Compact Ultra Wideband Two Port MIMO Antenna with Modified Ground Structure

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Abstract- In this paper, a novel and compact UWB MIMO antenna is presented. The proposed antenna is designed with two symmetric element which is present on the top surface and isolation is significantly reduce by T-shaped structure used in modified ground structure. Overall dimension of the designed antenna is 18mm x 34 mm x 1.6 mm.As a result the proposed antenna has wider bandwidth of 3.1-10.6 GHz along with lower mutual coupling (< -15dB)has lower and quasi-omnidirectional radiation patterns.

Keyword- MIMO antenna, modified ground structure,Isolation

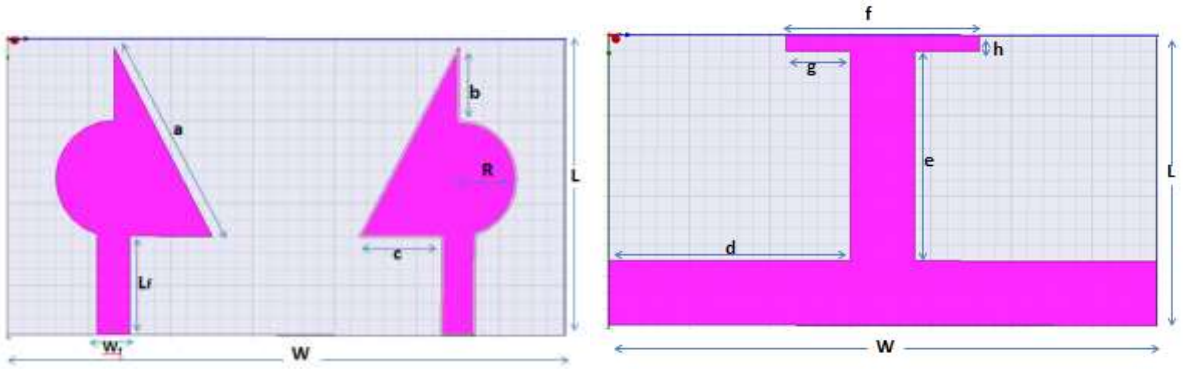
I. Introduction

Today high data rate, compact size and efficient spectrum utilization are demand of various wireless devices. This requirements can be achieved by multiple-input-multiple–output (MIMO) system. In MIMO technology, multiple antenna are placed at transmitter and receiver side which give better gain diversity as well as multiplexing gain because of this multipath fading problem has reduce and overall capacity of channel has enhanced. But one major problem mutual coupling occurs by placing of multiple antenna in small space. So, today number of research is going to improve mutual coupling or enhance the isolation between various antennas. By cutting rectangular or T-shaped slot in [1-2] on ground to enhanced isolation by suppressing surface current between ports. Furthermore protruding grounds, tree-like structures, defected ground structures (DGS), electro-magnetic band gap (EBG) and neutralization line [3-7] are also the efficient method to improve isolation. Antenna elements placed perpendicular, T-shaped stub is extruded in the ground and F-shaped stubs are introduced in the shared ground plane [8- 10] are used to improve the isolation.

In this paper, two-element wideband novel MIMO antenna is designed to operate in the frequency range of 3.1- 10.6 GHz which suitable for various wireless device applications. To obtained wideband by modifying ground and improve the isolation by using T-shaped structure in modified ground. Each element consist of triangular patch along with half circle. The proposed antenna is design on HFSS simulation software and simulated result has wider impedance bandwidth (7.5 GHz), stable gain, good return loss, quasi-omnidirectional radiation patterns and high isolation.

II. Antenna Design

Fig.1 shows the optimized geometry with dimension of proposed antenna structure which is fed by micro strip line. The antenna is design with FR4 substrate whose dielectric constant is 4.4 and loss tangent whose value is 0.025 with compact size of 18mm x 34mm x 1.6 mm. The simulation of antenna is carried out by using HFSS simulation software. The optimized parameter of proposed antenna are presented in Table I.



