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A Compact CPW Antenna for UWB-USB Dongle Applications

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ABSTRACT
A compact Coplanar Waveguide (CPW) antenna with operating at UltraWidebandwidth (UWB) is to design and analyzed. The proposed antenna is designed by using ANSOFT HFSS 13.0. Finite Element Method (FEM). By simply cutting notches and embedding types of slots into a rectangular patch is provide effective bandwidth. The proposed antenna was constructed and measured to show an ultra wide operating band with 10-dB return-loss bandwidth of 11.26 GHz ranging from 0.91 to 12.17 GHz, which sufficiently covers the operating band, 3.1 to 10.6 GHz. The antenna size $30\times11\times0.6mm^3$ it is very suitable for USB devices.

Keywords
Ultra wideband (UWB), Universal Serial Bus (USB**),** Coplanar waveguide (CPW).

I.INTRODUCTION

Nowadays interest in ultra wideband (UWB) communication systems such as wireless USB covering band from 3.1 to 10.6 GHz has rapidly increased due to their many advantages including the low-spectral-density radiated power and potential for accommodating higher data rate. Meanwhile, considering that the Universal Serial Bus (USB) is a well-adopted portable connectivity tool in data exchange between various consumer electronics and mobile devices, much attention is therefore being focused on the UWB operation in the wireless USB dongle device. Compared to the conventional USB devices, the new realized wireless UWB USB dongle has a potential function to provide short-range and high-data communication without requiring a wire simultaneously among a wide range of devices.

In wireless USB dongle applications is to achieve antenna compactness to be covered small space. The CPW UWB type[1], the meandered strip type[2],the microstrip-fed patch types[3]-[9].These earlier designs are very complex and the size is large for built into the compact space of a USB dongle device.

This paper is aimed at describing the design and realization of a compact coplanar waveguide (CPW) antenna suitable for use in the USB dongle. Meanwhile, regarding that the patch monopole prototypes initially not only has a planar and simple structure to make it easy to integrate itself with the system circuit, but also has a chance to achieve a low -factor for effectively increasing bandwidth by means of simply cutting the patch, and insert the triangular shape in to the rectangular plate. It produces the UltraWidebandwidth in terms of return Loss.

II. ANTENNA CONFIGURATION

Fig. 1 illustrates the geometry of the synthesized UWB CPW antenna. It is evolved from a rectangular patch. This patch as a radiator was etched on the top portion of one side of an GaAs substrate with initial

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dimensions of 30× 11 mm^2, which is in general approaching the size of a portable USB dongle device, The specified characteristics of this substrate are 0.6 mm in thickness and 12.9 in relative permittivity (ε_r). The rectangular patch with dimensions of 18 × 9 was used to evolve this design. A 50- microstrip line of width 1.5 and length 11 was then adopted for feeding the patch. For improving the matching condition and then effectively extending the impedance bandwidth, dual triangular slots are inserted, the length of the triangular slots are 15, 13 respectively. The width of the patch is 1mm.

