# CPW Fed Slotted Patch Antenna for UWB Applications

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***Abstract*—In this paper, a CPW fed slotted patch antenna is proposed for Ultra Wide Band (UWB) applications. A frequency domain analysis of the antenna is used to optimize the feed line, ground plane and slotted patch to realize the antenna performance for UWB purposes. The return loss is found to be better than 10 dB over a bandwidth of 2.95GHz to 10.65GHz which is the UWB band allocated by FCC. In this paper, the simulated return loss and radiation pattern are presented.**

**Keywords— CPW feed, Slotted patch antenna, UWB**

## I. Introduction

The Federal Communication Commission (FCC) issued a ruling for UWB implementation in data communication [1]. The UWB technology promotes the communication system, particularly wireless multimedia system with high data rate. A UWB antenna should provide a gain and impedance bandwidth from 3.1 GHz to 10.6 GHz. Printed slot antennas have attracted much attention due to their low profile, light weight and ease of integration with monolithic microwave integrated circuits (MMIC). Various techniques [2-9] have been proposed to broaden the bandwidth of printed slot antennas and improve their performance. Slot antennas can be realized by using microstrip line feeds [2-6]. To ease the feeding arrangement, a microstrip line feed has been used in [2, 3] where, a corrugated and folded fin structure was adopted for miniaturization. In [4], an open-ended slot is utilized for size reduction of a UWB antenna while an inverted feeding section maintains the impedance bandwidth. A printed wide slot antenna with enhanced bandwidth has been realized by a microstrip line fed tuning stub [5], CPW-fed asymmetric slot [6], rotated square slot [7] and monopole fed structure [8], and fractal slot [9].

In this paper a CPW-fed slotted antenna is proposed for UWB application. The proposed antenna has advantages such as simple structure, compact size and easy fabrication. Details of the design of the antenna and simulation results are described in Sections II and III, respectively with concluding remarks in Section IV.

## II. ANTENNA DESIGN

The basic design considerations for transmit-receive antennas in UWB systems are determined using the commercial software, high frequency structure simulator (HFSS). Fig. 1 presents the geometry and parameters of the CPW-fed slotted antenna. The antenna is printed on an FR-4 printed circuit board (L = 35mm, W = 30 mm). The substrate has a dielectric constant of $\varepsilon_r$= 4.4 of and of thickness h=1.6mm. The CPW-fed line has a single strip of width $W_f$= 3.6mm, length of $L_f$= 14 mm, designed for a 50 Ω characteristic impedance. The width $W_p$, and length $L_p$, of the rectangular pattern on the radiating path are 15.7mm and 15mm, respectively. The ground plane has dimensions of $L_g$ =13mm, $W_g$= 12.9mm, $L_{g1}$ = 4mm, $W_{g1}$ = 1.75mm. Slot has dimensions of $L_{p1}$ = 11.8mm, $W_{p1}$ = 8.3mm, $L_{p2}$ = 3.5mm, $W_{p2}$ = 1.2mm.

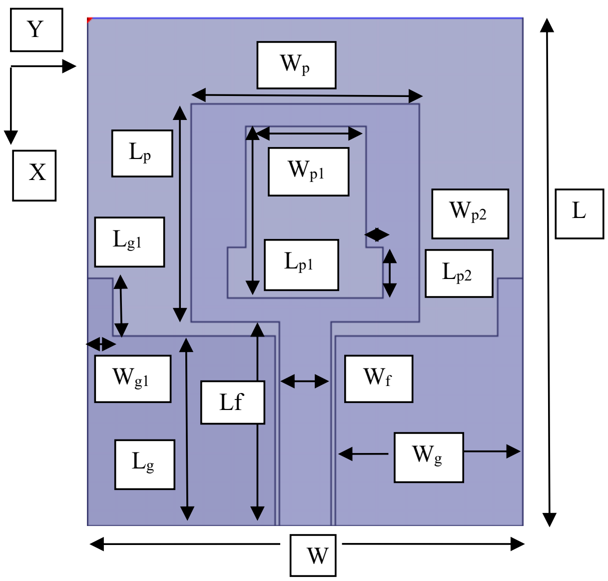


Figure.1 Top view of the proposed CPW fed slotted UWB antenna

## III. RESULTS AND DISCUSSIONS

A parametric study of the proposed antenna was carried out. To reduce the complexity of the design, some antenna parameters are selected to be fixed as shown in Figure.1 In this section the effects of variation of feed line length ($L_f$), ground length ($L_g$), ground width ($W_g$), ground length ($L_{g1}$) on the antenna performance is studied in detail as shown in Figures 2, 3, and 4.