(a)Top View (b) Back view

Fig.-1 Structure of proposed antenna with parameters

TABLE I. Optimized parameters with dimension of proposed antenna

Parameters	L	W	L_f	W_f	a	b
Dimensions(mm)	34	18	6	2	12.97	4.46
Parameters	c	d	e	f	g	h
Dimensions(mm)	5	15	13	12	4	1

III. RESULTS AND DISSCUSIONS

Fig.3 and fig.4 shows the simulated S-parameters for the proposed wideband MIMO antenna. The proposed antenna covers 3.1 GHz to 10.6 GHz bandwidth with S11/S22 < - 10 dB and S21/S12 < -15 dB.

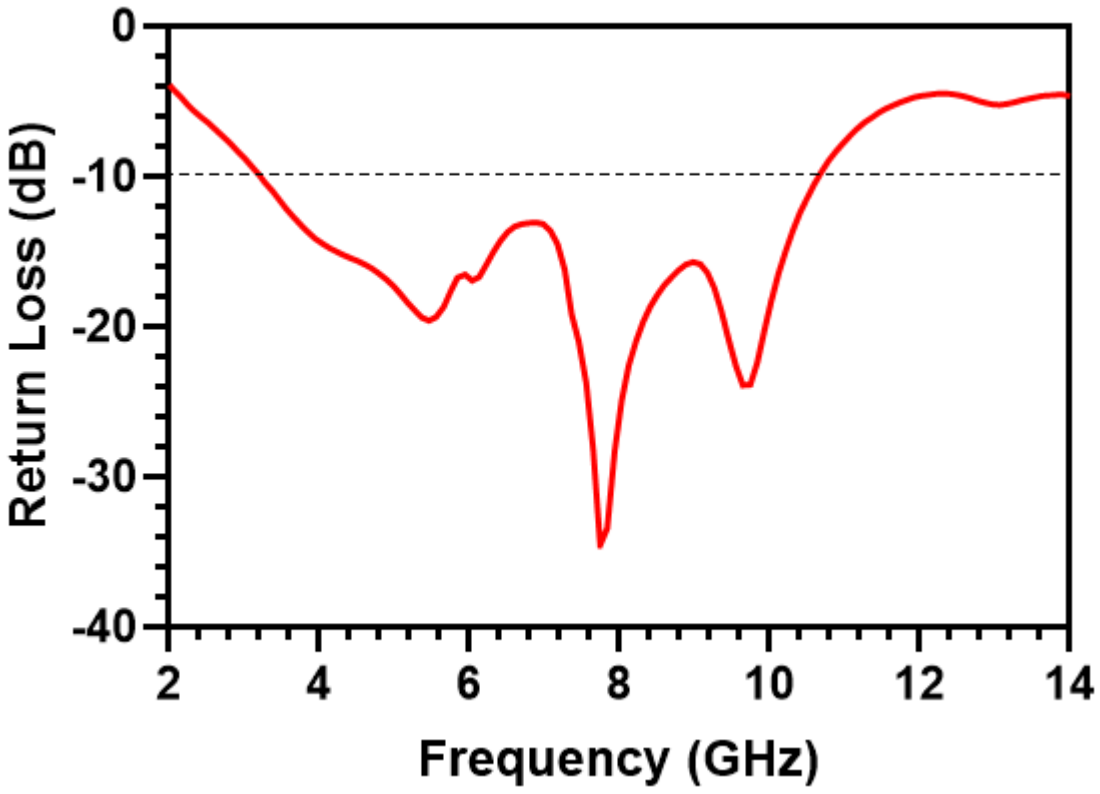


Fig.-3 Return loss of proposed antenna

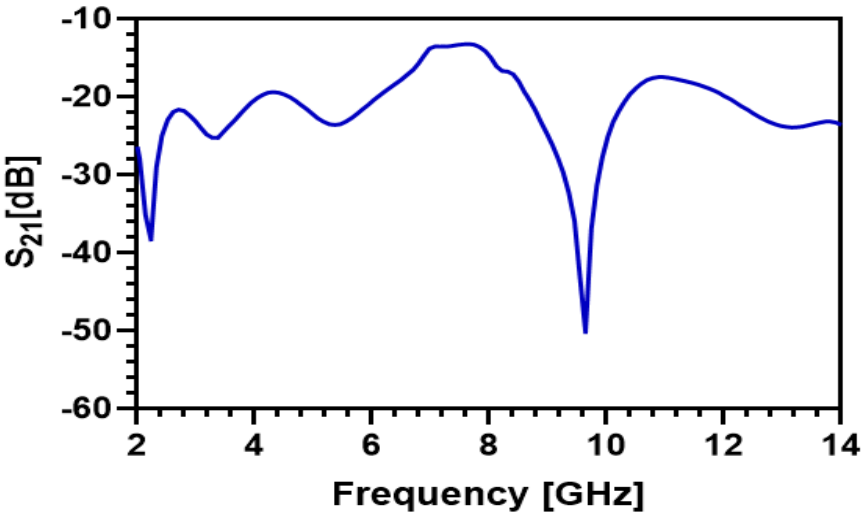
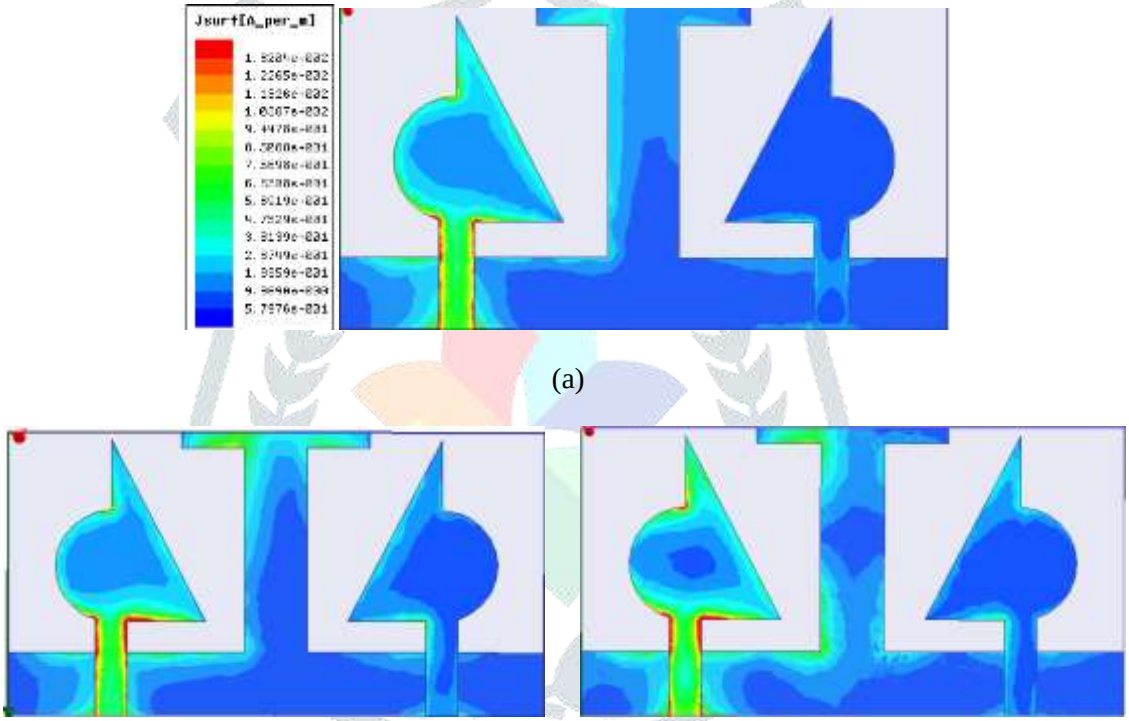


Fig.-4 S_{21} parameter of proposed antenna



(a)

(b) (c)

Fig.-5 Surface current distribution at (a) 5.6 GHz (b) 8.03 GHz (c) 10GHz

Fig. 5 shows the surface current distribution at 6.51 GHz, 8.03 GHz and 11GHz.and fig.6 show the gain of proposed antenna. The peak gain of antenna changes from 2 dB to 12 dBi at frequency band from 3.1-10.6GHz.

