# Design of Double-Spiral Microstrip Antenna Over a Rectangular Patch for Mobile and Wi-Max Applications

**SANDEEP KUMAR VERMA**
*Department of Electronic & communication Engineering*
*Bundelkhand Institute of Engineering & Technology, Jhansi (U.P.)*
sandeep241188@gmail.com

**[2]D.K. SRIVASTAVA, [3] J.P.SAINI, [4]D. S. CHAUHAN**
*[2]Department of Electronic & communication Engineering*
*Bundelkhand Institute of Engineering & Technology, Jhansi (U.P.)*
*[3]Department of Electronic & Communication Engineering*
*Madan Mohan Malviya Engineering College, Gorakhpur (U.P.)*
*[4]Uttrakhand Technical University, Dehradun*
[2]dks1_biet@rediffmail.com, [3]jps_uptu@rediffmail.com, [4]pdschauhan@gmail.com

**Abstract**

The proposed microstrip antenna uses microstrip line feed technique. The proposed antenna has improved bandwidth over the structure with single spiral of similar dimensions. Here, Double-Spiral microstrip patch antenna has a bandwidth of 23.828 that lies between the range 1.926 GHz to 2.447 GHz and it resonates at 2.1865 GHz. In this proposed antenna, the geometric parameters are investigated for and the antenna is simulated by using IE3D simulation software. The simulated result shows that the proposed antenna may be used for Mobile, Wimax Applications .

*Keywords:* Microstrip antenna; microstrip feed line; finite ground plane; return loss; IE3D software.

## 1. Introduction

In modern communication and radar systems, miniaturization and high performance are the main targets of the designers at all times. Microstrip or patch antennas are becoming increasingly useful because as they can be printed directly onto a circuit board. The microstrip antenna is composed of patch substrate and ground plane. The patch and ground plane are very thin metal disk. Dielectric substrate is between the ground plane and patch and radiation occurs due to fringing field. A microstrip or patch antenna is a low-profile antenna that has a number of advantages over other antennas -- it is lightweight, inexpensive, and easy to integrate with accompanying electronics[1]. While the antenna can be 3-D in structure, the elements are usually flat, hence is also known by other name, planar antennas. The low profile feature of the patch antenna leads to a relatively narrow bandwidth.

The band width of microstrip patch antenna can be improved by reducing Q (quality factor) , which can be obtained by increasing the thickness 'h' of the substrate, reducing the dielectric constant '$\epsilon_r$' of the substrate material[2], by cutting the slots in the patch and also by using the microstrip feed line technique.

In this proposed antenna, the band width can be improved by using the microstrip feed line technique.

## 2. Design and Simulation

### *2.1 Parameters of designed antenna*

The geometry of simulated antenna is shown in "fig.1." The antenna size is 60mm×40mm. Two symmetrical Spirals on patch is introduced as shown in "fig.1." The dielectric constant of substrate is around 4.2. The substrate thickness is 1.6mm and loss tangent is 0.0013. For feeding in

double spiral microstrip antenna, microstrip feed line technique is used.

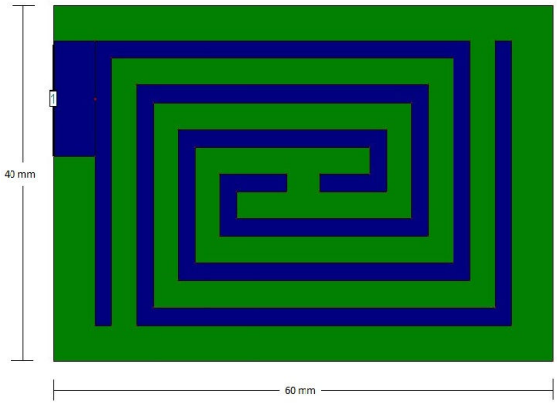


Fig.1. Proposed microstrip antenna design

### 2.2 *Simulation and analysis of designed antenna*

The simulation of micro strip antenna is done by using IE3D simulation software[3].The procedure of simulation is done by taking ground plane as a finite plane[2]. The resonance occurs at 2.127GHz and bandwidth is calculated at the frequency range where the return loss ($S_{11}$) is approximately 10 or below. The return loss characteristics of simulated antenna are shown in "fig.2." and simulated smith chart shows the impedance matching criteria of proposed antenna as shown in "fig.3."

## 3. Simulated IE3D Results

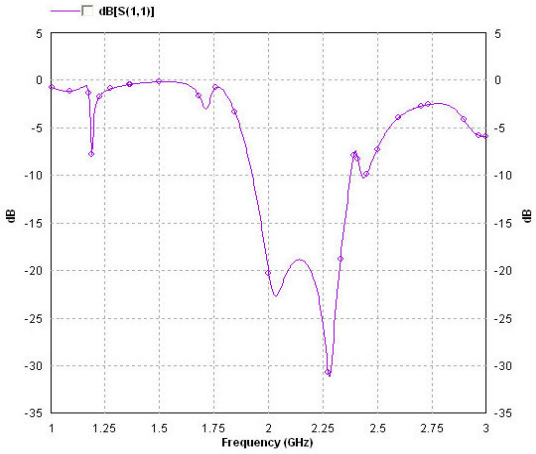


Fig.2. Freq.vs Return loss for proposed antenna

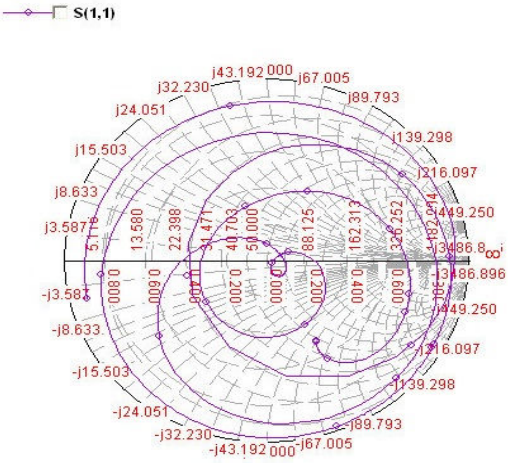


Fig.3. Smith chart for the proposed microstrip antenna

## 4. Conclusion

In this paper, double–Spiral microstrip antenna over rectangular patch improves the bandwidth for Mobile, WiMAX Applications[4]. Here, we have used microstrip line feed technique for enhancing the bandwidth of simple microstrip antenna. Here, we have shown the comparison between the Simulated and the experimental results. In this paper, proposed antenna has a bandwidth of 23.828%, in the range of 1.926GHz-2.447GHz and it resonates at 2.1865 GHz.

## 5. References

1. "Design of Broadband Multi-slotted Microstrip Patch Antennafor Wireless System" Norbahiah Misranl, Mohammad Tariqul Islam, Mohammed Nazmus Shakibl and BaharudinYatim, Proceedings of international conferenceson microwave 08.

2. K. L. Wong, "*Compact and Broadband Microstrip Antennas"*, John Wiley and Sons, Inc., New York, USA, 2002.

3. IE3D 12.32, Zeland Software, Freemont, CA, USA.

4. Yeonsu Jang, Sungchan Kang, Young-EilKim, Jongryul Lee, Jae-Hoon Yi, and Kukjin Chun ''A Triple-Band Transceiver Module for 2.3/2.5/3.5 GHz Mobile WiMAX Applications'' JOURNAL OF SEMICONDUCTOR TECHNOLOGY AND SCIENCE, VOL.11, NO.4, DECEMBER, 2011.