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FABRICATION OF SMALL ANTENNA FOR WIDEBAND APPLICATION

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ABSTRACT :

Now a days, due to fast growing of technology system, electrically small antennas has become a suitable candidate for communications system. Whether they are small compared to the extremely long wavelengths used at the lowest radio frequencies or intended to save space in GHz-range wireless devices, the basic principles are the same. This paper introduces antenna designs for Ultra Wideband 3.1-10.6 GHz communications. During the course of study, the inherent potential of Ultra Wideband systems and techniques for use in communication has been demonstrated in various ways.But , it is found that, it is not as per our requirement. Hence, efforts have been made to analyze the entire wideband spectrum using software HFSS.

KEYWORDS : *Antenna, HFSS, & Wideband.*

INTRODUCTION :

Loop antennas and short monopoles (whip) for medium wave (AM broadcast) reception are common in home and vehicle entertainment systems. With wavelengths in the 200 to 600 meter range, these antennas far exceed the λ/10 criterion. Antennas for FM and television broadcast reception are sometimes reduced in size for convenience and portability.

Most of the existing systems permit narrowband operations since they cover only a fraction of the entire spectrum. Narrowband systems concentrate all of their power in fairly narrow channels. Due to the narrow bandwidth it is not possible to achieve high speed and high data rates to carry out communication [1]. The possible remedy is the use of wide bandwidth.

Although the research in UWB radio and Communication gained significant momentum in late 1999[2], this technology dates back to more than a century. Electromagnetic communication actually started with UWB. In the late 1800s, the easiest way of generating an EM signal was to generate a short pulse: a spark-gap generator was used by Hertz in his experiments and by Marconi for the first EM data communication. Thus, the first practical UWB systems are really more than 100 years old [1]. At that time it was called 'baseband' or 'carrier-free' communication. A major concern for the frequency regulators was that the emissions from UWB devices would interfere with the other services [3-4]. The Federal Communications Commission (FCC) finally allocated.

In recent years, many varieties of UWB antennas have been proposed and investigated. They present a simple structure and UWB characteristics with nearly omni-directional radiation patterns. However, for some space-limited applications, UWB antennas need to feature a compact size while maintaining UWB characteristics. The objective is to design and evaluate performance of a compact sized antenna that operates in ultra-wideband range[5]. Several factors need to be considered while designing the antenna, including bandwidth, directivity, polarization, power gain, radiation pattern and return loss. The whole paper can be divided in two parts – antenna simulation and measurement. The software HFSS would be used to simulate the proposed antenna. The simulated results would then be compared with the measured results of the practically fabricated antenna.

ANTENNA GEOMETRY:-

Fig. 1 shows the geometry and as well as necessary parameters of the proposed antenna. The antenna is supported by a dielectric substrate of a height equal to and a relative dielectric constant of 4.4 and dielectric loss tangent equal to 0.02. The structure of UWB antenna has similar to microstrip patch antenna, it consists of three layers: the top is a radiator; the middle is a substrate with dielectric constant; the bottom is an etched ground plane. This antenna is optimized to cover UWB bandwidth and to miniaturize the antenna size .The feed line is 3.5-mm wide for a characteristic impedance of 50 ohms The patch is a circular with radius 9 mm. The rectangular part of the ground plane is 25mm×5mm.

RESULT

The results have been shown with the effect of ground plane keeping the operating frequency same. In S_{11} Parameter plot, Fig (i) has operating frequency of 7 GHz with ground plane along Y-axis is 5mm for which the simulated result is below -10 dB for complete band. But according to Fig. (ii) and Fig.(iii), the ground plane changes with the simulated result, given below -10 dB, which is not for complete band. In VSWR parameter, Fig. (iv) shows VSWR 1 at 5GHz, VSWR 0 for 7 GHz. approximately. The Fig. (v) and Fig. (vi) present VSWR Changes with the change in ground plane.

