# CPW Feed Rectangular Micro-strip Patch Antenna

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*Abstract :* Today within the world of communication systems the foremost wide researched space is of wireless technology and a study of communication systems is incomplete while not an understanding of the operation of the antennas. Within the recent years of development in communication systems a necessity for the event of light-weight, compact and efficient antennas that square measure capable of maintaining high performance over a good spectrum of frequencies. This technological trend has targeted abundant effort into the planning of a small strip patch antenna. A new design CPW feed rectangular micro-strip patch antenna to increase the bandwidth. The bandwidth of the proposed antenna is 700 MHz to about 2.565GHz at VSWR < 2, which is categorized as ISM band.

***IndexTerms* – Micro-strip Patch, ISM Band, CPW feeding, FR-4, Bandwidth.**

## I. INTRODUCTION

Microstrip patch antenna is a key building in wireless communication as well as Global positioning system. A Patch antenna is a radio antenna with low profile which can be mounted on a flat surface. A patch antenna is a narrowband as it consists of a flat rectangular sheet mounted over a larger sheet of metal called as ground plane. Patch antenna is simple to fabricate and easy to modify. Related with conventional antenna micro strip patch antenna have advantages. They are light weight, low cost and low profile planer configuration.

A micro-strip patch antenna is well suitable for wireless communication due to its light weight and low planer configuration. The impedance bandwidth of a patch antenna is the spacing between the patch and ground plane. Patch arrays can provides higher gain then a single patch. Such an array of patch antenna is a simple way to make phase array of antenna with dynamic beam forming ability. The industrial, scientific and medical (ISM) bands are operated. The frequency range is 2.4GHz for industrial, scientific and medical purposes. The antenna is designed for 2.4 GHZ and it can be used for various applications like WLAN, Wi-Fi family of standard (802.11) and Bluetooth short range wireless application.

## II. ANTENNA DESIGN

The designed antenna is printed on both sides of substrate, one side is patch and other is ground plane. Microstrip patch antennas can be fed by a various methods. The antenna is designed by using a microstrip feed line because it is one of the easier method to fabricate. The designed antenna is used as a substrate material is FR-4. The dielectric constant of the substrate material is 4.4.

## III. LITERATURE REVIEW

This paper proposed a new design of stacked ring rectangular microstrip antenna fed by coplanar waveguide to increase the bandwidth. The results shown that at frequency 2100 MHz the return loss value is -13.23 dB with VSWR 1,553; at frequency 2300 MHz return loss values -15.36 dB with VSWR 1,412 and at frequency 2400 MHz return loss values -29.93 dB with VSWR 1.224. The bandwidth of the proposed antenna is 560 MHz or about 25.38% at VSWR < 2, which is catagorized as Ultra Wide Band antenna[1].

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A novel coplanar waveguide (CPW)-fed circularly polarized (CP) antenna is proposed. The antenna is composed of a square ground plane with a circular slot and an equiangular tapered-shaped feedline. With the use of a special shaped feedline, the axial ratio (AR) bandwidth of the proposed antenna is about 61.9% (2.9–5.5GHz), which is larger than most of similar antennas proposed before. In addition, the impedance bandwidth, determined by 10-dB return loss, is between 2.9–20GHz, which makes the antenna be used for ultrawideband (UWB) applications[4].

A coplanar waveguide (CPW) fed printing and wide circular slotted, dual band antenna for Wi-Fi/WiMAX applications are presented. The antenna mainly encompasses a ground with a wide circular slot in the centre, a rectangular feeding strip, and two

pairs of symmetric planar inverted L (SPIL) strips connecting with the slotted ground. The tuning effects of the rectangular patch, ground size, and SPIL strips to the resonance and matching condition are examined by HFSS and the prototype is fabricated and measured. The simulation and experimental results show that the antenna has an impedance bandwidth with −10 dB reflection coefficients 600 MHz (3.26–3.86 GHz, lower band) and 1040 MHz (5.02–6.26 GHz, upper band), which can cover both the Wi-Fi 5.2/5.5/5.8 GHz and WiMAX 3.3/3.5/3.7/5.8 GHz bands. Moreover, a stable omnidirectional radiation pattern and average peak gain for lower band 3.23 dB and upper band 5.93 dB have been achieved, respectively[5].

