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Design of H Shaped Microstrip Patch Antenna with Hexagonal Slots for Microwave Band Applications

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ABSTRACT

A modern H shape Microstrip patch antenna using hexagonal slot design is presented during this paper. Several researchers have discussed taking place different shapes of patches. A H shaped hexagonal slot antenna is projected for bandwidth improvement. During this paper, the oblong and hexagonal slit that's added at the maximum plane side of the H Shape radiating patch. Micro strip-fed H shaped patch antenna is obtainable during this paper. The wished-for antenna is meant on Rogers /RT Duriod 5880 substrate and therefore the show is obtained by using Ansys High Frequency Structural Simulator. The antenna is best to other designs in terms of parameters like Bandwidth, Directivity, Radiation Pattern, Gain, Return Loss .The planned aerial operates over the waveband from 12.50 GHz for reflection coefficient (S_{11}) < -18 dB.

KEYWORDS: HFSS, hexagonal slot, H shape patch, Resonant Frequency

I INDRODUCTION

As the anxiety of wireless systems have greater than before day by day, low contour systems have drawn the attention of the researchers towards the Microstrip Patch Antennas. It involves move of in order without any bodily link between two or more points. It can be used for cellular telephony radio wireless technology, headphones, radio receivers, satellite television, broadcast television and cordless telephone. It has several compensation are discussed in Cost effectiveness Flexibility Speed Accessibility. The antenna is applicable in X band (8–12GHz) and Ku band (12–18GHz) which is primarily used for military applications, radar, civil, weather news and maritime vessel traffic. The settle down of the document is planned as follow. Part II presents the antenna design. Part III simulation results discussion .Conclusion of this research is given in Part IV.

II ANTENNA DESIGN

The width of Microstrip patch antenna is given by the following equation

$$W = \frac{c}{2f0\sqrt{\frac{\epsilon r + 1}{2}}}$$

C =3 x 10^8m/sec, C= speed of free space velocity

The effective dielectric constant is given by,

$$\epsilon_{reff} = \frac{\epsilon r+1}{2} + \frac{\epsilon r-1}{2}\left[1 + 12\frac{h}{Wp}\right]^{-1/2}$$

Where h is the height of the substrate and W_p is the width of the patch.

$$L_{eff} = \frac{c}{2f0\sqrt{\epsilon eff}}$$

Where f_0 is the operating frequency, c is velocity of light, ϵ_{eff} is the effective dielectric constant.

Length extension is calculated from the expression ΔL:

$$\frac{\Delta L}{h} = 0.412\frac{(\epsilon reff + 0.3)\left(\frac{Wp}{h} + 0.0264\right)}{(\epsilon reff - 0.258)\left(\frac{Wp}{h} + 0.8\right)}$$

The proposed structure has been designed H Shaped radiating patch. And next process four hexagonal slots were created. The center of the patch was created rectangular slot. The same dimension of the ground and substrate structure has been designed. A microstrip feed line has been designed. The arrangement of the proposed antenna is illustrated in Fig.1 Rogers /RT Duriod 5880 with dielectric constant 2.2 is used as substrate.

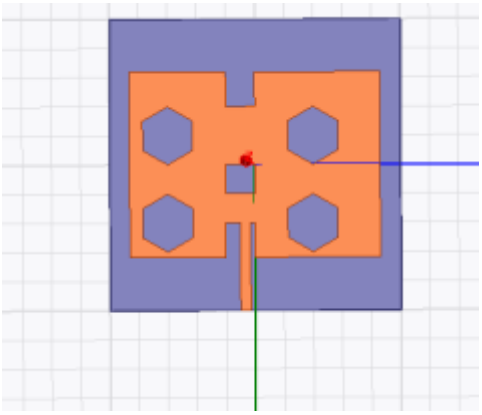

Fig 1 Proposed Antenna Design

The proposed design of antenna is measured length and width. The size of the patch antenna is 12.72 *17.22 mm, substrate and ground size 20*20mm and height 4 mm.It consists of central rectangular slot 2*2 mm.

