# CPW-FED OCTAGON SHAPE SLOT ANTENNA FOR UWB APPLICAION

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***Abstract:***

**In this paper, a design and analysis of compact coplanar waveguide-fed ultra wideband slot antenna is presented. The proposed antenna has simple structure consisting octagon shape on a square patch the overall dimension of the antenna come around 29mmX29mmX1.6mm and fed by 50Ω probe feed. The impedance matching and radiation characteristics of the designed structure are investigated by using MOM based IE3D™. The simulation results show that the antenna offers excellent performance for UWB application ranging from 7GHz to 10.65GHz. The proposed antenna achieved -10dB impedance bandwidth cover about 41%. The proposed antenna gain is 7.5dBi is achieved. This antenna configuration would be quiet useful for UWB indoor application as it is easy to fabricate and integrate with RF circuitry.**

**Index Terms-Coplanar waveguide (CPW), Slot Antenna Ultra Wideband (UWB), IE3D.**

## I. INTRODUCTION

Ultra-wideband (UWB) technology is one of the most promising solutions for future communication systems due to its high speed data rate and excellent immunity to multi-path interference. As the key components of UWB system, the feasible UWB antenna design face some challenges including the Ultra wide band performance of the impedance matching and radiation stability, the compact antenna size, and the low manufacturing cost for consumer electronics application. Because the CPW fed planar slot antennas have the advantages of wide bandwidth, low cost and easy to integration with radio frequency front end circuitry [1, 2, and 3].

In general planar slot antennas two parameters affect the impedance bandwidth of the antenna, the slot width and feed structure [4, 5]. The wider slot gives more bandwidth and the feed structure gives the good impedance matching [6,7]. The CPW feed line with various possible patch shapes. Such as T cross, Circular Slot, arc shape and square is used for wide bandwidth [8, 9].

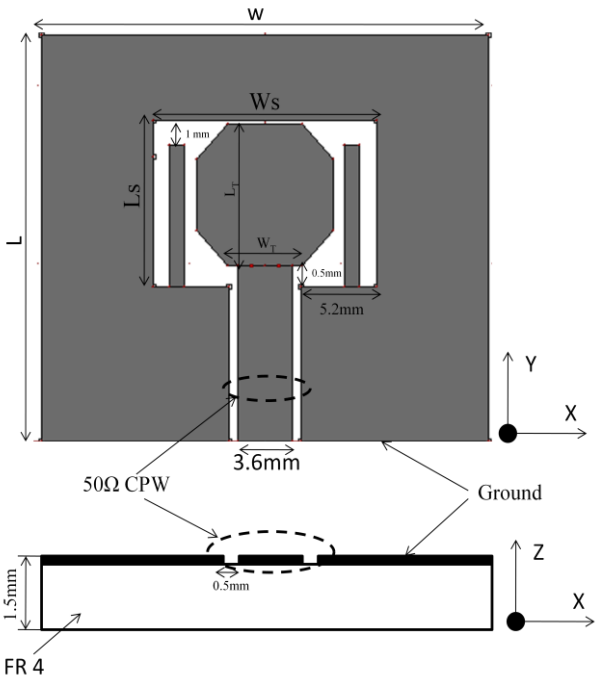



Fig.1 Geometry of the proposed CPW-Fed Patch Antenna.

In this paper, CPW-fed UWB square antenna with geometry is presented. The antenna has simple design due to less number of design parameters compared with the existing wideband antennas in the literature. Details of the antenna design are discussed and simulation results of the proposed antenna are presented and analyzed.

## II ANTENNA GEOMETRY

The structure of the antenna is shown in fig.1. The Parameter Ws & Ls are width and length of the rectangular slot $W_T$&$L_T$ are of square patch under the octagon structure W & L is the width and length of the antenna respectively. In this study a dielectric substance (FR4) with thickness of 1.6mm with relative permittivity of 4.4 is chosen as substrate. The Radiation element is octagon shape, which is fed by Microstrip line. The width of microstrip feed line is fixed at 3.6mm to achieve 50Ω characteristic impedance. The ground has a same size as the substrate and the inner profile of the ground is a rectangular cut. In order to achieve band-notched operation, two slots with 10mm inserted in ground plane. The branches destroy the surface current on the ground, so that the antenna makes negative response at the notched frequency.