We present a simple coplanar waveguide- (CPW-) fed rectangular ring monopole antenna designed for dual-band wireless local area network (WLAN) applications. The antenna is based on a simple structure composed of a CPW feed line and a rectangular ring. Dual-band WLAN operation can be achieved by controlling the distance between the rectangular ring and the ground plane of the CPW feed line, as well as the horizontal vertical lengths of the rectangular ring. Simulated and measured data show that the antenna has a compact size , an impedance bandwidths of 2.21–2.70 GHz and 5.04–6.03 GHz, and a reflection coefficient of less than −10 dB. The antenna also exhibits an almost omnidirectional radiation pattern. This simple compact antenna with favorable frequency characteristics therefore is attractive for applications in dual-band WLAN[6].

A triple-band rectangular ring, open-ended monopole antenna with symmetric L strips for wireless local area network (WLAN)/Worldwide Interoperability of Microwave Access (WiMAX) applications is proposed. The proposed antenna consists of two symmetric folded arms and L strips. Based on the concept, a prototype of the proposed triple antenna has been designed, fabricated, and tested. The numerical and experimental results demonstrated that the proposed antenna satisfied the −10 dB impedance bandwidth requirement while simultaneously covering the WLAN and WiMAX bands. Furthermore, this paper presented and discussed the 2D radiation patterns and 3D gains according to the results of the experiment. The proposed antenna's peak gain varied between 2.17 and 4.93 dBi, and its average gain varied between −2.97 and −0.53 dBi[7].

The purpose of this paper is to design a microstrip rectangular antenna in Advance Design System Momentum (ADS). The resonant frequency of antenna is 4.1GHz. The reflection coefficient is less than 10dB for a frequency range of 3.1GHz to 5.1 GHz. The proposed rectangular patch antenna has been devise using Glass Epoxy substrate (FR4) with dielectric constant (ɼr = 4.4), loss tangent (tan į) equal to 0.02. This rectangular patch is excited using transmission lines of particular length and width. Various parameters, for example the gain, S parameters, directivity and efficiency of the designed rectangular antenna are obtained from ADS Momentum[8].

Today in the world of communication systems the most widely researched area is of wireless technology and a study of communication systems is incomplete without an understanding of the operation of the antennas. In the recent years of development in communication systems a need for the development of lightweight, compact and cost-effective antennas that are capable of maintaining high performance over a wide spectrum of frequencies. This technological trend has focused much effort into the design of a Micro strip patch antenna. In this work, the simulation tool of IE3D is used to study the performance and gain of the rectangular Microstrip patch antenna. The design and simulation of patch antennas is widely used in mobile cellular phones today, and our emphasis in this work is on optimization of a 2.4 GHz rectangular Microstrip patch antenna. The return loss and the various gain plots have been studied along with the radiation patterns. Keywords: Gain, Inset feed, Patch antenna, Radiation pattern, Return Loss[9].

## IV. PROBLEM STATEMENT

Design of CPW Feed stacked rectangular microstrip patch antenna operating at 2.4 GHz. Antenna is simulated using HFSS software & result are obtained in following antenna performance parameters.

- Reflection coefficient.
- VSWR.
- Gain.
- Directivity.
- Impedance.
- General current and its direction.
- Generated E field.
- Generated H field.

Fabricate antenna with satisfactory software results and tested using network analyzer.

Compare software & hardware results for antenna.

