# A Survey Paper on Compact Coradiator UWB-MIMO Antenna with Dual Polarization

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*Abstract*— Two compact coradiator multiple-input–multiple-out (MIMO) antennas operating in the UWB frequency band with dual polarization are proposed. Different from traditional MIMO antennas, the radiator is shared by two antenna elements, which greatly reduce the overall size of the MIMO system. High isolation between the two antenna elements is achieved by etching a T-shaped slot in the radiator and extending a stub on the ground. Dual polarization can be realized by exciting the pentagonal radiator with perpendicular feeding structure. The simulated results of current and electric-field distribution show the dual-polarization characteristics of the diversity system. The objective of this paper is to design the UWB-MIMO antenna with DGS structure and then compare the performance parameters.

***Key words:*** IE3D Software, DGS Structure, UWB-MIMO Microstrip Antenna

## I. INTRODUCTION

Ultra wideband (UWB) is a very promising technology for short range wireless communications providing the opportunity of high data rate communications[1]. UWB radio has proved itself a suitable candidate for its low power and low cost design. However ,very low transmitted power in UWB systems limits the applications to short range or to moderate data rate[2]. Therefore, it is crucial to find some solution that will make the best possible use of radiated and received power, for the feasibility and future commercial success of UWB communication systems[3]. In this context, research is carried out and MIMO has been found one of the best solutions. MIMO technique in UWB systems will improve link robustness of UWB or data rate. But some challenges arise in designing of the MIMO antenna systems for UWB applications.

These challenges include the reduction of the mutual coupling and the correlation between the elements of the antenna systems[4]. In this article, antenna systems proposed in the literature as well as by authors have been discussed. Some techniques have been presented to face these challenges. Finally, proposed UWB-MIMO antenna systems in the frequency band of 3.1 –10.6 GHz are efficient in terms of diversity, radiations, size, etc. UWB communication systems have the promise of very high bandwidth.

1) It provides reduced fading from multipath.
2) It provides low power requirements .
3) The main concept behind UWB radio systems is that they transmit pulses of very short duration as opposed to traditional communication schemes which send sinusoidal waves.
4) The role that UWB antennas play in all of this is that they have to be able to transmit these pulses as accurately and efficiently as possible.

## II. MATERIALS AND PARAMETERS

Here microstrip has been used due to its light weight, thin size and patch can be of any shape. UWB-MIMO patch microstrip antenna has been selected for investigation. UWB-MIMO patch is etched on dielectric substrate i.e. FR4 substrate whose thickness is 1.524mm and dielectric constant is 4.4 and the loss tangent .02. FR4 in comparison has a higher dielectric constant which results in a smaller patch size.

### A. *Parameters:*

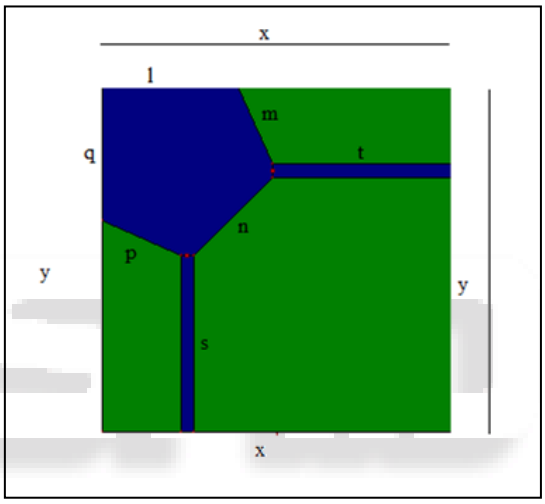


Fig. 1: Antenna Design Parameters

| Sr. No. | Points | x-coordinate | y-coordinate |
|---|---|---|---|
| 1. | l | 15.5mm | 0mm |
| 2. | m | 4mm | -9.019mm |
| 3. | n | -9.019mm | -9.019mm |
| 4. | p | -8.981mm | 4.038mm |
| 5. | q | 0mm | 15.5mm |
| 6. | t | 19mm | 0mm |
| 7. | s | 0mm | -19mm |

Table 1: Parameters of Antenna

The antenna ground is finite and the overall volume is 40mm*40mm.

### B. *DGS Structures:*

In this for the improvement we implement DGS structures in the design of the antenna. A Defected Ground Structure (DGS) is an etched lattice shape, which is located on the ground plane. DGS has arbitrary shapes and is located on the backside metallic ground plane. DGS is realized on the bottom plane with one island placed at both sides of the microstrip line on the upper plane. The characteristics of the defected ground structure are:

- Disturbs shielding fields on the ground plane.
- Increases effective permittivity.

 

- Increases effective capacitance and inductance of transmission line.
- Has one-pole LPF characteristics (3dB cutoff and resonance frequency).
- Size reduction for the component.

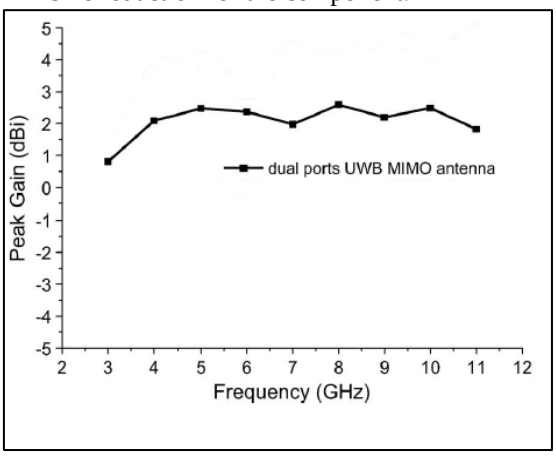


Fig. 2: Measured Antenna Gains

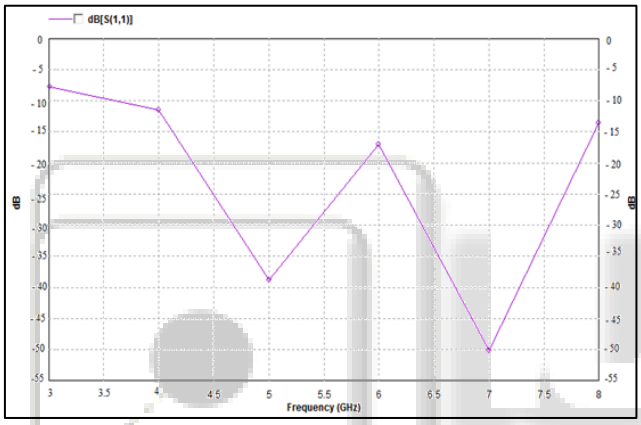


Fig. 3: Return Loss of Antenna

## III. Conclusion

A method of using co-radiator in diversity antenna designing has been proposed and two UWB-MIMO antennas with two elements have been presented in this paper. High isolation between two ports has been achieved by etching a T-shaped slot in the radiator and extending a stub from ground. The shared radiator is fed by two perpendicular feeding structures, which result in dual polarizations of the system. The simulated current distribution and far-field electric field have also demonstrated that the UWB-MIMO antenna with dual polarization characteristics. The diversity performance of the UWB-MIMO antenna have also been studied and presented in this paper. Furthermore by employing DGS structure into antenna performance is increased.

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