Design And Simulation Of Tri Band Patch Antenna Using DGS For WirelessApplications

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Abstract *- Microstrip patch antennas are stated to be printed antennas due to the fact they may be printed/fabricated on a ci rcuit board directly. In this work, we used tri band patch antenna for wireless applications with defected ground structure. The proposed antenna is designed using HFSS for wireless applications It is specially operated at x band, Wi-Fi, WI-max range frequencies. The FR4-epoxy is the substrate with di-electric constant 4.4 and height of the substrate is 1.6mm. The proposed antenna specially resonates at 3.02GHZ, 5.3GHZ and 8.44GHZ frequencies. It's Bandwidth for 3.02GHz is 170MHZ, for 5.3GHZ is 1.3GHz, for 8.44GHZis 1. 8GHZ.The Return loss is -10.8db, -17.7db, -19.13db for 3.02GHZ, 5.3GHZ, 8. 44GHZ.The Gain is 6.044db for 3.02GH, 2.27 for 5.3GHZ, 3.9 for 8.44GHZ.*

Index Terms—HFSS, DGS.

I. INTRODUCTION

Microstrip patch antenna is extremely used in many devices, due to its simple and inexpensive nature to manufacture. Patch antenna has a broad range of properties which are very helpful. In recent times, antenna structures are built for dual, triple, and multiband applications [4]. Accordingly, the techniques performed to develop triband are slots and defected ground structure. Based upon the kind of feeding, the suggested antenna gives the final performance. Therefore, contact and non-contact type feedings are accessible for constructing any type of antenna. The non-contact method feeding is hard to fabricate an antenna. Consequently, contact method utilized to excite the antenna. Identifying feed technique for [5,6] a microstrip patch antenna is necessary in designing because it directly shows the impact on bandwidth, return loss and its efficiency. The substrates are used to give mechanical strength to the antenna in microstrip patch antenna. By choosing suitable dielectric medium can decrease the spread of the surface waves. Generally, microstrip patch antenna gives less gain and bandwidth. These parameters can be improved by making changes using slots and DGS technique. The suggested patch antenna with hexagonal slot

[1] is designed using FR4 substrate and DGS techniques. It is simulated using HFSS software.

II. ANTENNA DESIGN

Microstrip patch antenna consists of three layers; they are ground plane, substrate and radiating patch. The ground plane and radiating patch are etched on either side of the substrate. The substrate used in this proposed antenna design is Fr-4 epoxy with a dielectric constant of 4.4 and the zsssthickness of the substrate is 1.6mm. The strip line feeding technique is used to provide impedance matching, and the proposed antenna is designed using HFSS software. Defected ground structure technique is introduced in this proposed antenna design by cutting the ground L-shape. The dgs technique is used to increase the bandwidth and gain of the patch antenna, and it is used to improve the characteristics of the microstrip antenna radiation.

PARAMETER	VALUE
Operating Frequency	3.1GHz
Ground plane Length	5.75mm
Ground plane width	24mm
Substrate Height	1.6mm
Substrate length	22mm
Substrate width	24mm

Table—1: The above table represents the design parameters of tri band microstrip patch antenna. The parameters of this proposed antenna is designed using reference [3]. The proposed antenna is designed using high frequency structure simulator (HFSS). Fig 1 describes the geometry of the proposed antenna

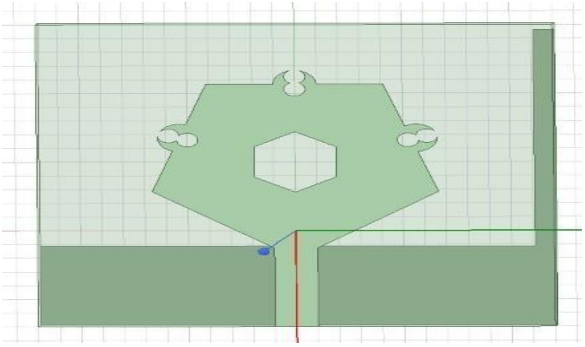

Fig-1: Geometry of the Proposed Antenna.

