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DESIGN OF CIRCULAR MONOPOLE ANTENNA GROUNDPLANE FOR UWB APPLICATIION

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Abstract - *In this Project, we are going to design a circular monopole antenna ground plane for ultra-wideband application this technology constantly spreading in the every day life. The circular monopole antenna with microstrip feed line and also optimization of various parameters. The antenna has been designed on a FR4 substrate with dielectric constant 4.4. The antenna has been optimization to obtain ultra-wideband characteristics for frequency range 1.6GHz to 7GHz. The parameter affected on antenna result and radius of circular monopole, feed gab, transmission line and width of ground plane. This antenna is designed and stimulated by Ansoft High Frequency Structure Stimulator(HFSS). Good agreement between the stimulated and measure result is achieved. The obtained result that proposed antenna is good candidate for reconfigurable of Ultra-wideband applications.*

Key Words: *Ultra-wideband, HFSS, Circular disc, efficiency, return loss, Network analyzer.*

1.INTRODUCTION

The fast-growing technology and development in wide band wireless technology system has increased the use of Ultra-Wideband (UWB) antennas. Ultra-Wideband (UWB) is a wireless communications technology for transmitting data over the wide bandwidth that exceeding minimum 500 MHz or 20% of the center frequency, with low power for a short-range. After releasing a 10-dB bandwidth of 2.6 GHz (1.6GHz to 3GHz) by Federal Communication Commission, UWB technology has quickly attracted the attention of academia and industries in the wireless technology. Wireless applications that operated for the different frequencies band such as Wireless local area network (WLAN 2.412 - 2.4835 GHz), Long-term Evolution (LTE 1.71 - 1.88 GHz). The antenna plays the important roles transmit and receive the electromagnetic waves. UWB antennas having log periodic geometries or spiral radiate each frequency component from different part of antenna results in distortion to radiated signal and theses antenna are known as a dispersive. These antennas are broadband dipoles with circular, *pentagonal, elliptical, square and hexagonal configurations.*

In this paper, a circular monopole antenna is proposed and investigated. The geometric antenna dimensions are maintained to obtain an ultra-wideband width response with a bandwidth of 2.6 GHz and acceptable radiation pattern properties.

2 DESIGN OF ANTENNA

The radius of circular monopole is R=12.5 mm and a microstrip feed line are printed on same side of subtract with characteristics impedance of 50 Ω and the width of line is fixed at 2.6mm to achieve this impedance. In this design FR4 is used as a subtract with 1.6mm thickness and 4.4 relative permittivity and W is denoted as width of the dielectric substrate which is varied for the batter result. On the other side of the dielectric substrate, the partial conducting ground plane is designed, which only covered the section of microstrip feed line, the length of ground plane is represented as Lg. Here the width of the subtract and width of the ground plane are same.

TABLE 1 DETAIL GEOMETRY OF PROPOSED ANTENNA

S. No.	Parameters
1	*Radius of circular patch(R)*
2	*Length of Line feed()*
3	*Width of line feed()*
4	*Feed gab(g)*
5	*Length of rectangular ground plane()*
6	*Width of substrate(w)*
7	*Length of substrate(L)*

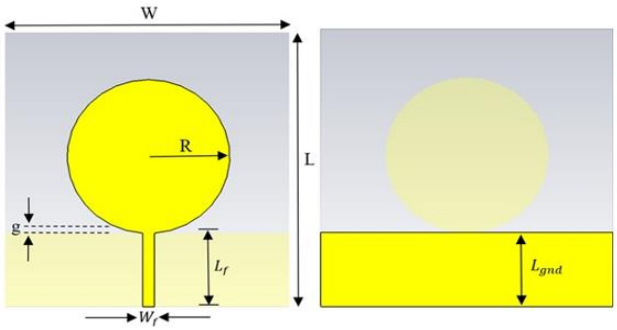

FIGURE 1: *Geometry of propose circular monopole antenna.*

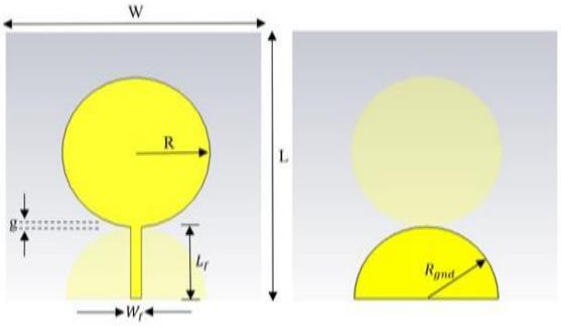

FIGURE 2: *Ground plane of monopole antenna*

3 RESULT AND DISCUSSIONS

The design parameters of antenna like radius of circular monopole, length of feed gap and width of ground plane are affected on the performance of antenna. So, for the optimum design of antenna these parameters are going to vary to get wider band.

The proposed circular monopole antenna using ground plane modification is stimulated by using (HFSS). The results such as Return loss, Radiation pattern and Current Distributions for the designed model is given as below:

3.1 Effect of the Patch Radius(R)

The first step towards the optimization is to vary the radius of circular monopole . For that width of ground plane W is constant as feed gap. The return losses simulated in HFSS at different radius shows in fig.-4.

