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Circular Monopole Antenna Designing for Ultra-Wideband Applications

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Abstract: The microstrip-fed, circular-shaped monopole antenna is proposed for the application As, It produce impedance bandwidths that cover the WiMAX (2.08–4.59 GHz) frequency bands. Moreover, the antenna design is very durable, simple, & occupied less space, making it ideal for practical use.

Index Terms **- Monopole antenna, partial ground, DGS, Ultra-Wideband.**

I. INTRODUCTION

In modern life, wireless communication has become a necessary part. Antennas, also known as the "ears" & "eyes” of communication systems, are more significant parts of the wireless communication device. The printed antenna, one of the high frequently consumed than commercial antennas, is generally used to apply civil & military [1], such as radar systems communication systems, transportation systems & satellites since it provides advantages like compact structure, low manufacturing costs & lightweight. This paper discusses the Ultra-Wide Band (UWB) communication technology [2].

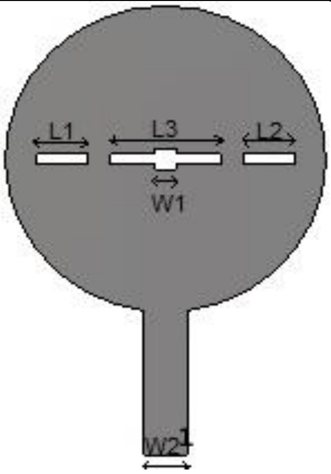
While the Federal Communications Commission (FCC) has given a free-license spectral mask service for the UWB Radio for a bandwidth of 7.50 GHz between 3.1 and 10.6 GHz (UWB frequency ranges), The Ultra-Wide Band Communication has become an important subject of intensive research across the past decade [3]. A UWB communication device, on the other hand, needs extremely low radiation power to prevent interference with other communication devices. Three antenna-based techniques are suggested in the context of this work as a response to this challenge [4].

Several antennas for the application of radar systems & wideband communications have been studied for several years [5]. The design of wideband antennas, particularly for a hand-held terminal, is difficult since the balance must be achieved among cost, size, & simplicity. The design and broad characteristics of a small antenna throughout the working spectrum are one of the key problems with UWB communication systems. Because of its huge attraction to bandwidth, simple construction, omnidirectional radiation pattern and facility for intercultural monopolies have been implemented for UWB applications [6]. The following: square, circular, pentagonal, hexagonal & elliptical. However, they are not ideal for incorporation with printed circuit boards because they don't have planar structures. A monopole antenna fed on a microstrip is therefore appropriate for integration in manual terminal characteristics like low cost, lightweight & low profiles [7].

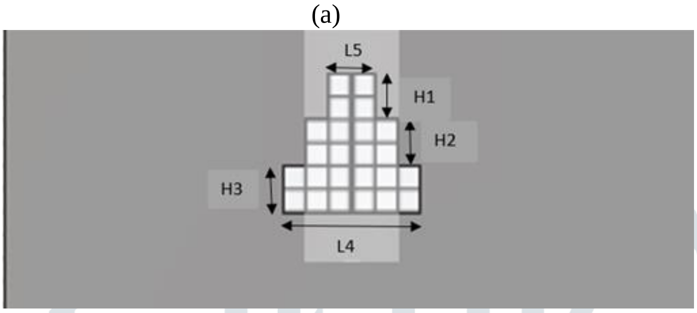
This letter proposes a new lightweight monopole antenna with ultra-bandwidth microstrip-feeding. DGS is partially implemented, and some defects have been rendered on the patch for optimum impedance bandwidth. Experimental & Simulated outcomes are shown to show how an antenna is performed [8].

II. METHODOLOGY

Figure 1 shows the presented wideband antenna configuration, which consists of a circular patch with a microstrip feedline; the patch has also defected with two perpendicular cut widths.



(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 is having a circle of radius 10mm, having values of W1= 2.2mm, W2= 4mm, L1= L2= 4.7mm, L3=10mm, L4=6mm, and L5=2mm, whereas H1=H2=H3= 2mm. The radiation efficiency of the antenna is increased by using partial ground along with the DGS.

This DGS in the partial ground has three rectangular blocks with dimensions mentioned. Following is the simulated result of the suggested antenna.

