Design of U Shaped Microstrip Patch Antenna for Dual Band Frequency Application

Paritosh Kumar
Master Of Technology
Department of Electronics & Communication Engineering,
Madan Mohan Malaviya Engineering College, Gorakhpur, Uttar Pradesh, India.
paritosh_62@yahoo.co.in

Chandan
Lecturer
Department of Electronics & Communication Engineering,
Madan Mohan Malaviya Engineering College, Gorakhpur, Uttar Pradesh, India
chandanhcst@gmail.com

R.K.Prasad
Associate Professor
Department of Electronics & Communication Engineering,
Madan Mohan Malaviya Engineering College, Gorakhpur, Uttar Pradesh, India
rkp.sikarpur@gmail.com

Abstract

In this paper we present a proposed design for U shaped rectangular micro strip patch antenna. Using proposed antenna design and coaxial feeding techniques at proper position, we receive the resultant bandwidth as a dual band bandwidth. We are using IE3D simulation software for designing and analysis. Proposed antenna is designed for wireless communication system and Wi-max applications.

Keywords: U shaped rectangular Microstrip patch antenna; bandwidth; VSWR; return loss; coaxial feeding techniques.

1. INTRODUCTION

Microstrip antenna plays a major role in wireless communication. It has many advantages such as low profile, compactness, easy to fabricate, easy installation, low cost etc but it has a major disadvantage of narrow bandwidth which proved to be a challenge for engineers to meet high data rate for various broadband application. bandwidth of antenna can be increased by various method such as by increasing the thickness of substrate with low dielectric constant, by probe feeding, by cutting slot and by different shape of antenna .By probe feeding and moving the location of probe feeding we get optimized bandwidth. The Increased bandwidth is compare with bandwidth of normal patch antenna and bandwidth of E shape Microstrip antenna. We will analyse that there is increase in bandwidth using proposed antenna and using coaxial feeding at position where maximum matching is obtain. Simulation of U shaped patch antenna has been carried out using IE3D software. In the proposed U shaped antenna at probe location (56mm × 60mm), the antenna performs as a dual band antenna with bandwidth of 34.27% and 14.68%.

2. ANTENNA DESIGN

The proposed antenna is design by cutting single slot in rectangular patch to make it a U shaped antenna as shown in fig 1. Cutting of these slots in antenna increases the current path which increases current intensity as a result efficiency is increased. The dimension of the ground plane is taken as (70mmx70mm). The substrate dielectric constant is 4.2 and substrate thickness is 1.6mm and loss tangent is 0.0013.The probe feeding is implemented on (56mm×60mm) for optimum result. Figure 1 shows the shape of normal U shaped patch antenna which has a dual bandwidth of 34.27% and 14.68%.