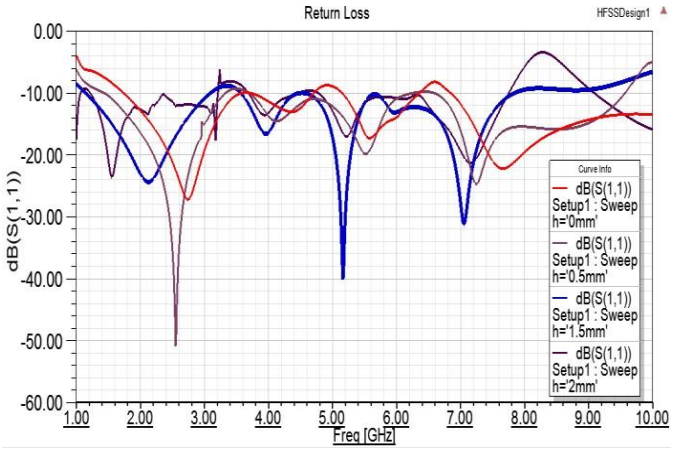

FIGURE 4 *Return loss*

As seen from the previous figure, the radius of circular monopole set gives the wider bandwidth compare with the other radius. The other parameter which is affected on the performance of antenna is feed gap. To achieve the optimum value of it the feed gap is going to be changed.

3.2 STIMULATION RADIATION PATTERN

The stimulation radiation pattern of 2GHz, 3GHz, 5GHz.

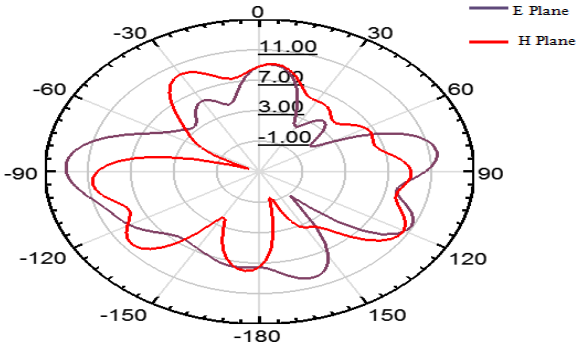

FIGURE 5 : *Radiation pattern of 2GHz*

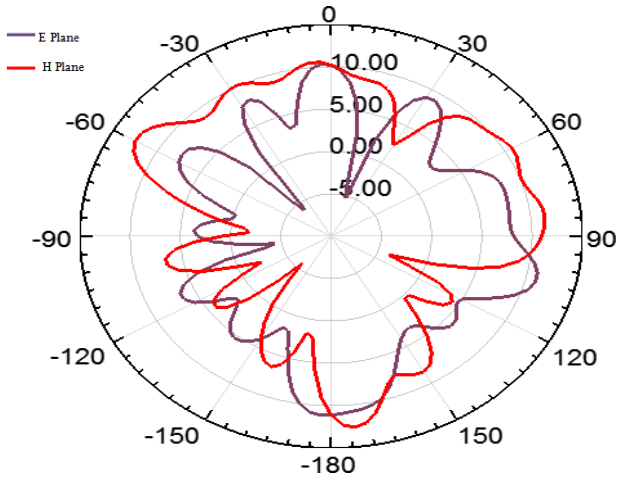

FIGURE 6: *Radiation pattern of 3GHz*

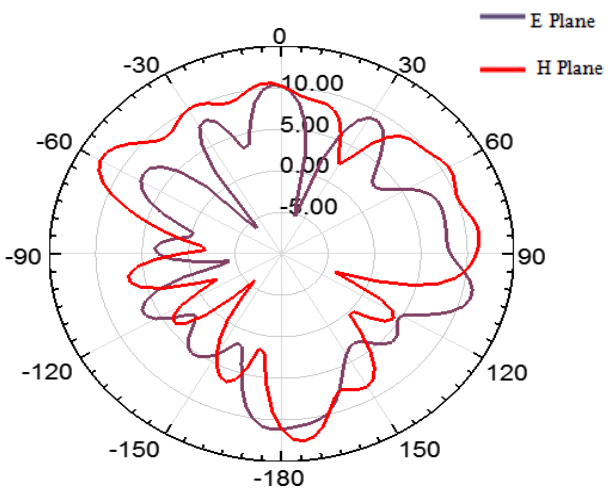

FIGURE 7: *Radiation pattern of 5GHz*

4. CONCLUSION

In this paper the different parameters of antenna are varied to check the effect of those parameters on the antenna. The width of ground plane, radius of patch and feed gap are varied to observe the response. The optimum feed gap value is 1.5 mm and the width of ground plane should double of the diameter of circular monopole. It has been shown that the performance of this antenna in terms of its frequency domain characteristics is mostly dependent on the circular monopole radius, ground plane width and feed gap. It is demonstrated by simulation that the proposed antennas can yield an ultra-wide bandwidth, and that the radiation patterns are nearly omni-directional over the entire -10 dB return loss bandwidth. The result indicates to optimal achieved by the elliptical slot on the semicircular ground plane. Future work is to improve more bandwidth and add more covered range frequencies with other modern techniques.

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