CPW Feed UWB Antenna with Single Band - Notch Characteristics

Priyanka Garg, Ira Joshi

Electronics and Communication Engineering Department,
Rajasthan College of Engineering for Women Jaipur

Abstract—In this paper CPW feed UWB antenna with single band-notch characteristics is proposed. The antenna proposed here has a simple geometry with dimensions of 50X50mm^2. The height of antenna including ground plane is 1.5mm with FR-4 as a substrate having dielectric constant 4.6. The antenna design consists of two rectangular and a circular ring of radiating patch. The feeding used here is coplanar waveguide which gives broad band performance. CST (Computer Simulation Technology) software is adopted here in this study. The proposed antenna works on ultra wide band characteristics which is suitable for short distance applications.

Keywords—*Single band notched, UWB, CST*

I. INTRODUCTION

Wireless communications have been growing with an astonishing rate over the past few years and wireless terminals for future applications are required to provide diverse services. This rising demand prompts the need for antennas able to cover multiple bandwidths or an ultra-wide bandwidth for various systems [1].

Ultra-wideband (UWB) technology has received considerable attention in recent years for high data-rate short distance communication in the 3.1 GHz to 10.6 GHz region and transmission of sensor data. UWB wireless communications offers a radically different approach to wireless communication compared to conventional narrow band systems [2].UWB technology is based on theuse of very narrow baseband pulses in the order of nanoseconds. These pulses result in spectral components covering a very wide bandwidth in the frequency domain. For communication applications high data rates are possible due to the large number of pulses that can be created in short time duration [3]. Ultra Wideband is any communication technology that holdsmore than 500 MHz of bandwidth, or more than 25% of the operating frequency. Most narrowband systems occupy less than 10% of the centre frequency bandwidth, and are transmitted at far greater power levels[4].

When signals are sent via ultra-wide band antennas, a low level of signal by a broad frequency band, less power is required because it undergo from less interference. The means UWB antennas requires fewer energy to give access to internet, digital voice services and video telephony. Ultra-wide band antennas are basically used with software defined radios. The software prescribed radio or SDR that have one UWB antenna rather than numerous to cover any frequency range it is set for at that moment [5].

Many slot antenna elements suitable for a CPW-fed UWBconfiguration have been studied in literature. Study of CPW feed circular disc monopole for ultra wideband applications [6]. Compact SRR loaded UWB circular monopole antenna with frequency notch characteristics [7]. High performance direct coupled band pass filters on coplanar waveguide[8].

Antenna requirements for software defined and cognitive radio [9]. New reconfigurable antenna design for cognitive radio[10].Yi-Cheng Lin has been discussed the design of three advanced band-notched 5–6 GHz UWB rectangular aperture antennas[11].

The organization of this paper is as follows. In Section II, basic design of antenna is described. In Section III, the simulated results of designed antenna are presented and finally, the paper is concluded in Section IV.

II. ANTENNA DESIGN

This section briefs the design of the proposed antenna.The antenna is designed by using CPW feed configuration.CST (Computer Simulation Technology) microwave studio is used for the simulation of proposed design. Fig.1 shows the geometry of the proposed antenna which has dimensionof50X50X1.5 mm^3 and it includes two rectangular patch with one circular ring attached to microtrip line. Substrate used in this design is FR-4 having dielectric constant 4.6 with the ground plane of 0.035 mm.The feeding provided here to this antenna is CPW (coplanarwaveguide) which is made byplacing three conducting strip in a single plane. From the structure of proposed antenna it is seen that circular ring is attached to the microstrip line which is placed between two rectangular shapes conducting strip thus making it a coplanar

feeding. The characteristics impedance of a coplanar waveguide is not affected by thickness and depends on width and space. Thus by making variation in the distance between the rectangular patch and microstrip line good results are achieved.