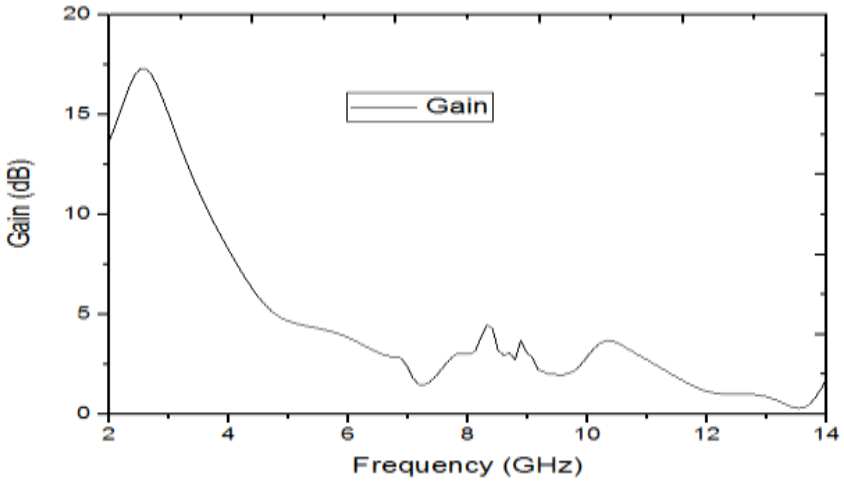
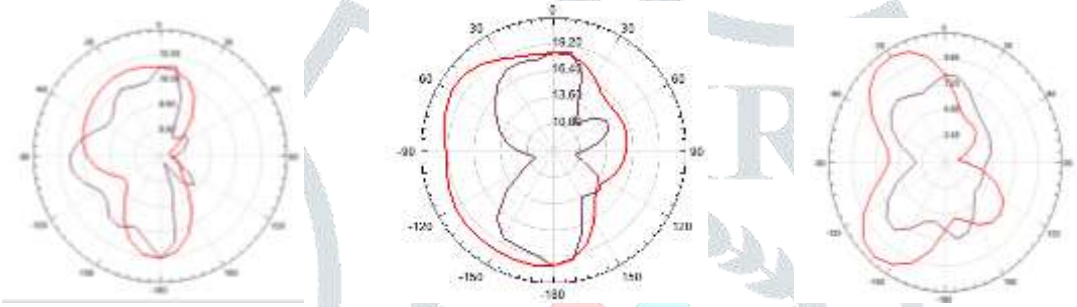


Fig.6 Gain of proposed antenna



(a) 5.6 GHz (b)8.03 GHz (c)10 GHZ

Fig.7 Radiation pattern of proposed antenna at (a) 5.6GHz (b) 8.03GHz (c) 10 GHz

Fig.7 shows the radiation pattern of proposed antenna at 5.6 GHz, 8.03GHz and 10 GHz for E-plane and H-plane which quasi omni-directional for H-plane.

IV Conclusion

A compact two element wideband MIMO antenna is presented in this paper. The high performance and compact size are achieved by modifying ground structure and introducing T-shaped in ground plane. More over the major parameter like S-parameter, radiation pattern, isolation and gain are investigated by simulation which is carried on HFSS simulation software .Above result shows the good return loss, wider bandwidth, high isolation, quasi omni –directional radiation pattern. Therefore, the proposed antenna is good for various wireless portable devices.

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