A New four Truncated Corners Ultra-Wideband Antenna with two Crossed Slits in the Path

A. ZITOUNI[1], N. BOUKLI-HACENE [2]

Laboratoire de Télécommunications[1,2] (2)
Faculté des Sciences et des Sciences de l'Ingénieur, Université Hassiba Benbouali de Chlef[1]
Faculté des Sciences de l'Ingénieur, Université Abou-Bekr Belkaïd –Tlemcen[2]
BP 230, Pôle Chetouane, 13000 Tlemcen- Algeria
Fax: +213 43 28 56 85; ahmed_zitouni_71@yahoo.fr, bouklin@yahoo.com

***Abstract*- In this paper, we present a new form of ultra-wideband antenna (UWB) for UWB applications. The proposed antenna consists of a square patch with four truncated corners, a two crossed slits and a partial ground plane with a rectangular slit. The proposed antenna is designed to operate from 2.97 to 29.48 GHz. Details of the proposed antenna design and simulated results are presented and discussed.**

***Index Terms*- crossed slit,** microstrip patch, **partial ground plane, truncated corners, ultra-wideband antenna, UWB.**

I. INTRODUCTION

The communications, in particular wireless communication, are today in full growth. With the increase in the needs of high data-rate and rarefaction for the available frequency bands, it became essential to find new solutions which satisfy these requirements. Technology UWB (Ultra Wide Band) seems a very promising solution.

As antennas are the key components of any UWB wireless system, it is essential that they have ultra-wideband performance particularly with respect to bandwidth (VSWR< 2), omni-directional characteristics and good radiation efficiency throughout this band.

Today the state of the UWB art antennas focuses in the microstrip, slot and planar monopole antennas with different matching techniques to improve the bandwidth ratio without loss of its radiation pattern properties [1-10].

In this paper, we propose a new ultra-wideband antenna for UWB applications. The proposed antenna consists of a four corner-truncated square microstrip patch with two crossed slots on the patch, and a partial ground plane with a rectangular slit. Investigations based on simulations are conducted. The simulation is performed using the commercially available simulation software Ansoft High Frequency Structure Simulator (HFSS). The proposed antenna is successfully implemented. In this design, a 2.97–29.48-GHz frequency range for VSWR< 2 is obtained. Radiation patterns are also examined.

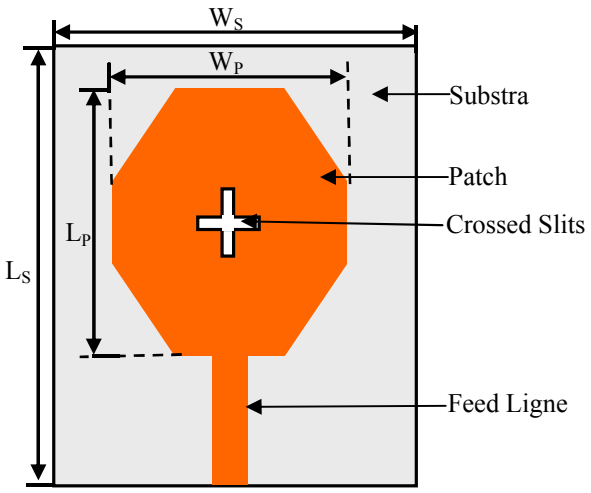
II. ANTENNA DESIGN

Fig.1 shows the configuration of the proposed UWB antenna, which consists of a square patch with four truncated corners, a two crossed slots on the patch, and a partial ground plane with rectangular slot. The antenna, which has compact dimensions of 20 x 20 mm^2, is printed in the front of substrate FR4 epoxy of thickness 1.6 mm, relative permittivity 4.4, and loss tangent 0.02.

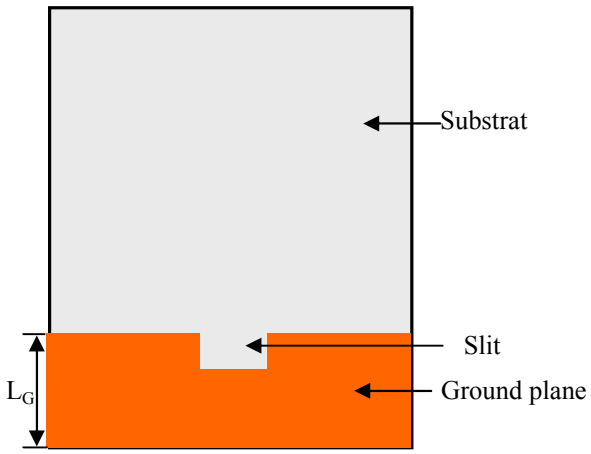
The dimensions of truncated corners are 7 x 7 mm^2. The dimensions of the slots on the patch are 4 x 0.5 mm^2 and the dimensions of the ground plane are chosen to be 30 x 11.5 mm^2 in this study. The antenna is fed by a 50 Ω microstrip line printed on the partial ground plane.

The antenna has the following parameters: W_S=30 mm, L_S=35 mm, W_P=20 mm, L_P=20 mm,

and L_G=11.5 mm. The dimensions of slot in ground plane are 3 x 2 mm^2.



(a) Front view



(b) Back view

Fig.1. Geometry of the proposed UWB antenna

III. RESULTS AND DISCUSSION

The antenna is designed and simulated using Ansoft HFSS, which is based on the Finite-Element Method (FEM). The simulated return loss plot of proposed antenna with and without slit in the ground plane is as shown in the Fig.2.