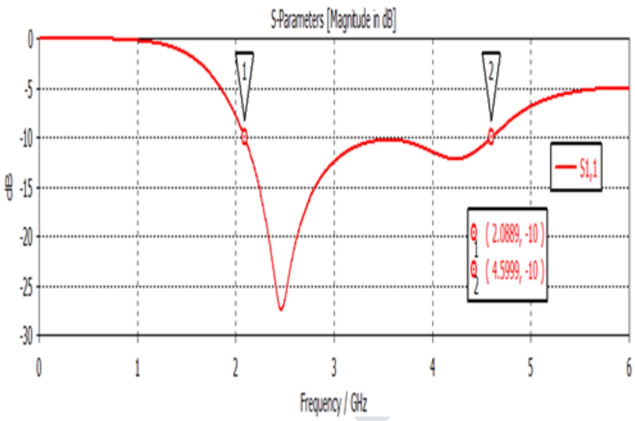


Figure 2 antenna results shown in fig 1 having a return loss of -26 dB & bandwidth of 2.5 GHz.

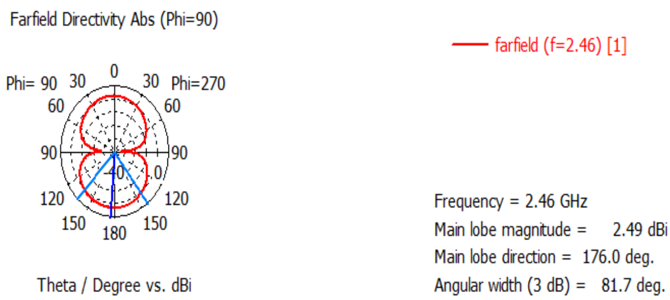


Figure 3. The radiation pattern of the simulated patch antenna at 2.46GHz operating frequency.

These outcomes suggest that the antenna is having a return loss value of -26dB, which is represented in figure 2, bandwidth represented in the same figure is of 2.5GHz. The subsequent figure3 is showing the radiation pattern at the operating frequency. By observing the figure, it can be analyzed that by raising the operating frequency, the coverage area of the radiation by an antenna can also be varied.

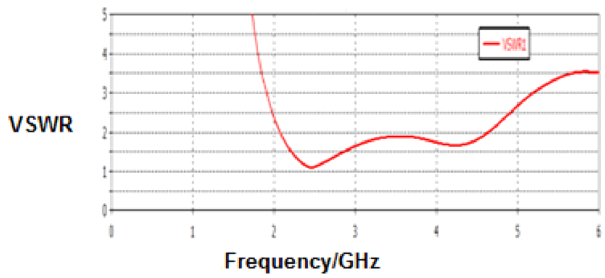


Figure 4. VSWR of the proposed antenna.

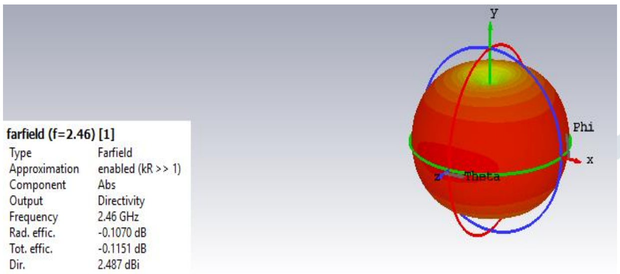


Figure 5. Directivity of the proposed antenna

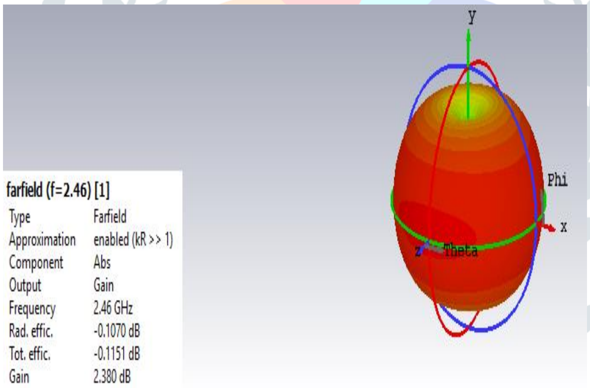


Figure 6. Gain of the proposed antenna

Result of suggested monopole antennas with the partial ground are having very low return loss that is the main requirement, i.e., of -26dB and fulfilling the other requirement too, i.e., of bandwidth which is 2.5GHz. Apart from that, the figures of radiation pattern indicate that the antenna is also having an omnidirectional antenna-like radiation pattern at high frequencies.

III. CONCLUSION

The antenna proposed is a compact, monopole antenna fed by microstrips, which is proposed for ultra-wideband application and is executed. The antenna suggested has a very basic & simple manufacturing configuration. To achieve the broad bandwidth, DGS has been implemented on the partial ground plane of the patch. The designed antenna meets the requirement for 10 dB return losses from 2,08GHz to 4,59GHz and gives better patterns of monopole radiation. Experimental outcomes indicate that the antenna suggested might be a better aspirant for the hand-held UWB applications.

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