Micro strip Fed Mimo Antenna for Satellite Applications

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Abstract: ***A MIMO antenna is used for the multiple transmission and receiving antenna for multipath direction. MIMO is essential for wireless communication. We analyse the performance of a Massive multiple input and multiple MIMO base station deployed at a data center to provide massive connectivity to a large variety of devices. In this paper a compact MIMO antenna proposed with dimensions of 38.5*38.5 mm2 and with operating frequency band of 8.0-17.0 GHz. The proposed antenna designed on FR4 substrate with dielectric constant of 4.4 and thickness of 1.6mm. The simulation results show that antenna has minimum return loss of <10dB between 8-17GHZ and have better radiation characteristics. These outputs represent that the MIMO antenna is acceptable for satellite communication and RADAR applications.***

Index Terms: Multiple-Input-Multiple-Output(MIMO) antenna, micro strip-fed.

I. INTRODUCTION

The massive multiple input and multiple output (MIMO) systems in which it consists of single base station with an multiple number of antennas serves a huge group of single antenna devices at the same time, channel correlation among the devices or users has extensive impact on device capacity [3]. The spectrum width from 8 to 17 GHz is used for the commercial applications. The techniques of wide band have advantages such as high data rate, high bandwidth and low cost [1]. A considerable new number of antenna structures have been designed and proposed for hand held wireless devices but they have constrained spectrum coverage. In addition to this the pattern shift inside the antenna applications, they are also need to support the satellite communication where multi-standard communication devices may be integrated to share the information. Multiple input and multiple output techniques helps to activate the transmission of information over the multiple channels and this improves the capacity of the channel [2]. To increase the reliability of wireless communication and channel capacity the multi element antennas are used explicitly. The wireless communication services and technologies require compact antennas operating over a wide frequency band .

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The antennas are positioned perpendicular to each other in order to attain polarization diversity and high isolation [4].

II. ANTENNA DESIGN

The designed MIMO antenna with the size of 38.5´38.5 mm2 is printed on FR4 substrate with a relative dielectric constant of 4.4 and thickness of 1.6 mm[1]. The proposed antenna contains of ground plane etched with a rhombic slot and a couple of L-shaped slits [5].The microstrip-fed lines at an offset distance from the middle have 3 stages for impedance transforming. The parasitic strip placed between the antenna factors plays an crucial role in isolation improvement. It contains two major parts one is perpendicular to the diagonal and microstrip is placed along the diagonal. On another side of the substrate the ground plane is introduced. The geometrical refinement of the antenna structure and numerical analysis were carried out by using the HFSS from ANSYS electromagnetic simulation software. The antenna parameters are mentioned below

PARA-METER	DIMENSIONS (mm)	PARA-METER	DIMENSIONS (mm)
W(antenna width)	38.5	W3=W5	1.5
L(length of the antenna)	38.5	W4	3
W1=L1	25.2	D1	8
L2	20.4	D2=D3	19.25
L3	12	S1	7.3
L4	7.4	S2	1.3
W2	4	G	0.3

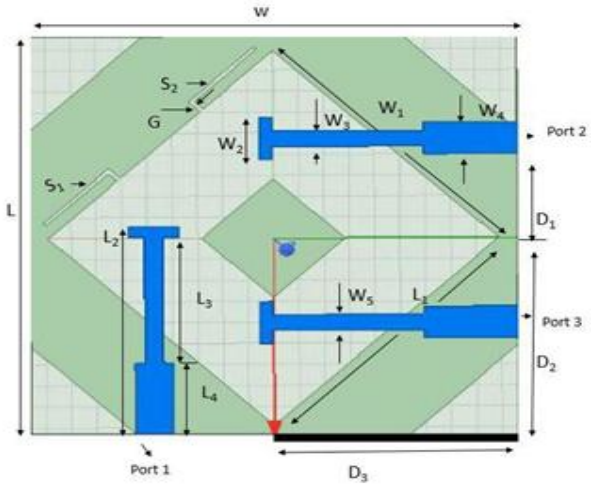

Fig. 1 Design of Proposed Antenna

Impacts of Etched Slits

The proposed MIMO antenna have S-parameters with various arrangements are shown. As seen in Figure 1, the basic MIMO antenna with symmetrical feed patterns accomplishes port isolation of -10db in MIMO spectrum. To additionally improve the isolation, another port is added to the design.