The proposed antenna produces wide bandwidth with omni-directional radiation pattern. The wide bandwidth and wide impedance matching with reduced size of the antenna is achieved.

TABLE 1

PAMAMETER VALUES OF ANTENNA

| Parameter | Description | Value |
|---|---|---|
| L | Length of the patch | 29mm |
| W | Width of the patch | 29mm |
| $L_S$ | Length of the slot | 11mm |
| $W_S$ | Width of the slot | 15mm |
| $L_T$ | Length of the Hexagon | 10mm |
| $W_T$ | Width of the Hexagon | 5mm |

## III SIMULATED RESULTS AND DISCUSSION

In order to evaluate the performance of the proposed the antenna is simulated through the simulation tool IE3D[10]. The analysis of the antenna for different physical parameter values has been done by varying one of them and keeping others as constant. The optimal parameter values of the antenna are listed in the table 1.

The simulated return loss & VSWR of the proposed antenna is shown in fig 2

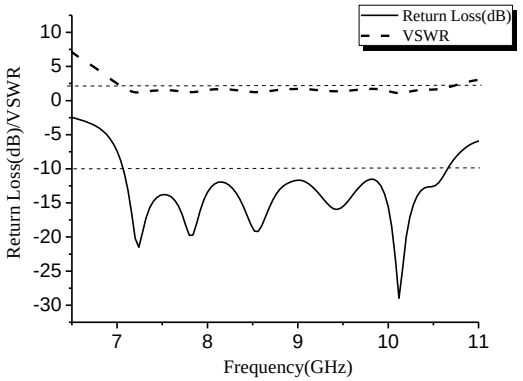



Fig.2 Simulated Return loss /VSWR of the Proposed Antenna.

### A. *Effect of parameter L&W:*

For various values of the L and W antenna is studied and found that two antenna sizes (29mmX29mm and 30mmX29mm) give good responses. Even through two of them give good response; the first antenna size is taken for analysis, since it has gives good bandwidth.

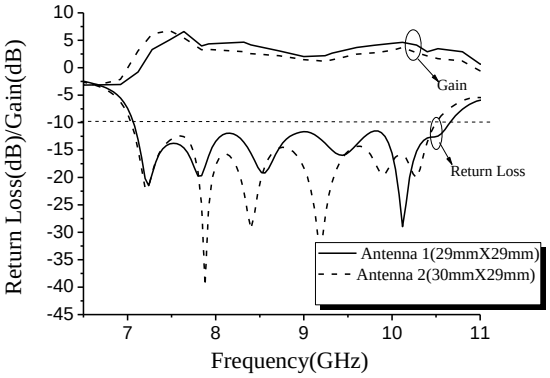



Fig.3 Simulated Return loss/Gain for different Antenna Width.

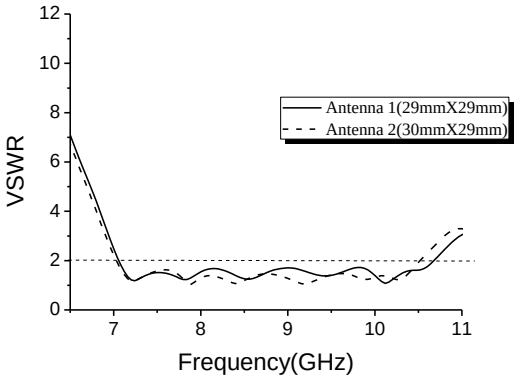



Fig.4 Simulated VSWR for different Antenna width.

*B. Effect of the other Antenna Parameters:*

For the fixed values of L and W the length and width of the rectangular slot Ls and $W_s$ are varied and the simulation results are displayed in fig 5,6. The response clearly brings out that these two parameters affect the resonance and impedance matching of the antenna. It is found that the optimal size of the slot for this case is 15mmX16mm. The radiation patterns of the E plane and H plane are obtained at 7.5, 8.5 and 9.5 GHz is shown in fig 7.