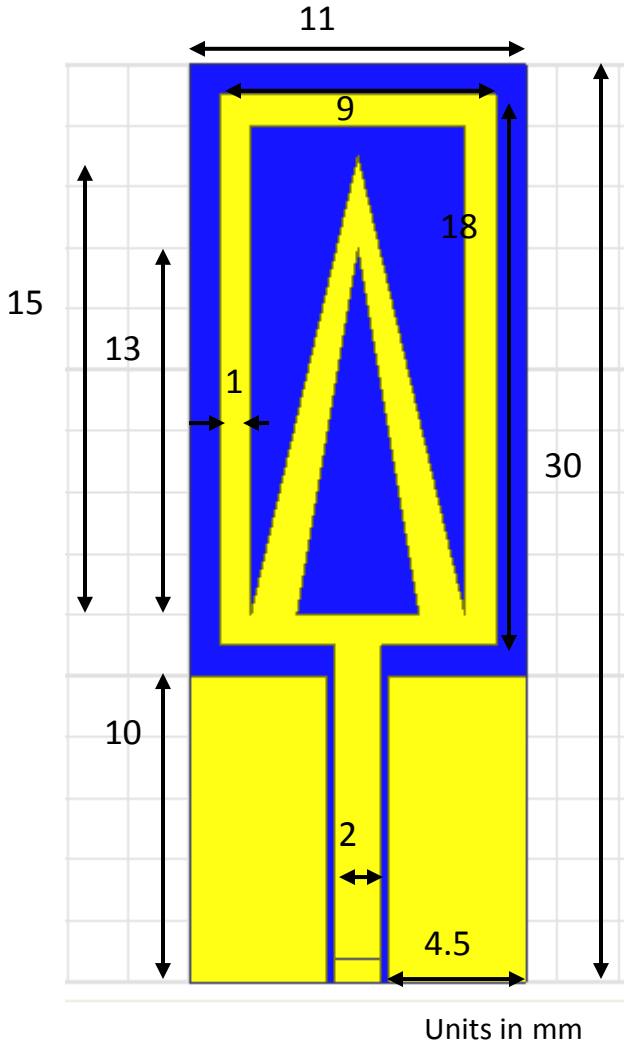

Fig.1. Configuration of proposed compact CPW antenna

III. SIMULATED RESULTS

The proposed antenna Return loss is shown in Fig.2, resonant bands are 2.53, 10.95 GHz have multiple resonances are excited and bandwidth is 11.30 GHz ranging from 0.94-12.24 GHz and it covers the UWB band. The antenna has two resonant frequency points (2.53GHz, and 10.95GHz). This frequency points are making slots in the antenna. The three resonance frequency is matching at return losses are -40.03 and -34.56 db respectively as the resonance frequencies. The proposed antenna return loss is shown in Fig.2.

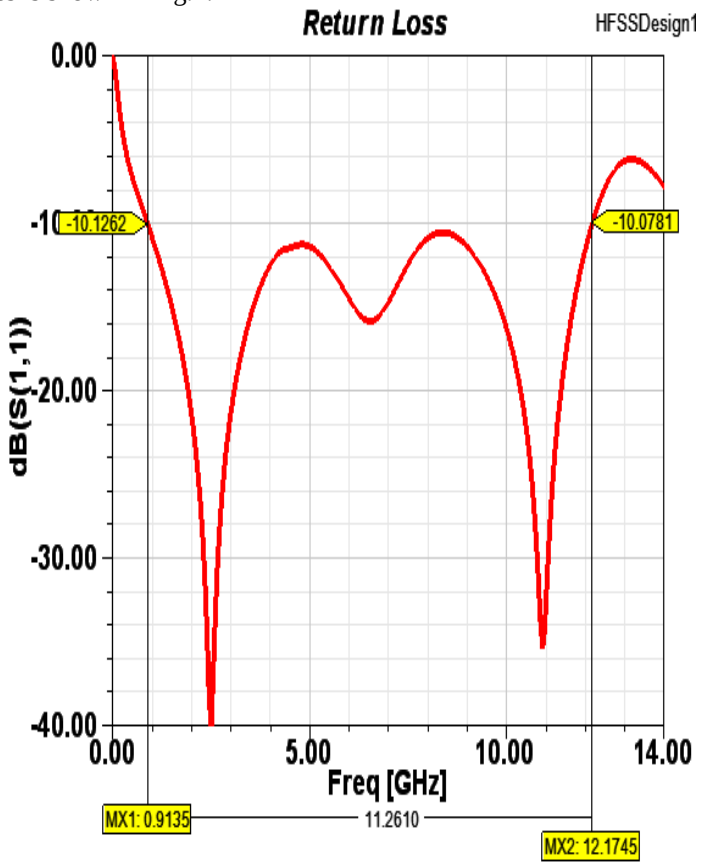

Fig.2. Simulated Return loss

Fig.3 presents the simulated VSWR values against frequency.