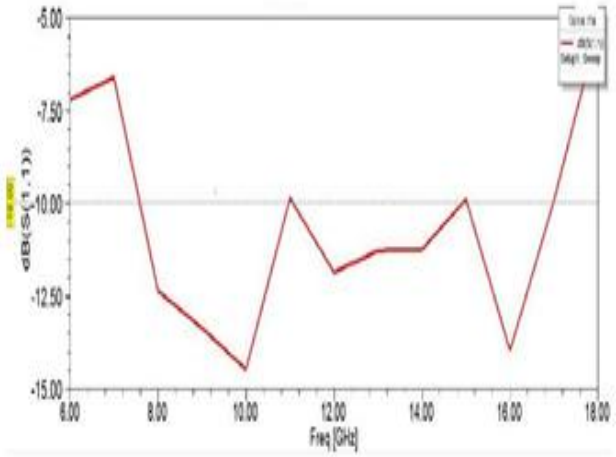

Fig. 2 Measured and Simulated S-Parameters of the designed antenna

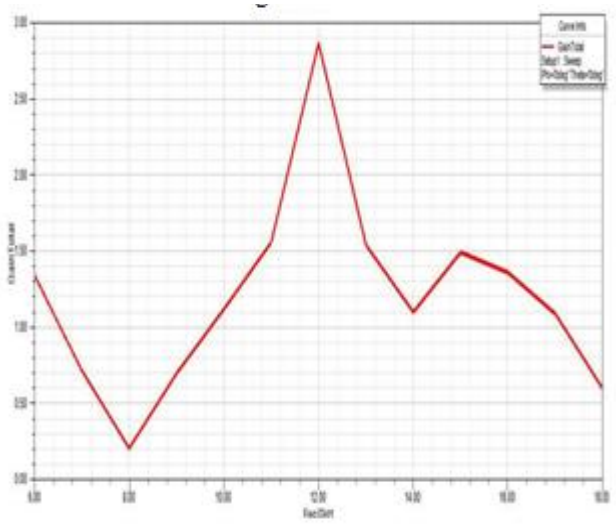

Fig. 3 Gain Vs Frequency Plot

III. RESULTS AND DISCUSSIONS A.RADIATION CHARACTERISTICS

The radiation attributes of designed antenna have estimated with ports 1, 2 and 3 respectively. Measured radiation pattern are shown in above Fig 3. Since the MIMO antenna apparatus comprises of two indistinguishable components found opposite one another in 900 rotation and one port is parallel to one of the ports in vertical position. As seen, the patterns of antenna radiation are semi-omni directional in the H-plane. In any case, the proposed multiple input multiple output antenna which accomplish symmetrical examples to moderate the impact of coupling between the nearby components. Estimated gain ranges from 1.4dbi to 3.6dbi from entire band.

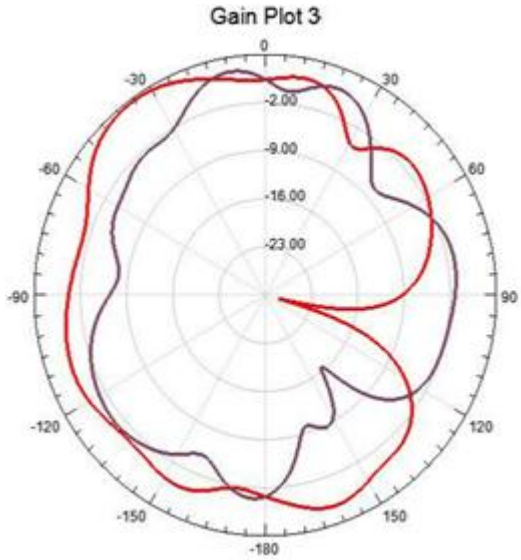

Fig. 4 Measured Radiation Patterns

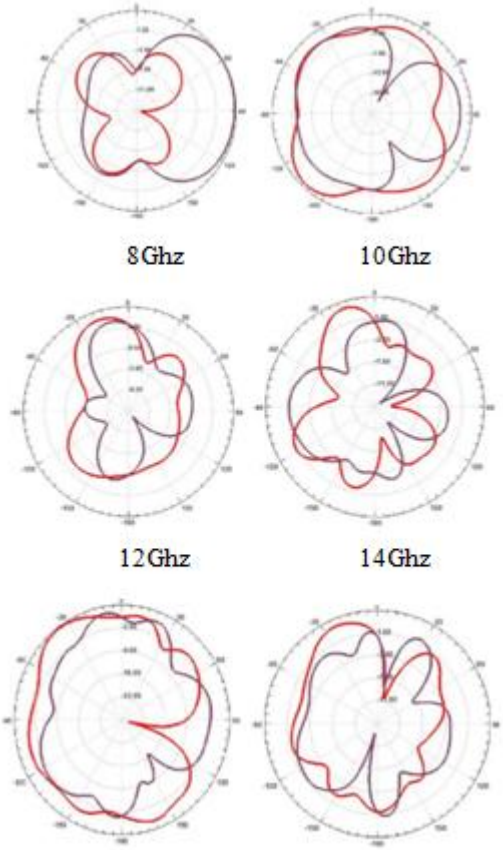

Fig. 5 Radiations patterns for different frequencies

IV. CONCLUSION

The microstrip feed lines are utilized to feed the antenna with wideband impedance coordination. The isolation of port is progressed by utilizing a simple decoupling structure. Estimated results demonstrate that designed antenna accomplishes an impedance transmission of bandwidth larger than 8-17GHz.As it covers both X and Ku band which helps to transmit the data to remote areas.

As the size and design is simple, the proposed antenna meets the standards of MIMO antenna.

REFERENCES

1. Le Kang, Hui Li, Xinhuai Wang, and Xiaowei Shi, "Compact Offset Microstrip-fed MIMO Antenna for Band-Notched UWB Applications,"IEEE Antennasand Wireless Propag.,vol.14,2015.
2. J. Wallace, M. Jensen, A.Swindlehurst, and B. Jeffs, "Experimental characterization of the MIMO wireless channel: Data acquisition and analysis," IEEE Trans. Wireless Commun., vol. 2, no. 2, pp. 335–343,Mar. 2003.
3. Run Tian, Yuan Liang, Tongtong Li,"Overlapping User Grouping inIoT Oriented Massive MIMO Systems, "International conference on Computing Networking and Communications, Wireless Networks 2017.
4. M. Arif Khan, M. Aziz ul Haq, Sabihur Rehman,"A Practical Miniature Antenna Design For Future Internet of Things Enabled Smart Devices,"10th International conference on signal processing and communication Systems 2016.
5. Anju Satheesh, Rithika Chandrababu, I.Srinivasa Rao,"A Compact Antenna For IOTApplications,"Internationalonference on Innovation in information Embedded and communication Systems 2017