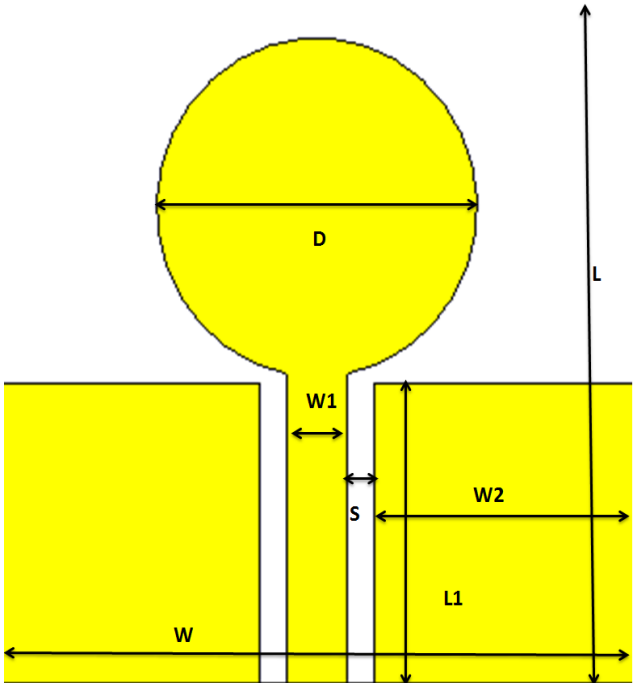


Fig.1 Geometry of proposed antenna

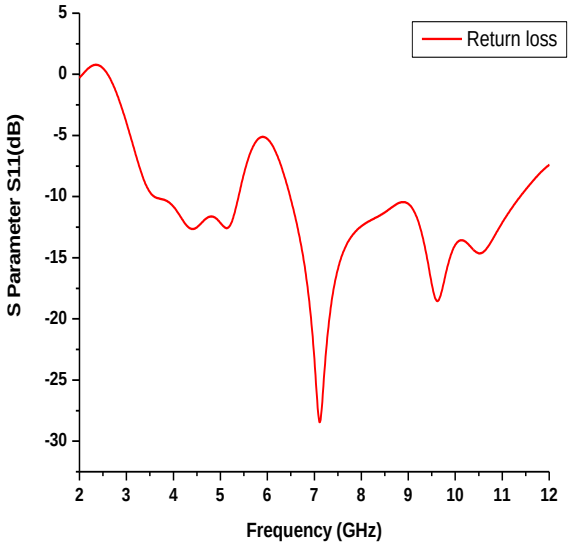
Table I shows the dimensions of the antenna, all parameters are mentioned in this table.

TABLE I
KEY DIMENSIONS OF ANTENNA DESIGN

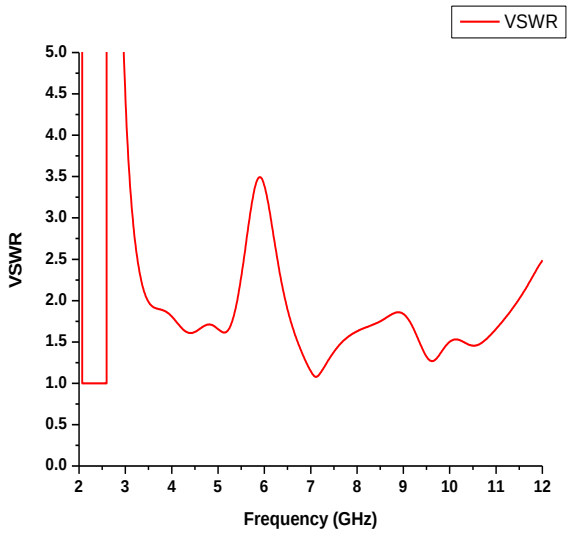
Antenna parameter	Value	Antenna parameter	Value
L	50mm	W	50mm
L1	22.86mm	W1	6mm
L2	22.15mm	W2	20mm
S	2mm	D	25mm

III. SIMULATION RESULTS AND ANALYSIS

Software used for simulation of this structure is Electromagnetic (EM) simulation software.This software is widely used in the design of tunable filters, patch antennas, wire antennas, and other RF/wireless antennas. For calculating and plotting the S_{11} parameters, monostatic RCS,insertation loss, current distributions as well as the radiation pattern this software is used. Return loss and VSWR characteristic for the proposed antenna is shown in Fig.2.



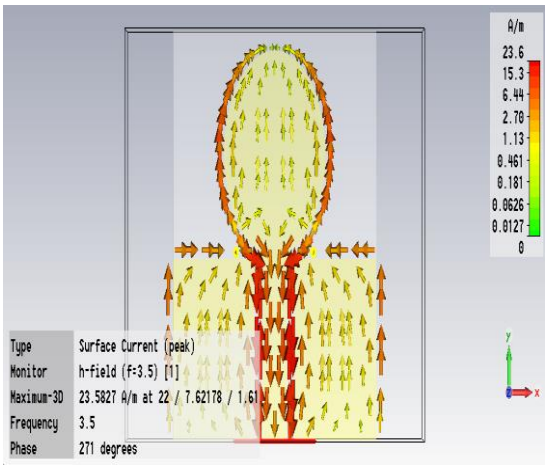
(a)



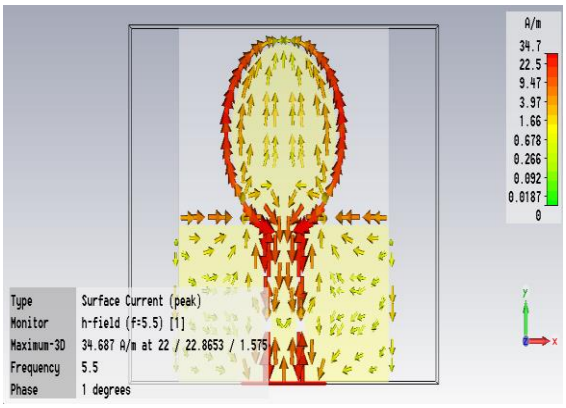
(b)

Fig.2 Simulated results of proposed antenna (a) Return loss (b) VSWR

The graph presents single band notch between the frequency bandwidth of 5.2- 6.7 GHz which shows that the antenna rejects the interference created by WLAN range thus at this particular range return loss is coming at less than -10dB which satisfies the required condition for return loss and from the graph of VSWR it can be detected that the result is coming at less than 2 for this frequency range which also fulfil the required condition of VSWR. Fig.3 shows the surface current distribution.



(a)



(b)

Fig.3 Surface current distribution for (a) 3.5GHz (b) 5.5GHz

IV. CONCULSION

In this paper, CPW feed UWB antenna with single band notch characteristic has been proposed for various UWB applications. The fabricated antenna covers the frequency band from 3.1 to 10.6 GHz with one rejection band 5.2- 6.7GHz. In the proposed structure, rectangular and circular shaped radiating patch is used to improve the impedance bandwidth. Moreover by adjusting the distance between tworectangular shaped slots and circular shaped ring connected to microstrip line on the ground plane a single band notch characteristic is generated. The designed antenna satisfies the condition of VSWR and return loss for UWB range except the notched band . The experimental results show that the realized antenna with a very compact size, simple structure, and wide bandwidth can be a good candidate for UWB applications.

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