III. RESULTS

In this the antenna results are obtained by using HFSS. The results that are obtained are Return loss, VSWR, gain in terms 3D, bandwidth and fractional bandwidth. The antenna resonates at three different frequencies they are 3.02GHz, 5.3GHz and 8.44GHz. The bandwidth obtained at these frequencies are 170MHz, 1.3GHz and 1. 08GHz.The Return loss and VSWR of these frequencies are -10.8dB, -17.7dB, -19.12dB and 1.8, 1.2 1.2. The gain obtained at these frequencies are 6.044dB, 2.27dB, 3.9dB.

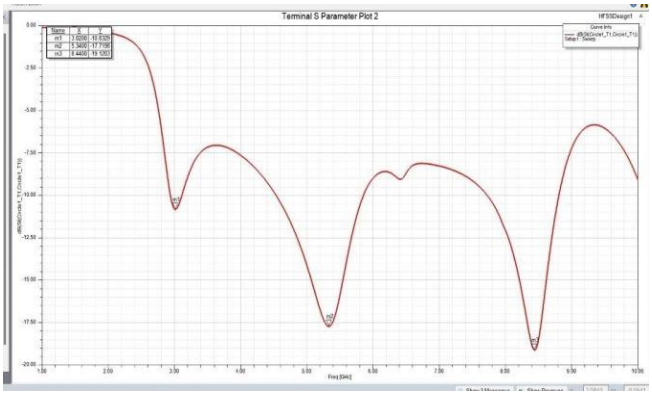

Fig-2: Return loss with frequency

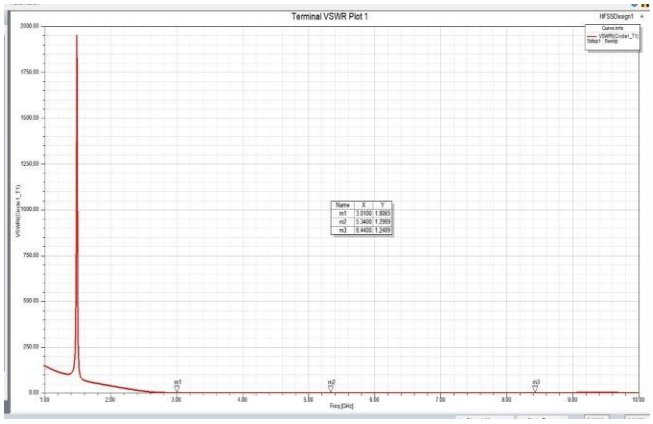

Fig-3: VSWR with frequency

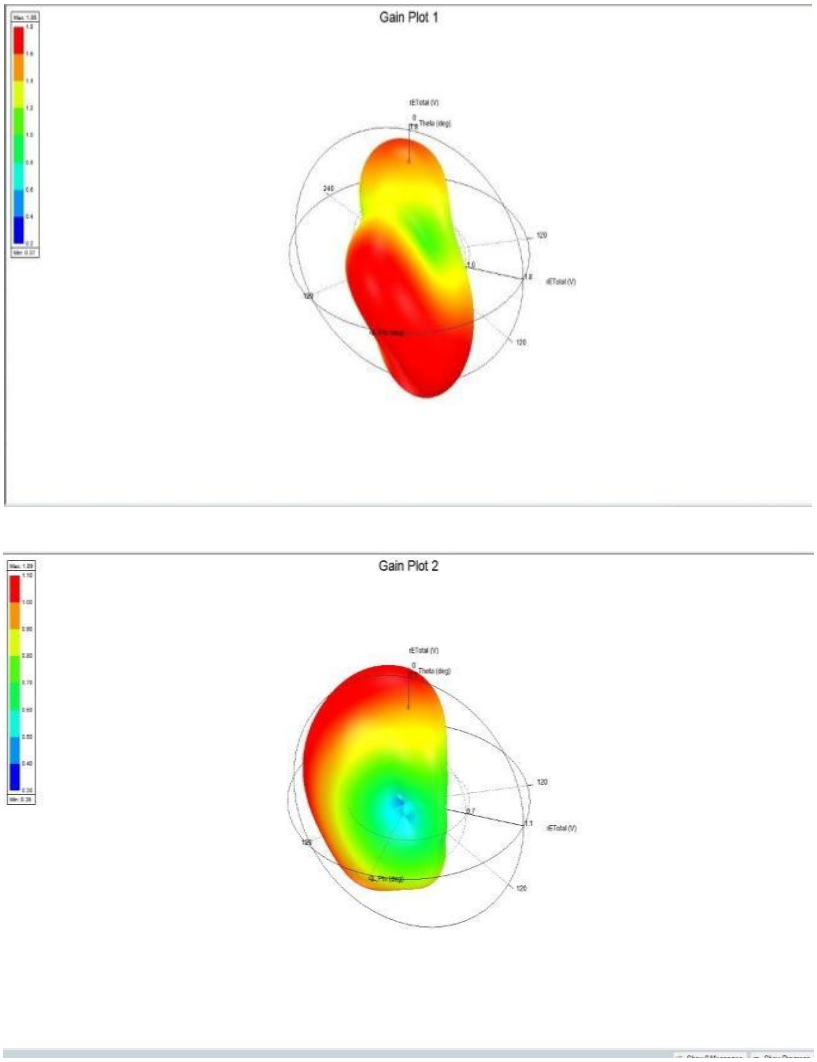

Fig-5: Radiation pattern at 5.3GHz

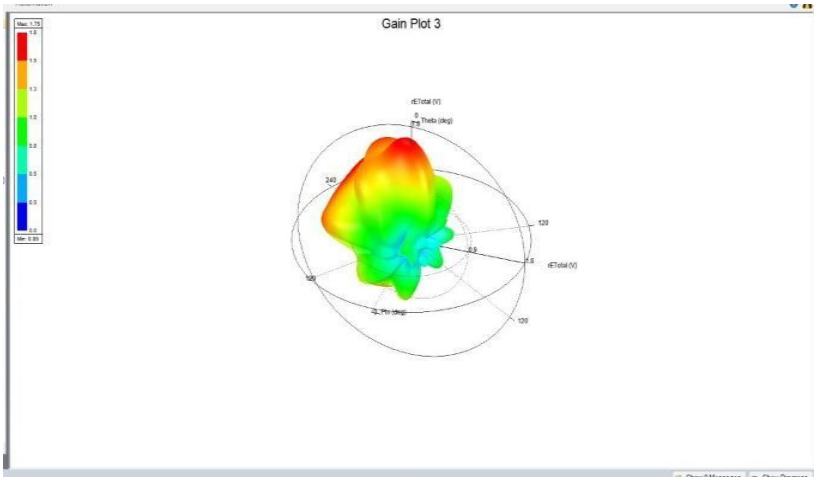

Fig-6: Radiation pattern at 8.44GHz

Summary of the proposed antenna results are shown in thebelow table 2

Resonant frequency	3.02GHz	5.3GHz	8.44GHz
S11(dB)	-10.8dB	-17.7dB	-19.12dB
VSWR	1.8	1.2	1.2
Gain(dBi)	6.044dB	2.27dB	3.9dB
Bandwidth	170MHz	1.3GHz	1.08GHz
Fractional Bandwidth	5.6%	24.5%	12.7%

CONCLUSION

This is the paper for new configuration of tri band patch antenna for Wireless applications. The irregular patch shape, DGS technique gives the tri band response, and the antenna resonates at 3.02GHz, 5.3GHz, 8.44GHz with a gain of 2 to 6dB and VSWR is less than 2. The antenna resonating at three different frequencies are used for WiMAX, Wi-Fi and x-band applications.

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