## V. SIMULATED ANTENNA

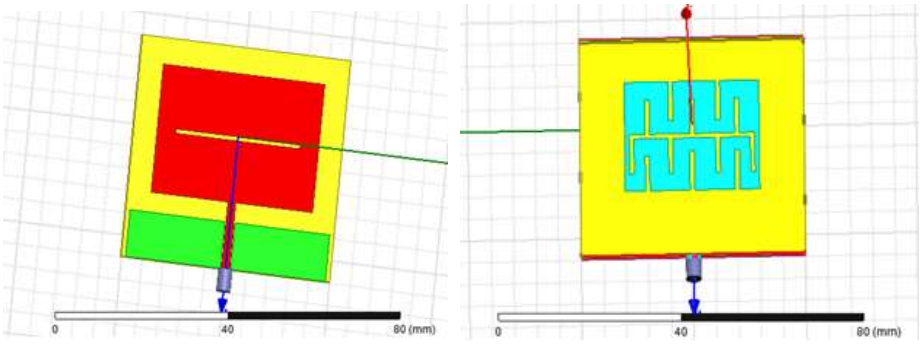


Fig1. Simulated Antenna

## VI. SIMULATED RESULTS

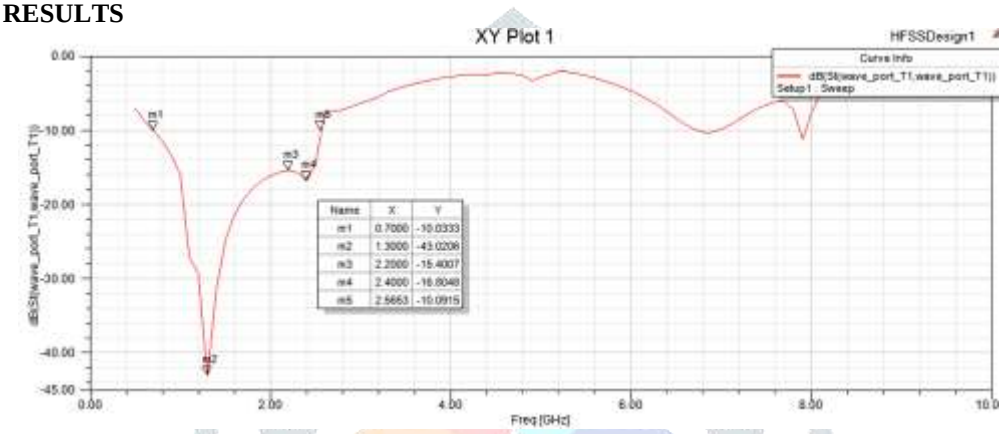


Fig2. Return Loss of Simulated Antenna

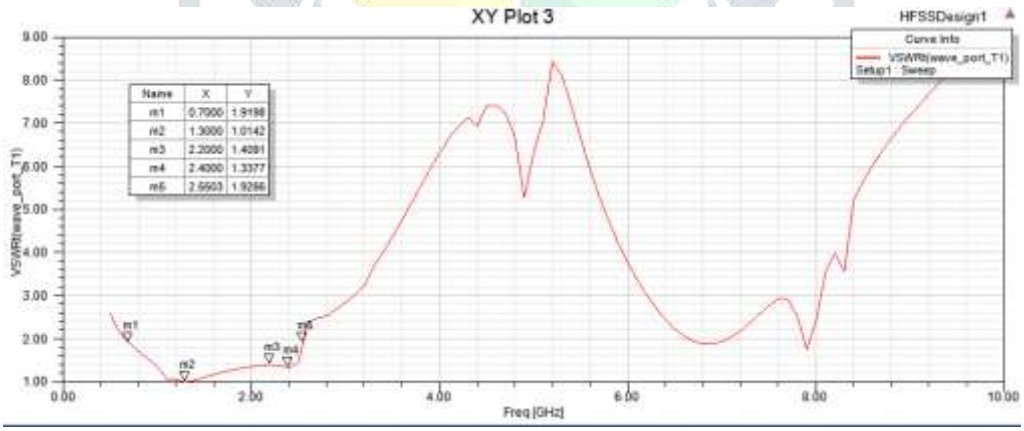


Fig3. VSWR of Simulated Antenna

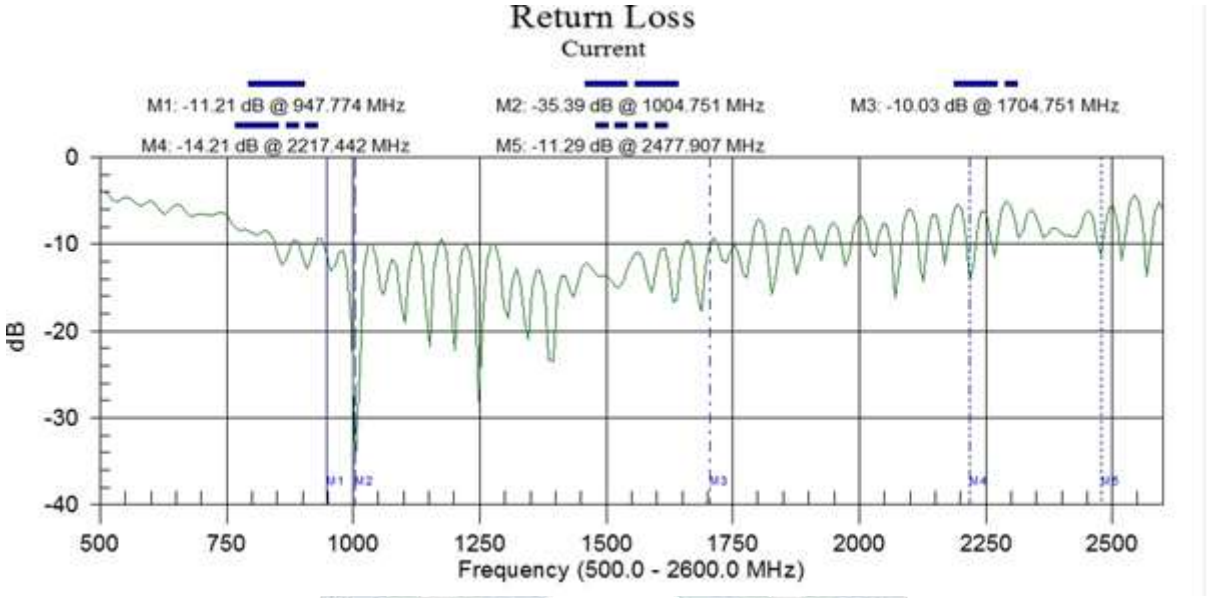


Fig4. Return Loss of Fabricated Antenna

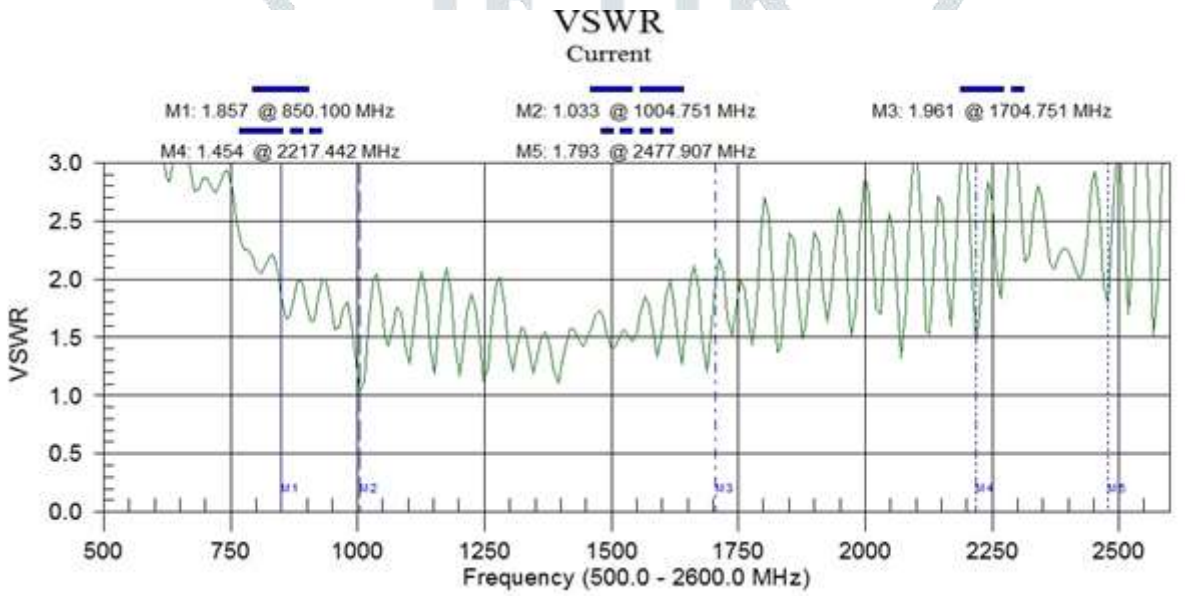


Fig5. Return Loss of Fabricated Antenna

## VII. CONCLUSION

A micro-strip antenna consists of conducting patch on a ground plane separated by dielectric substrate. In case of a antenna generally CPW (Coplanar Waveguide) feeding technique is used. A literature review of micro-strip patch antennas operating at 2.4 GHz frequency is part of this report.

In this paper we design & present results of a CPW feed Rectangular shape patch antenna which is designed using HFSS. The results of said antenna is obtained in term parameters like, reflection coefficient, VSWR, generated electric field, magnetic field & current distributions.

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