The return loss plot shows that an impedance bandwidth of 26.51 GHz (2.97- 29.48 GHz) below -10 dB of return loss is obtained for the antenna with slit, which corresponds to impedance bandwidth of 163.4%. It also shows that the effect of the slit in ground plane is the decreasing in the return loss, but it is greater than -10 dB in some interval of frequency.

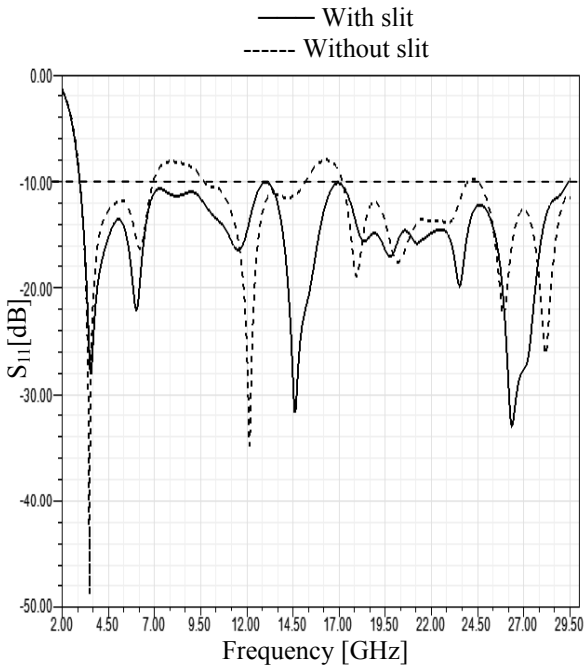


Fig.2. Simulated return loss

The simulated radiation pattern obtained for this antenna for 3.5, 6, 14.5 and 26 GHz are shown in Fig.3. The simulated radiation patterns are stable across the operating frequency, but with omnidirectional performance deteriorating with frequency. The average gain obtained from simulation is less than -1 dB.

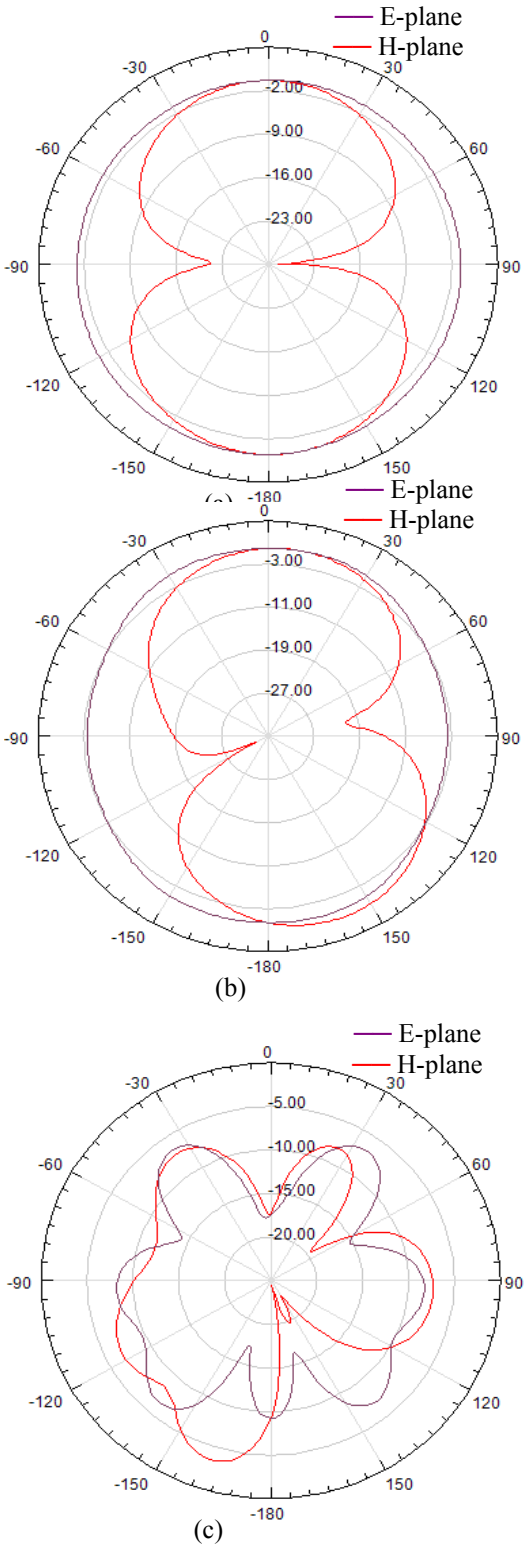


Fig.3. Simulated radiation patterns for proposed antenna at (a) 3.5 GHz, (b) 6 GHz, (c) 14.5 GHz, (d) 26 GHz.

IV. CONCLUSION

In this paper, a new ultra-wideband antenna has been proposed for UWB applications. The proposed antenna is simulated by the Ansoft HFSS. The frequency range obtained for return loss <-10dB is 2.97- 29.48 GHz, which corresponds to impedance bandwidth of 163.4%. The simulated radiation patterns at 3.5, 6, 14.5 and 26 GHz were also presented. The antenna has good radiation pattern across the matching band.

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