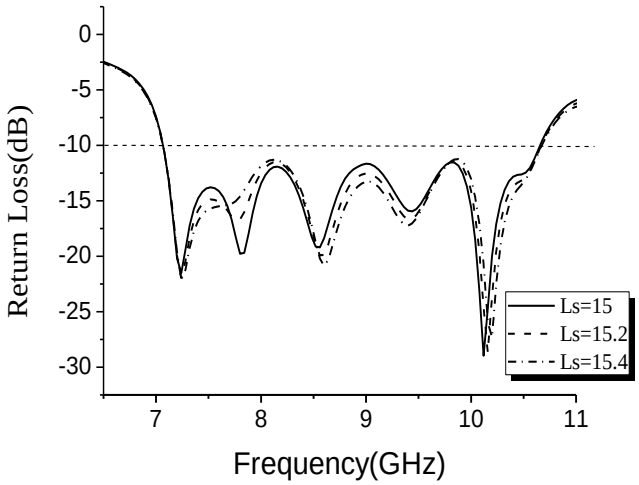



Fig.5 Simulated return loss for different slot width ($L_S$).

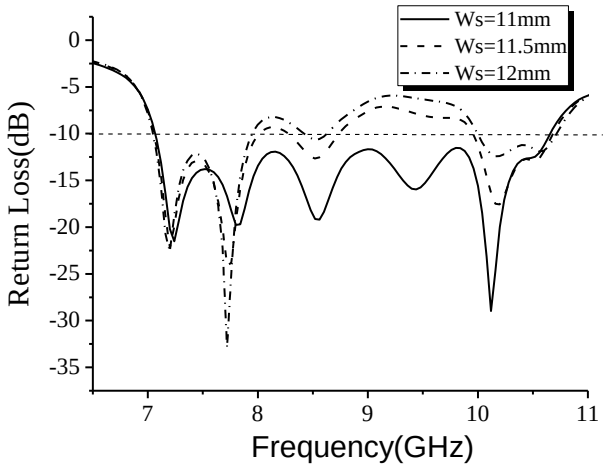
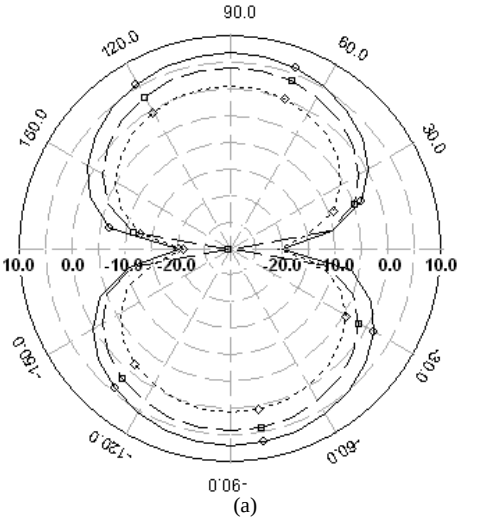
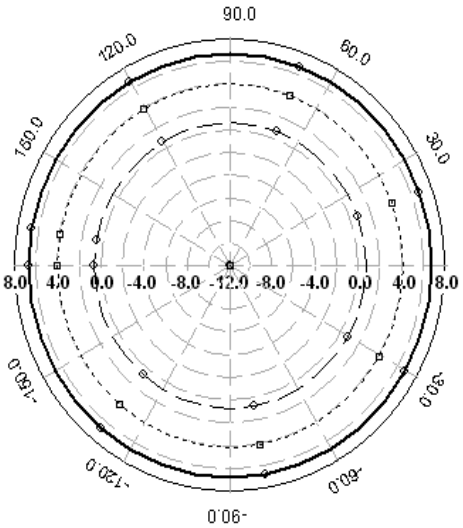



Fig.6 Simulated return loss for different slot width ($W_S$).




(a)




(b)

Fig.7 Radiation patterns of the proposed antenna a) E-Plane (yz-plane) at 7.5, 8.5 and 9.5 GHz b) H-plane (xz-plane) at 7.5, 8.5 and 9.5 GHz.

## IV CONCLUSION

A parametric study has been done for octagon shape patch antenna. The simulation results show that the proposed antenna can offer good performance for UWB application ranging from 7GHz to 10.65GHz. The proposed antenna achieved -10dB impedance bandwidth of about 41 %. Hence this type of antenna is suitable for UWB application. The practical implementation and measurement of this antenna can be carried out in future.

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