Monopole Antenna Designing for UWB Applications

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Abstract-*A micro strip-fed, circular shaped monopole antennais proposed for UWB applications. As FCC introduced the range of UWB operations from 3.1 to 10GHz, antenna was intended to work under this defined range of frequency. The antenna is composed of apartial ground and a Circular-shaped radiating patch that actually is a modified circle monopole. The antenna is prepared to create impedance bandwidths to knit the frequency groups of the WiMAX (three.3–4.2 GHz). Furthermore, the antenna is circularly polarized in particular band. Additionally, the antenna constitution is tremendously simple, durable and occupies small space, making it suitable for sensible applications.*

Keywords*-*Monopole antenna, partial ground, DGS, Ultra Wideband.

I. INTRODUCTION

Wireless communication has become an indispensable part of modern life. A standout amongst the most essential segments of wireless correspondence frameworks are antennas, named as "eyes" and "ears" of correspondence frameworks. A printed antenna, a standout amongst the most commercial antennas, is widely used for civil and military applications, i.e., for communication systems, radar systems, satellite and transportation systems since the printed antenna provides some benefits such as light weight, compact structure and low manufacturing cost. Printed antenna design for a communication technology called Ultra-Wide Band (UWB) is discussed in this dissertation.

Ultra-Wide Band communication has undergone intensive investigation in the past decade since the Federal Communications Commission (FCC) released the free license spectral mask operation of the UWB radio over 7.5 GHz bandwidth from 3.1 to 10.6 GHz (UWB frequency range), a technology promising high-rate data transmission over a short range [1].On the other hand, a UWB communication system requires extremely low radiation power to avoid interferences to other communication systems. As an answer for this challenge three procedures in light of antenna aspects are proposed in the frame of this work.

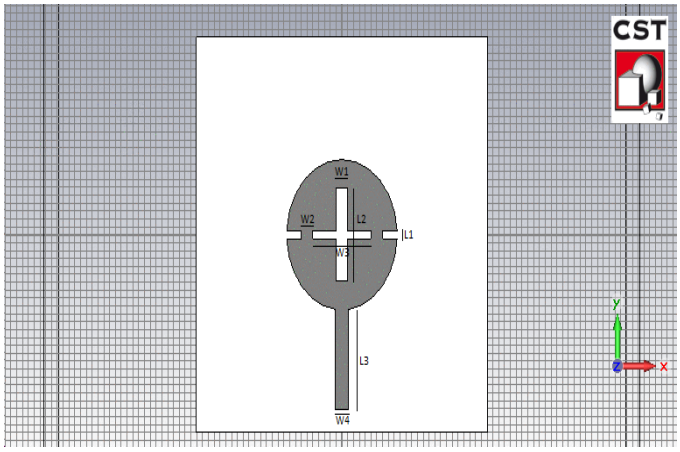
For quite a while, diverse antennas for wideband operation have been focused on for interchanges and radar structures [2]. The plan of wideband antenna is exceptionally troublesome assignment particularly for hand-held terminal since the tradeoff between size, cost, and effortlessness should be capable. In UWB correspondence frameworks, one of key issues is the plan of a reduced antenna while giving wideband trademark over the entire working band. Because of their engaging elements of wide data transfer capacity, straightforward structure, omnidirectional radiation example, and simplicity of development a couple of wideband monopole outlines, for example, round, square, bended, pentagonal, and hexagonal have been proposed for UWB applications [4]–[6]. Be that as it may, they are not appropriate for integration with printed circuit sheets since they don't have planar structures. Subsequently, a micro strip-sustained monopole antenna is reasonable contender for joining with hand-held terminal inferable from its appealing elements, for example, low profile, minimal effort and light weight.

In this letter, a novel minimal ultra wideband microstip-fed printed monopole antenna is proposed. To achieve the maximum impedance bandwidth, DGS is implemented on partial ground and some defects have been made on the patch. Simulated and experimental results are displayed to exhibit the execution of a suggested antenna.