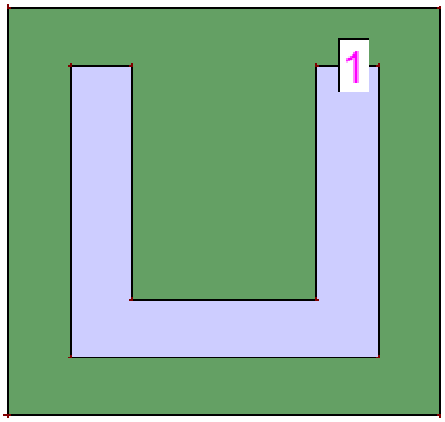

Figure (1): Normal E-Shape Microstrip Antenna

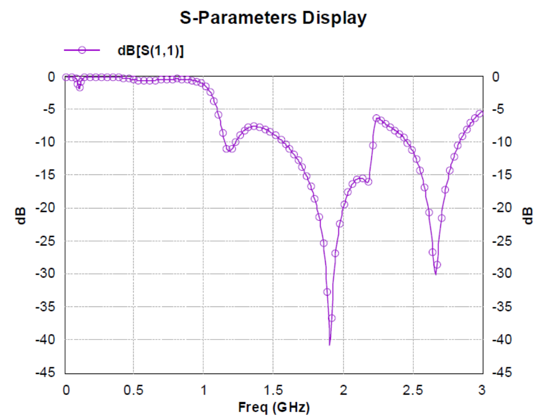

Figure (2): Return loss Vs Frequency for the U shaped antenna

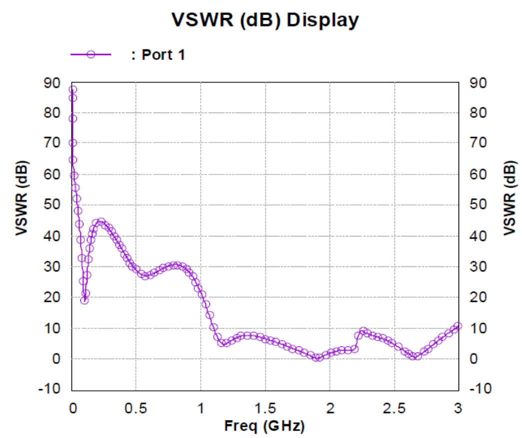

Figure (3): VSWR Vs Frequency for U shaped antenna

3. ANTENNA RESULT

We are using IE3D simulation software for simulation of Microstrip patch antenna [4]. The bandwidth of proposed antenna on simulation comes out to be 34.27% and 14.68% at 1.909GHz and 2.66GHz resonance frequency respectively. The return loss (S_{11}) of H shaped patch antenna has -40.5dB at the 1.909 GHz and -30dB at 2.66GHz resonant frequency, and normal U shape patch antenna is improve bandwidth 34.27% and 14.68% at 1.909GHz and 2.66GHz resonance frequency respectively. The band width is calculated at the frequency range where the return loss (S_{11}) is approximately -10 or below [2]. Antenna efficiency is 90.7% shown in fig 5, radiation efficiency is 93.7%, and directivity is 6.1, this show that there is bandwidth improvement in proposed antenna. The return loss of proposed Microstrip patch antenna is shown in figure (2). The plot the result of the VSWR at the resonant frequency and VSWR value is observed as ≤ 2 improved matching conditions, 3D diagram, VSWR, directivity, gain are shown in figure (3-7).

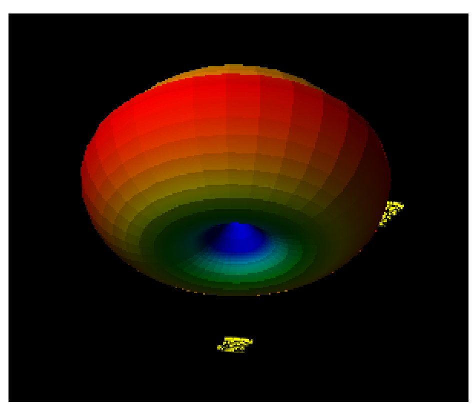

Figure (4): 3D diagram of radiation pattern for U shaped antenna

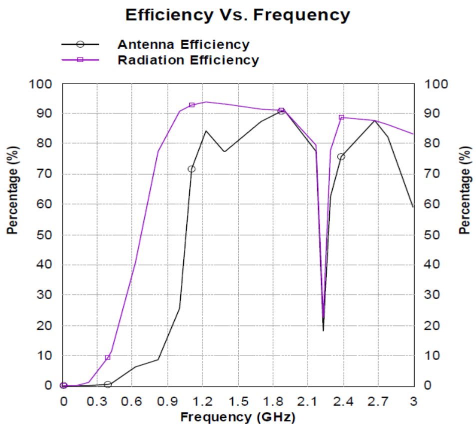

Figure (5): Efficiency of U shaped antenna

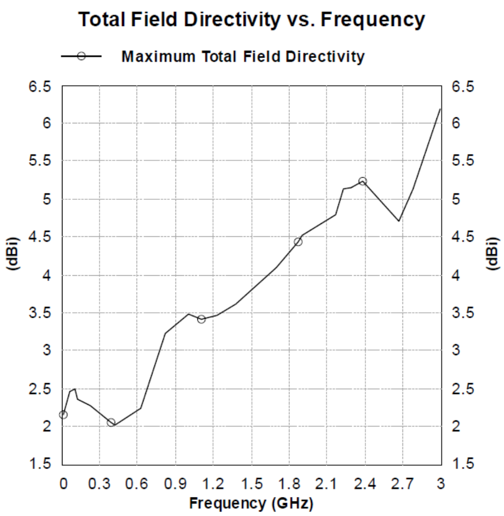

Figure (6): Directivity Vs frequency of U shaped antenna

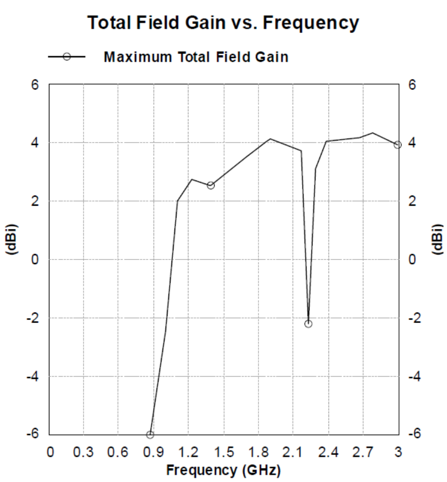

Figure (7): Gain Vs frequency for U shaped antenna

4. CONCLUSION

We can analyse that by using U shaped microstrip patch antenna and coaxial feeding techniques we can achieve modified bandwidth. The antenna band width is increased up to 34.27% and 14.68% at 1.909GHz and 2.66GHz resonance frequency. Along with band width antenna directivity, efficiency and radiation pattern also changes the proposed antenna has high bandwidth which can be used for wireless communication of high data rate.

5. REFERENCES

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