A Novel MIMO Antenna For UWB Application

Kirti vyas, Rajendra Prasad Yadav

***Abstract*— Multiple input multiple output MIMO antennas reported in this paper covers 65 X 32 mm2 area and is fabricated on FR4 substrate. The antenna has dynamic characteristics with band notching in 4.3-5.7 GHz band for Satellite communication and wireless local area Network (WLAN) band. The antenna has good Diversity characteristics with more than 9.93 dB diversity gain, less than 0.13 Envelope correlation Coefficient (ECC),.Individual antenna gain varies from 2.5 dB to 4.6dB.and has above 75% radiation efficiency for most of UWB range .**

***Index Terms*— MIMO, UWB, Diversity, Envelope correlation Coefficient (ECC).**

I. INTRODUCTION

In the present world the MIMO technique has increased the reliability of the and efficiency of the communication systems. A number of UWB MIMO antennas are reported in the literature [1-10] but still there is a requirement to improve the performance of the MIMO antennas for UWB applications.

In this paper MIMO antennas are designed using the modified stepped ground approach which helps in impedance matching. The notching is provided by novel 'π' shaped half wavelength resonator to reduce the interference from the satellite and WLAN bands.

II. ANTENNA DESIGN

The MIMO antenna comprises of laterally placed UWB antennas which are formed by modifications in ground structure and modifications in the conventional rectangular shaped radiator. These modification have lead to coverage of Ulltra wide bandwidth. In order to band notch the satellite communication band and the WLAN band a 'π' shaped slot resonator is inserted in the center feed of CPW line and the radiator. The layout of MIMO antenna is shown in figure 1.

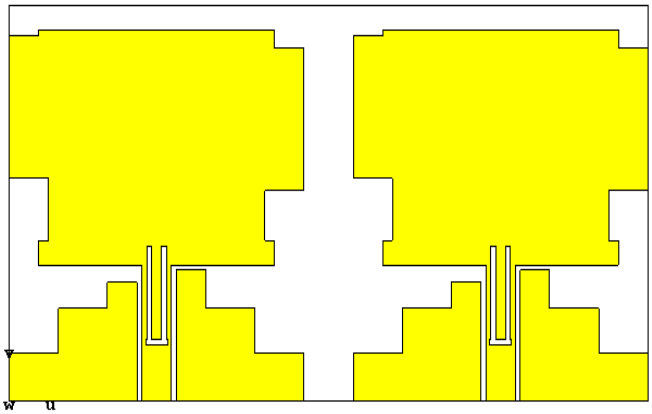

Figure 1. Proposed MIMO antenna

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III. RESULTS ALONG WITH DISCUSSIONS

The S parameters of the MIMO antenna are shown in figure 2. It can be noticed that the antenna covers entire UWB with isolation greater than -15 dB for all most entire UWB region.

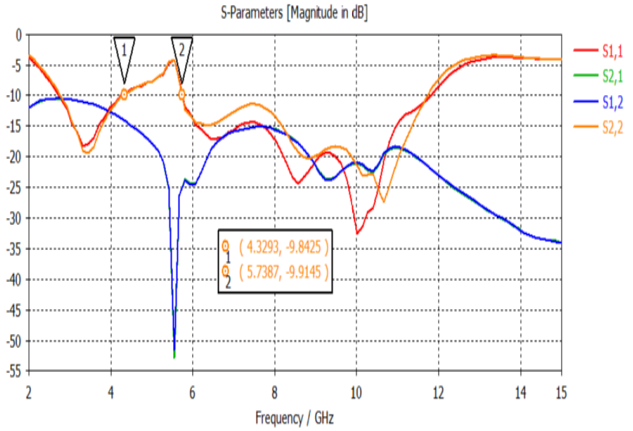
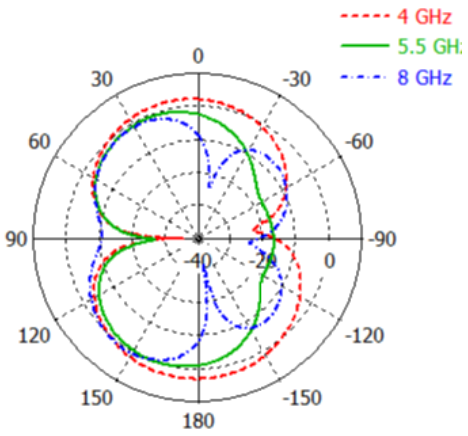
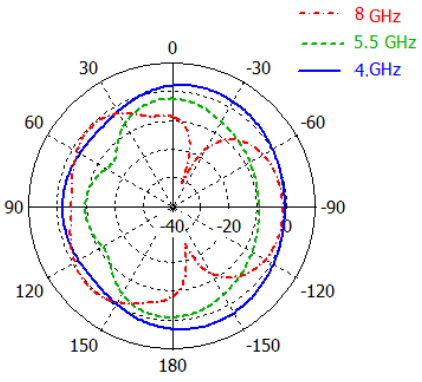


Figure 2. The S parameters of the MIMO antenna

Figure 3 presents the radiation patterns. Figure 3 (a) shows the bidirectional E plane and figure 3(b) shows the omnidirectional H plane pattern. Slight distortions in the conventional patterns are noticed at high frequencies



(a)



(b)

Figure 3 The radiation patterns (a) Eplane (b) H plane

Figure 4 shows the diversity gain which is more than 9.93and figure 5 shows the ECC which is less than 0.013. Both these values assure good diversity characteristics.