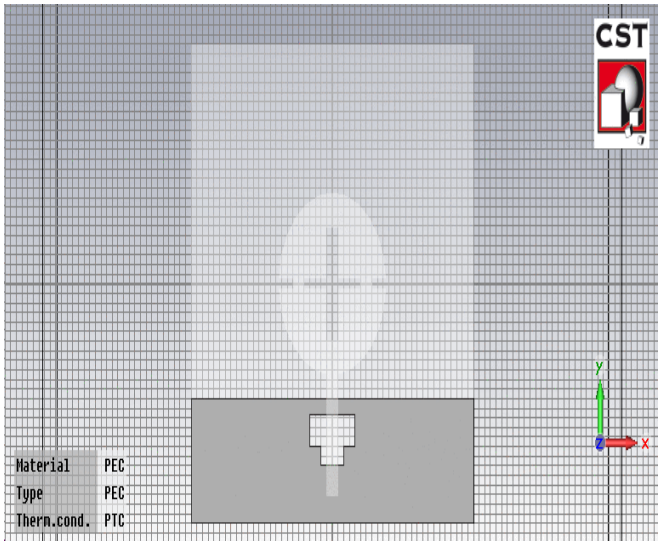
II.METHODOLOGY

Fig. 1 shows the configuration of the proposed wideband antenna which consists of a circular patch with microstrip feedline, patch is also defected with two perpendicular cut widths.

The best perspective of reception antenna is appeared in figure.



(a)



(b)

Figure l. Front and Back sides of the proposed antenna. (a) Front side of circular patch with microstrip feed, (b) Partial ground with DGS.

The proposed antenna having circle of radius 10mm, having values of W4=W2=W1 i.e. 2.2mm and W3 is of 12mm, L1, L2 and L3 are having values of 1.5mm, 12mm and 18mm respectively. The radiation efficiency of the antenna is increased by using partial ground along with the DGS.

This DGS in the partial ground has two rectangular blocks with 5X2 and 2X2 area. Following is the simulated result of the proposed antenna.

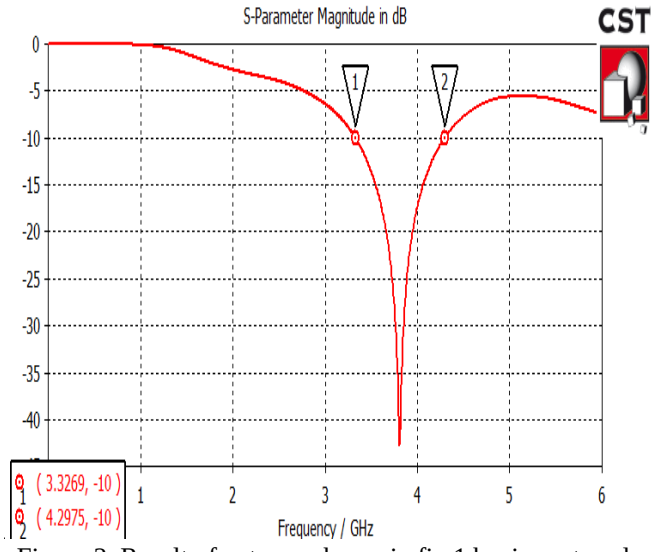


Figure 2. Result of antenna shown in fig 1 having return loss of -43 dB and bandwidth of 970 MHz.

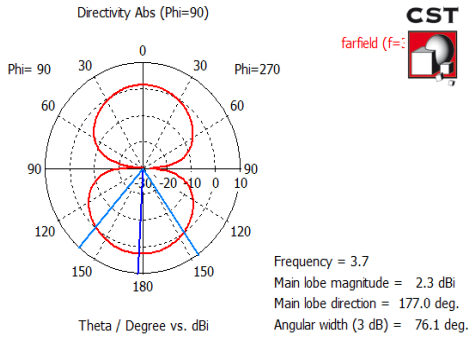


Figure 3. Radiation pattern of the simulated patch antenna at 3.7GHz operating frequency.

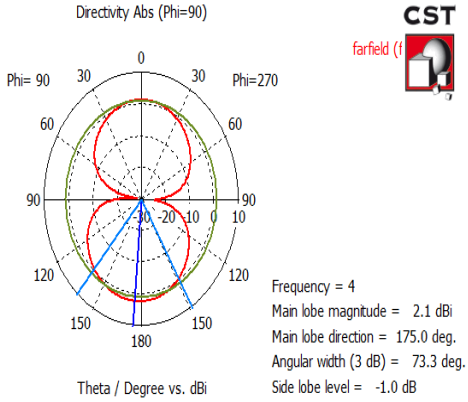


Figure 4. Radiation pattern of the simulated patch antenna at 4 GHz operating frequency.