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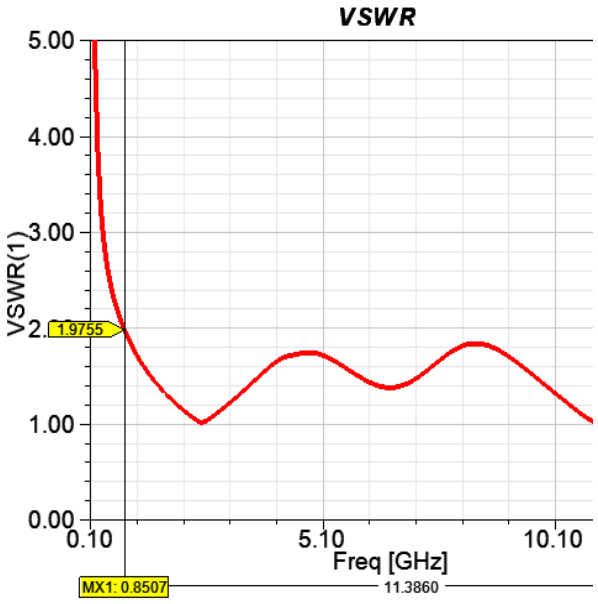

Fig.3. Simulated VSWR

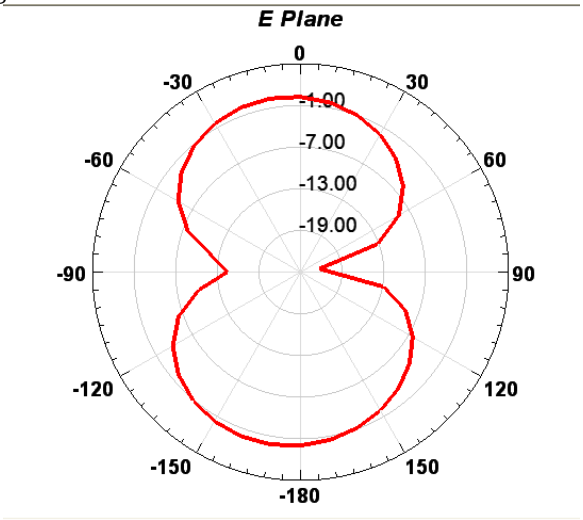

Fig.4. E-Plane

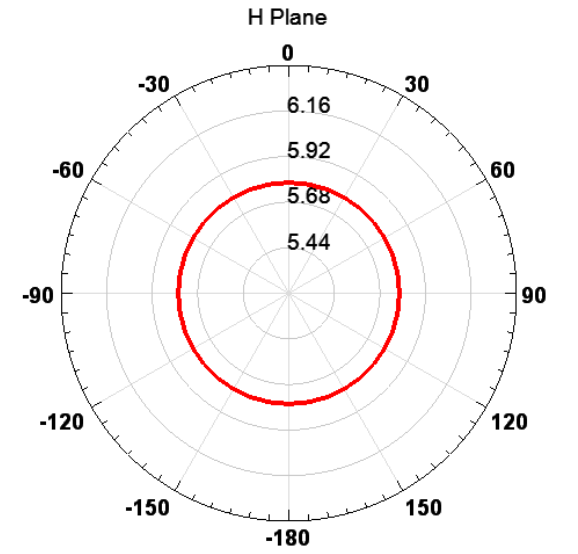

Fig.5. H-Plane

The far-field 2D radiation patterns at frequencies of 2.53, and 10.95 GHz for the proposed antenna. 4.12 GHz simulated radiation pattern of E plane and H plane are shown in Fig.4.and Fig.5. E plane has bidirectional pattern. And the H plane has unidirectional pattern.

IV. CONCLUSION

The optimal slotted patch antenna was designed and simulated by using ANSOFT HFSS 13.0. This CPW UWB USB dongle is operating band width -10dB return loss bandwidth of about 11.26 GHz ranging from 0.91 - 12.17 GHz. The Antenna gain is about 4dbi around the frequency range is 0.91-12.17 GHz. With an antenna size is only 30× 11 mm^2, multi resonance having ultra wide bandwidth and suitable for USB dongle devices. Simulated antenna results are showing a good behavior.

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