It can be observed from Fig. 2 that the lower cutoff frequency, upper cutoff frequency and the bandwidth depend on the feed line length *Lf*. The optimized value of *Lf* is found to be 14 mm.

It can be observed from Fig. 3 that the upper cut off frequency and operating band width depends on ground width $W_g$. The optimized value of $W_g$ is12.9 mm.

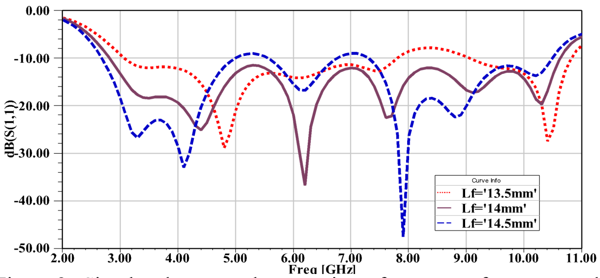


Figure.2 Simulated return loss against frequency for proposed antenna with varying fed line length *Lf*; other parameters are same as in figure 1.

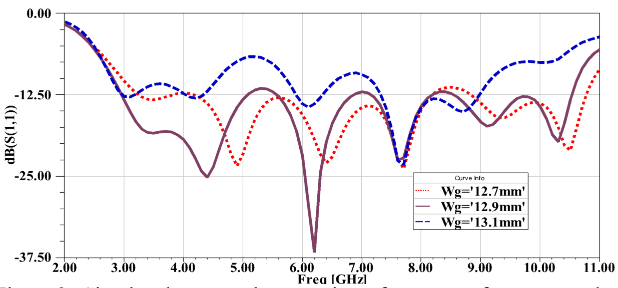


Figure.3 Simulated return loss against frequency for proposed antenna with varying ground width $W_g$; other parameters are same as in figure 1.

Fig. 4 illustrates the return loss plot of the optimized structure covering the 3.1GHz to 10.6 GHz band. Radiation patterns are plotted in Fig. 5. E-plane patterns are directional while the patterns are non-directional in the H-plane. Fig. 6 shows the current density for different frequencies on the patch and ground. For all frequencies current density is mainly concentrated on the patch and ground area which is near the feed line.

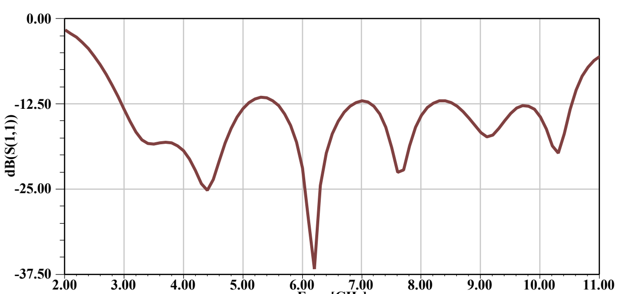


Figure.4 Simulated return loss against frequency for optimized proposed CPW fed slotted antenna

## IV. CONCLUSIONS

WE have presented results of an optimized slotted patch antenna covering the UWB band of 3.1 to 10.6 GHz.

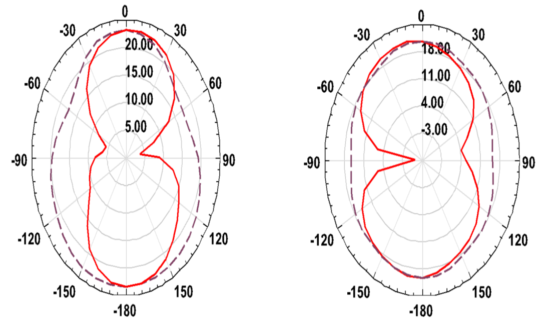


Figure.5 Solid line show E plane (ϕ=0°) and dash line show H plane (ϕ=90°) at 4 GHz and 6.2 GHZ frequency.

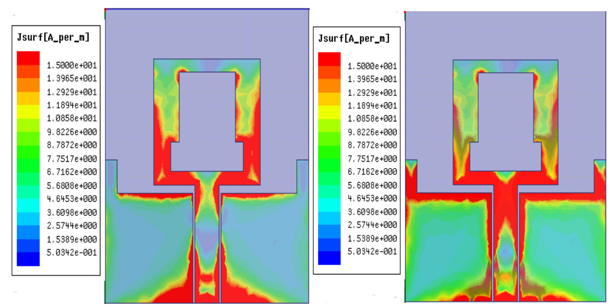


Figure.6 Current density at 3.1 GHz and 5Ghz frequencies

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