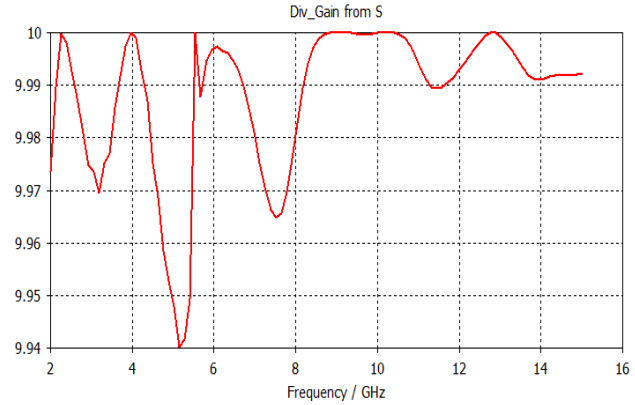


Figure 4. The diversity gain curve

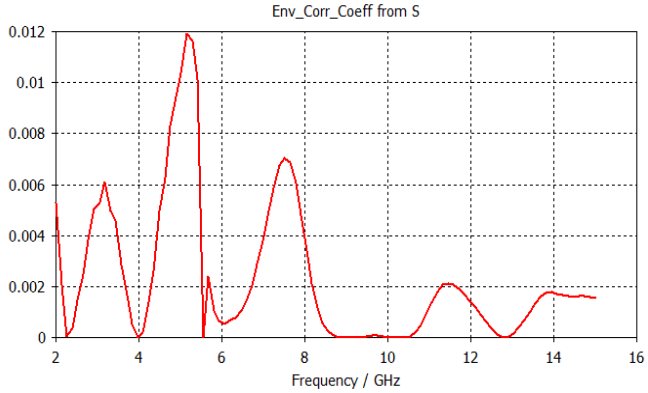


Figure 5 ECC curve verses frequency

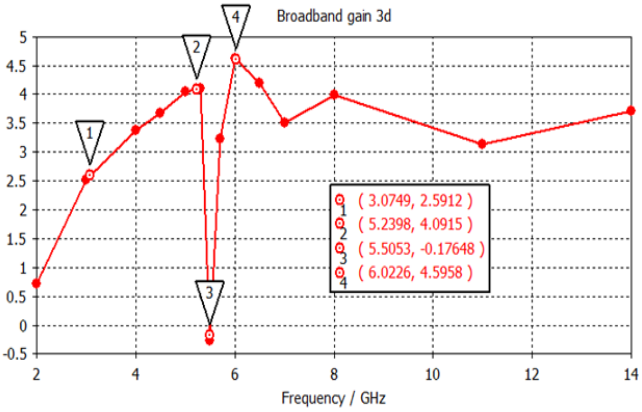


Figure 6. The individual antenna gain curve

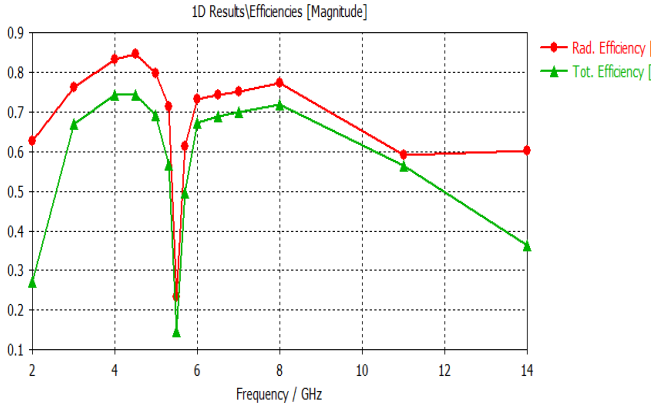


Figure 7. Radiation efficiency curve

The individual antenna gain is demonstrated in figure 6. A sharp dip can be noticed at band notched frequencies at central frequency of 5.5 GHz with reduced gain of -0.18dB. Figure 7 depicts radiation efficiency values which are greater than 70% for almost entire UWB region.

IV. Conclusion

A novel MIMO antenna is reported in this paper with -15 dB isolation. This antenna achieves 2.8-11.8 GHz impedance bandwidth with good diversity characteristics. The ECC values are lesser than 0.13 and more than 9.93 dB diversity gain. Radiation efficiency achieved is greater than 70% for almost entire UWB region. The proposed antenna is applicable for UWB imaging application.

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