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Design an Elliptical Shaped UWB Antenna Enhanced Bandwidth by Using Notch

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Abstract: This paper presents the design of rejection band centered at 5.5 GHz is obtained by etching out incomplete inverted C type slots coplanar waveguide (CPW) with band notch. The FR4 material is used as substrate here having a dielectric constant of 4.3. The impedance bandwidth of the proposed antenna covers the frequency range from 2.6GHz to13.89 GHz. The group delay shows a flat response lying within 1ns except at the notch frequencies.

Keywords: Ultra Wide Band, CPW Feed, WLAN, Slots, MSA.

I.INTRODUCTION

In general Microstrip antennas show the high resonating frequency and narrow bandwidth, but the exploding growth of wireless communication system leads to an increasing demand for wideband, compact, low-cost Microstrip antennas. So the design of printed antenna has become an interesting topic for research work now a day. After only wideband antenna the era of Ultra-Wide Band (UWB) antenna has been introduced. The UWB technology enables high-speed data transmission with low power consumption. Apart from wireless communication, these low-cost UWB antennas are also desirable for radar, medical imaging, and indoor positioning. The merits of printed antenna such as low profile, light weight, small size and make them an attractive candidate for UWB antenna development. For the integration of the UWB technology in the handheld terminals that are becoming smaller and thinner each day, the design of a very compact UWB antenna covering the whole operating frequency band is one of an essential requirements. However, reducing the size of a Microstrip antenna usually brings about reducing operating bandwidth. The proposed antenna could potentially minimize frequency interference from much underlying technologies, for example, WLAN, WiMAX, and Aeronautical mobile band. A printed elliptical antenna with a printed and modified fed was designed to support a number of wireless communication frequency bands. The FCC designed notch band for ultra-wide band system, there exists various narrow frequency bands used by other wireless systems such as WiMAX (3.3GHz-3.7GHz), WLAN (5.15GHz-5.825GHz), satellite communication (7.25GHz-7.75 GHz).

In this paper, a compact CPW-fed UWB printed monopole antenna of size 40 x 40 x 1.6 mm3 with a single notched band centered at 5.5 GHz. The paper is arranged such that section 2 describes the details of the design and parametric study, which is followed by result and discussion and conclusion in section 3 and section respectively.

II.ANTENNA DESIGN

The geometry of the proposed antenna is shown in figure.1. The proposed antenna is perceived on FR4 substrate having dielectric constant = 4.3, thickness 1.6mm. The radiator patch consists of an elliptical feed by a 50-ohm coplanar waveguide line. The antenna is simulated using CST Studio microwave software. Two symmetrical in complete C Shape. The slot is greed in ground planes result in notch band at 5.5GHz.The two incomplete c shape slot is cutting the ground plane to create a rejection band centered at5.5GHz for WLAN

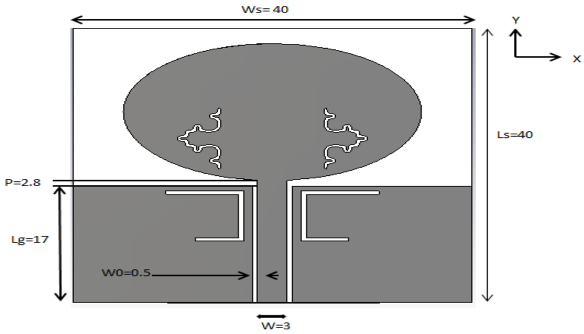

Fig.1. proposed antenna

The total length of the incomplete C shape patch is calculated at the center frequency 5.5 GHz for WLAN band and the total length of minkowsi fractal is calculated at the center frequency 5.8 GHz.

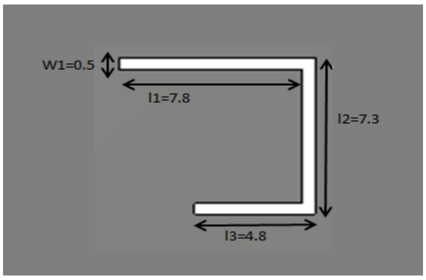

Fig 2 incomplete C- shape slot

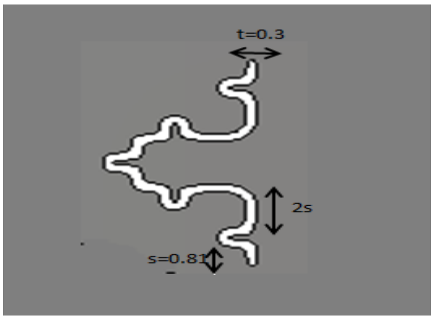

Fig 3 minkowsi fractal

III. RESULT AND DISCUSSION

The current distribution is studied and is shown in figure 4. Current density shows the information of standing waves around the slots at the respective band notches. At 5.5GHz, the current density is maximum around the two incomplete C-shape slot etched from the ground Plane. In this figure, the red color shows the maximum current distribution across the slot.

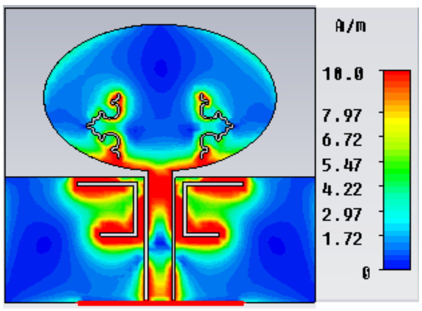

Fig.4 current distribution of proposed antenna

The VSWR of the antenna is plotted in figure 5which shows wide impedance bandwidth from 2.6 GHz to13.89 GHz.

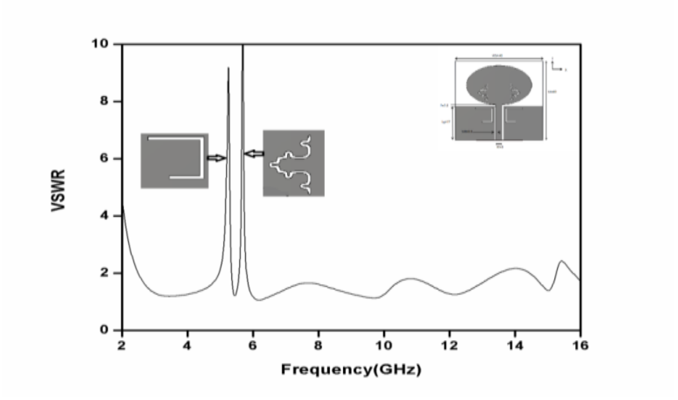

Fig.5 simulated VSWR of proposed antenna

To study the time domain characteristic of proposed antenna, its group delay is studied as shown in figure 6. The antenna is non-dispersive in nature as its group delay lies within 1 ns except at the band notches where the group delay is more as per desire reaching up to 2ns.

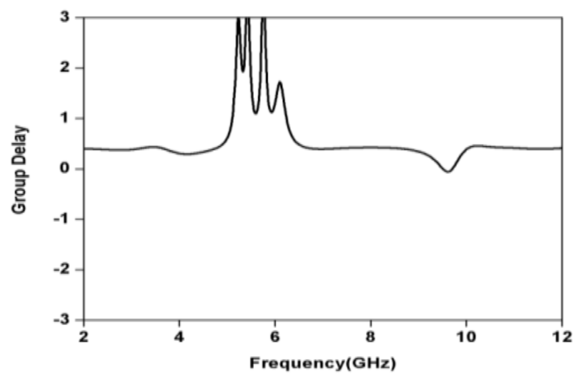

Fig 6 simulated return loss of proposed antenna

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