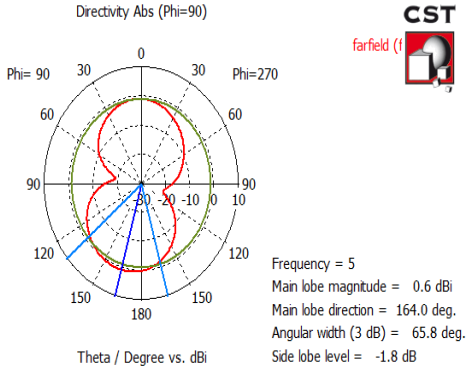


Figure 5. Radiation pattern of the simulated patch antenna at 5 GHz operating frequency.

These results indicate that the antenna is having return loss value of -43dB which is represented in the figure 2, bandwidth represented in the same figure is of 970MHz. subsequent figures 3,4 and 5th are showing the radiation pattern at different operating frequency. By observing these figures, it can be analyzed that by increasing the operating frequency the coverage area of the radiation by antenna can also be varied. Approximately omnidirectional results are gotten extraordinarily at upper operating frequency.

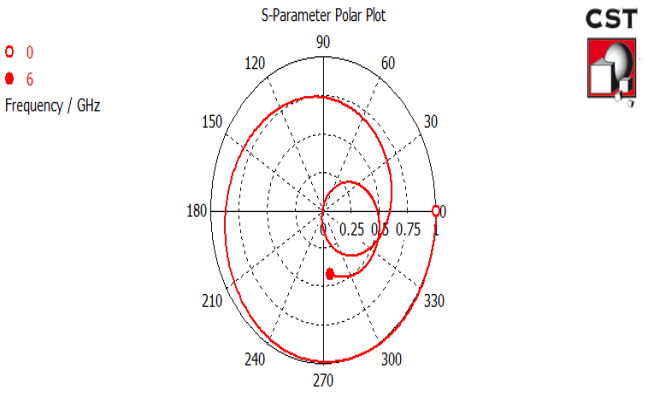


Figure 6. Polar plot of the proposed antenna.

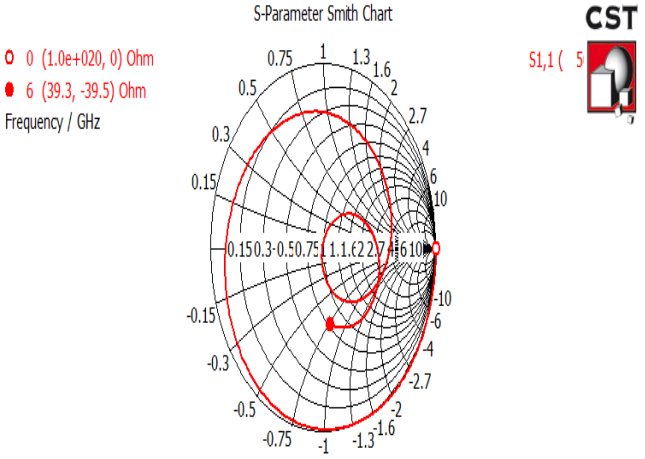


Figure 7. Smith chart showing the impedance matching of 40Ohm.

Results of the proposed monopole antenna with halfway ground is having very low return loss that is the main requirement i.e. of -43dB and fulfilling the other requirement too i.e. of bandwidth which is 970MHz. apart from that the figures of radiation pattern indicates that the antenna is also having the omnidirectional antenna like radiation pattern at high frequencies.

III. CONCLUSION

Proposed antenna is a minimized micro strip- fed monopole antenna. This has been proposed and actualized for ultra wide band application. The proposed antenna is having an exceptionally straightforward design and is anything but difficult to fabricate. To obtain the wide bandwidth, the DGS has been implemented on partial ground plane of the patch. The composed antenna fulfills the 10dB return misfortune necessity from 3.326 to 4.297GHz and provides good monopole-like radiation patterns. Thus Experimental comes about exhibit that the proposed antenna could be a decent contender for hand-held UWB application.

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