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DESIGN OF T-SHAPED LOADED DUAL BAND MICRO STRIP PATCH ANTENNA FOR WIRELESS COMMUNICATIONS

SURAJ UPADHYAYA & DEEPAK SHUKLA

Department of Electronics and Communication Engineering, Ritm Luck Now, India

ABSTRACT

Here, in this study, a simple designs of rectangular Micro strip patch antenna is proposed that is investigating for enhancing the impedance bandwidth for wideband applications, especially for Mobile Services (1.885-2.025 GHz) and WLAN (2.40-2.48 GHz). On the conducting patch T shaped slot has been cut. The % impedance bandwidth (VSWR ≤ 2) at -10 dB return loss for band 1 comes out to be about 19.5%, ranging from 2.194 GHz to 2.667 GHz and 6.7 % ranging from 3.493GHz to 3.773 GHz for band 2

KEYWORDS: Micro strip Antenna, Rectangular, T-Shaped Slot, Wideband, IE3D

INTRODUCTION

Micro strip antennas are becoming very widespread within the wireless and mobile communication because of their various advantages over the conventional antennas. Micro strip antennas have many advantages over the conventional antennas because of light weight and low volume, low profile planar configuration which can be easily made conformal to host surface, low fabrication cost, capable of dual and triple frequency operations, mechanically robust when mounted on rigid surfaces [1]. There are various methods to increase the impedance bandwidth of antennas, including, the use of a low dielectric substrate, slotted patch antenna, increase of the substrate thickness, the use of various impedance matching and feeding techniques [3-12].

The aim of this paper is to present a design and fabricate dual band T shaped slot-loaded rectangular micro strip patch antenna and in order to overcome disadvantages like limited bandwidth and low radiation efficiency and to develop an antenna that can Be compact in size, Be used wireless applications, especially for Mobile Services (1.885-2.025 GHz) and WLAN (2.40-2.48 GHz), Exhibit wideband characteristics, Be light weight. Dual band characteristics can be obtained by providing proper feed, choosing suitable patch and slot shape and tuning their dimensions.

Here we are providing two 50 ohms micro strip line feed. For simulation we are using IE3D (version 12.32) software package of Zel and.

Antenna Design

The frequency of operation of the patch antenna is determined by the length L. The center frequency will be approximately given [3] by:

$$f_c = \frac{c}{2L\sqrt{\varepsilon_{reff}}} = \frac{1}{2L\sqrt{\varepsilon_0 \varepsilon_r \mu_0}} \quad (1)$$

Where length L is given by [16]:

$$L = \frac{c}{2f_r\sqrt{\varepsilon_{reff}}} - 2\Delta L \quad (2)$$

For an efficient radiator, practical element width given [5] by:

$$W = \frac{c}{2f_c\sqrt{\frac{(\varepsilon_{reff}+1)}{2}}} \quad (3)$$

Where, f_c = resonant frequency of the antenna, c = velocity of the light in free space, L = actual length, ε_{reff} = effective dielectric constant of the substrate and ΔL = length of equivalent radiation gap.

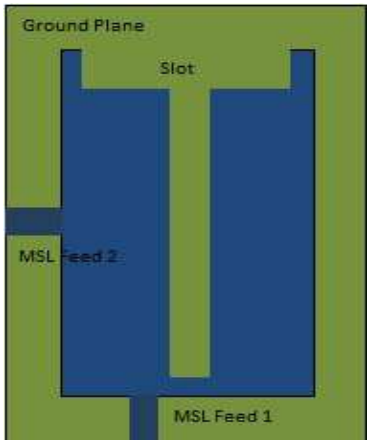

Figure 1: Top View

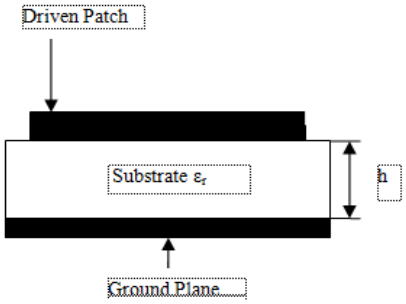

Figure 2: Side View

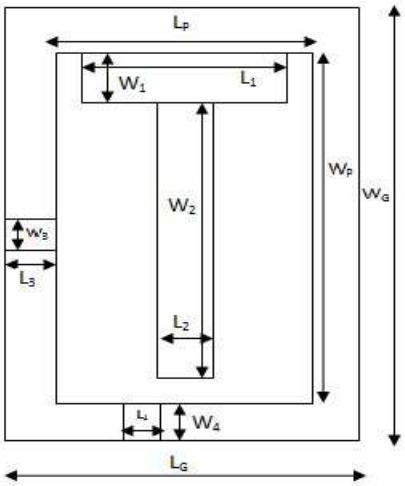

Figure 3: Dimensional View

Figure 1, 2 and 3 shows the geometry of proposed antenna. Glass epoxy is used as substrate for the antenna with dielectric constant $\varepsilon_r = 4.2$ and height h = 2 mm. The top view and side view of the patch antenna is shown in figures 2 and 3 respectively. The dimensions of the proposed antenna are shown in figure 3. The optimized design parameters of the proposed antenna are as follows:

Table 1: The Proposed Patch Antenna Parameters

Parameter	Value(Mm)
L_G	40 mm
W_G	50 mm
L_P	30 mm
W_P	40 mm
L_1	35 mm
W_1	5 mm
L_2	5 mm
W_2	32.5 mm
L_3	5 mm
W_3	3 mm
L_4	3 mm
W_4	5 mm

Here, feeding is provided by two 50 ohms microstrip line feed to the patch, one on x-axis and other on y-axis. The use of micro strip line feeding technique configuration provides the bandwidth enhancement.

RESULTS AND DISCUSSIONS

The antenna presented in this paper is simulated using IE3D software, 12.32 version of Zeland. The simulated return loss of the proposed antenna is shown in figure 4. The impedance bandwidth at -10 dB return loss comes out to be 19.5% for band 1 at center frequency 2.430 GHz and 6.7% for band 2 at center frequency 3.633 GHz. The VSWR of the proposed antenna is shown in figure 5.

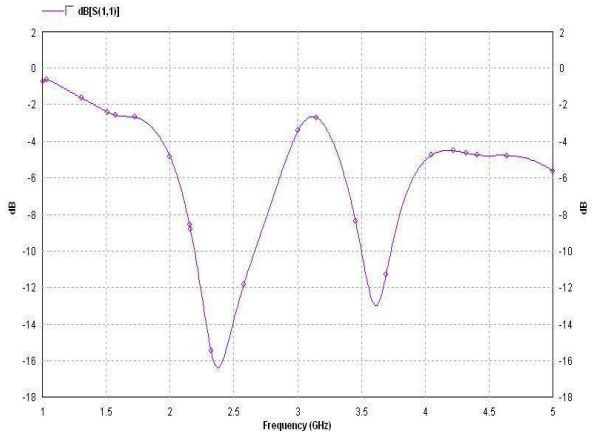

Figure 4: Simulated Return Loss

Figure 6 shows the simulation setup of presented antenna which is simulated on IE3D software version 12.32

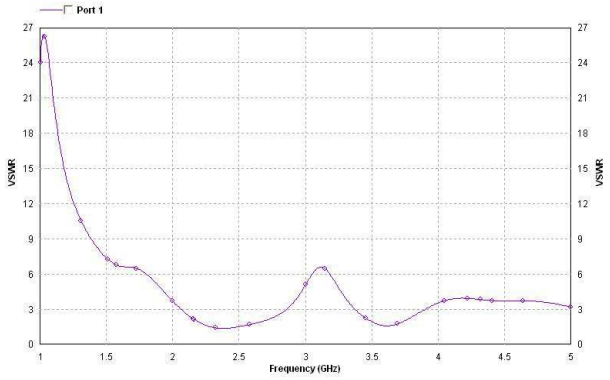

Figure 5: Simulated VSWR

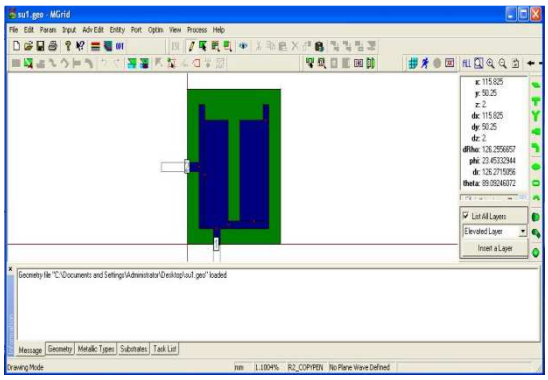

Figure 6: Simulation Set Up

CONCLUSIONS

In this communication, the narrow bandwidth problem of a micro strip patch antenna is studied. The method employed to improve its bandwidth is the use of radiating element which consists of a rectangular patch with a T- shaped slot and is fed by two 50 ohms micro strip lines.

T shaped slot slotted micro strip antenna for 2.194/2.667 GHz and 3.493/3.773 GHz is presented. The presented antenna has a very compact size of (40 mm x 50 mm x 2 mm). The impedance bandwidth of the proposed antenna at -10 dB return loss is about 19.5% for band 1 and 6.7 % for band 2, which is covering the frequency bands of UMTS, Wi Max, WLAN (2.40–2.48GHz), and UMTS II (2.50–2.69GHz). The antenna is simulated using IE3D, 12.32 version of Zealand. Good antenna performance and impedance matching can be realized by adjusting the length and width of micro strip line.

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