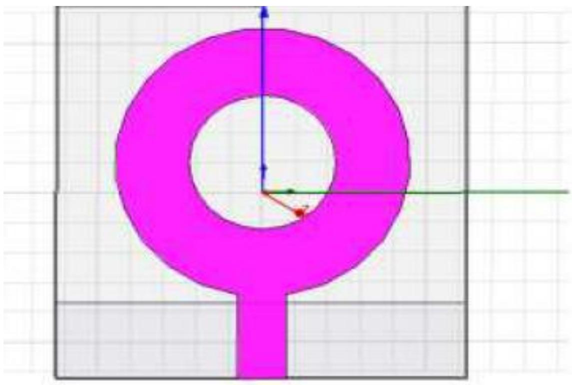

Fig. 1 Circular Ring Antenna

SIMULATED RESULT

A) S11 PARAMETER

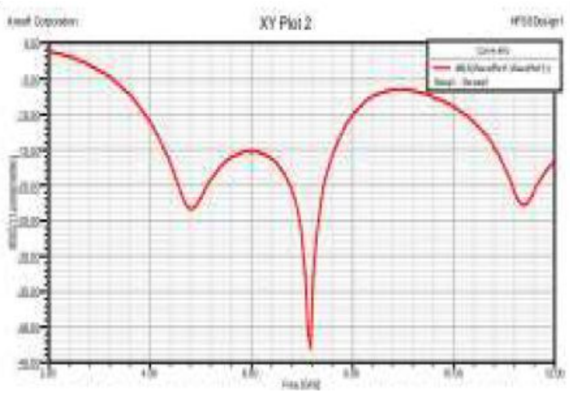

Fig.(i):s11 parameter with ground plane 5mm

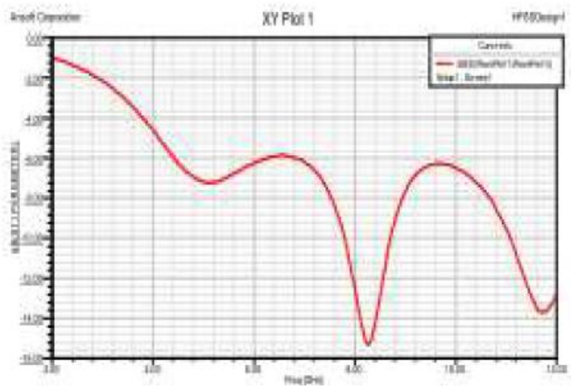

Fig.(ii): s11 parameter with ground plane 7mm

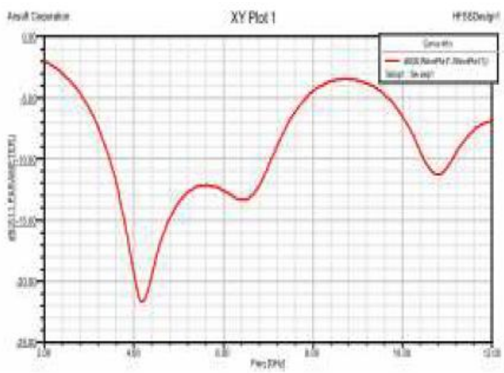

Fig.(iii): s11 parameter with ground plane 3mm

B) VSWR

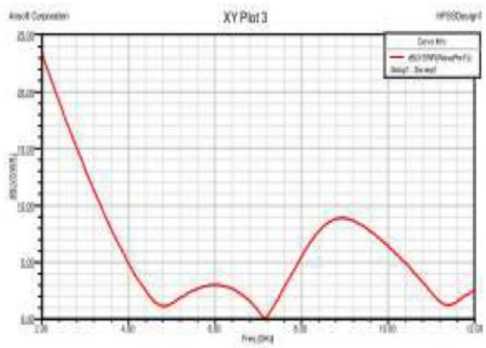

Fig.(iv): VSWR parameter with ground plane5mm

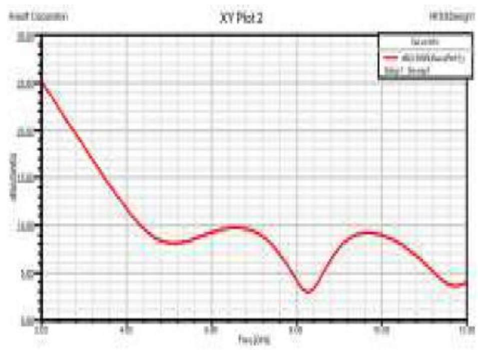

Fig.(v): VSWR with ground plane 3mm

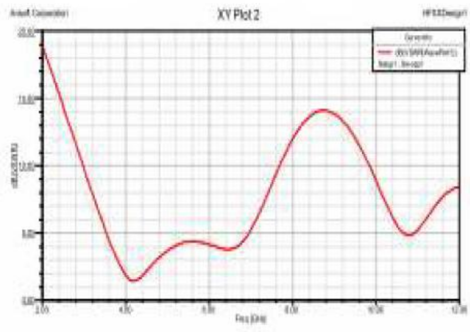

Fig.(vi): VSWR with ground plane 3mm

CONCLUSION:-

This paper focuses on the designed antenna which has simple configurations and easy to fabricate. Simulation has been done using commercial software HFSS and the simulated antenna produced an ultra wide bandwidth, and the radiation patterns which are nearly Omni-directional over the entire 10 dB return loss bandwidth. Here S_{11} parameter is obtained at 7GHz for the complete band from 3 GHz to more than 10GHz. VSWR obtained is 1 at 5GHz and 0 for 7 GHz. Gain is 0dB at 7GHz.

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