III SIMULATION RESULTS

The proposed antenna radiates well for the band of frequency range 12.5 GHz with reduced loss. It has been return loss measured at S_{11}= -18dB

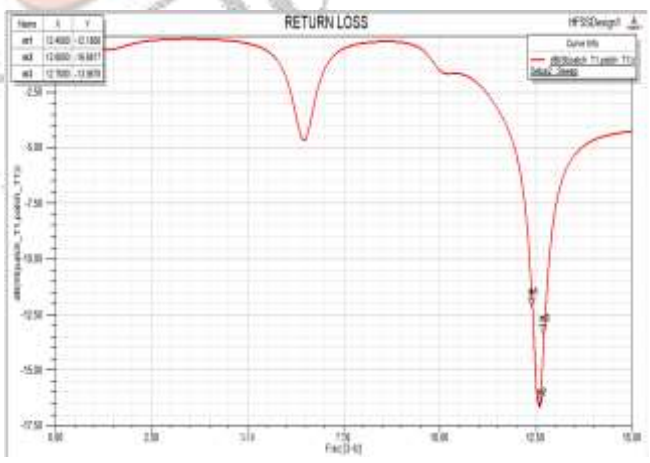

Fig 2 Return loss for Proposed Antenna

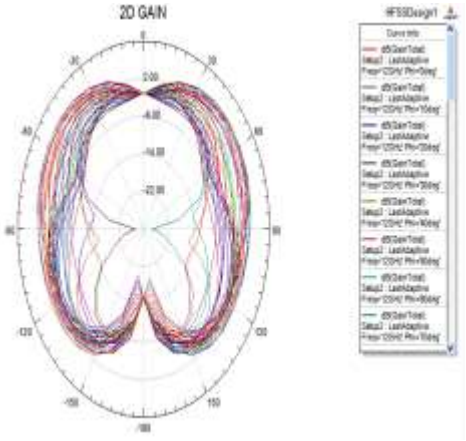

Fig 3 2D Gain for Proposed Antenna

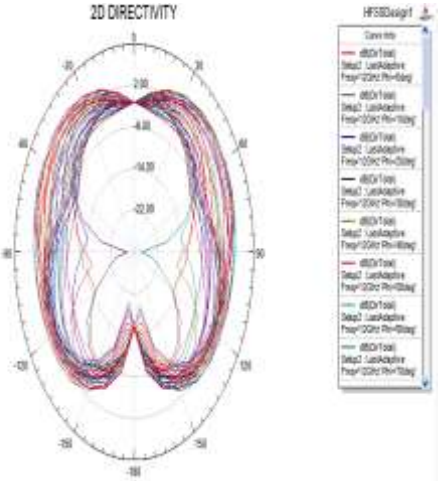

Fig 4 2D Directivity for Proposed Antenna

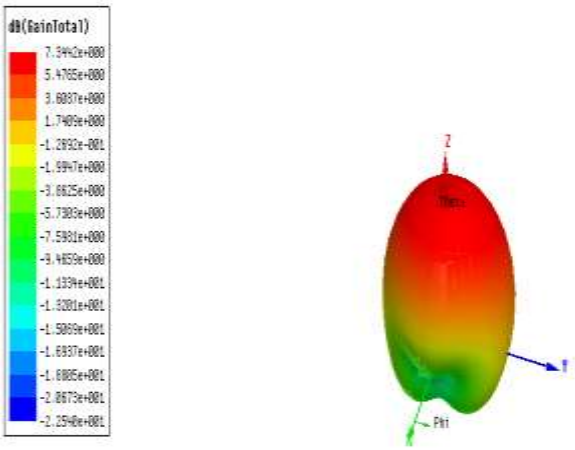

Fig 5 3D Gain for Proposed Antenna

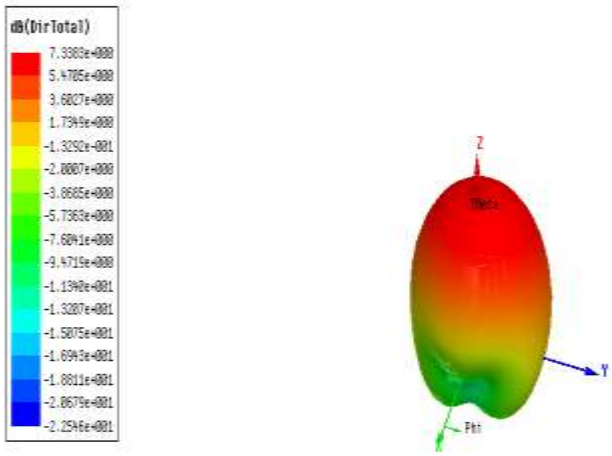

Fig 5 3D Directivity for Proposed Antenna

ANTENNA PERFORMANCE TABLE.I

S.NO	Antenna Parameters	Range
1.	Return Loss	-18 dB
2.	Gain	7.33 dB
3.	Directivity	7.33 dB
4.	Substrate	Rogers /RT Duriod 5880

IV. CONCLUSION

An H Shaped hexagonal slots structure was designed. It provides very good return loss and gain, directivity. The efficiency of the antenna varies between 90%.In additions, the proposed antennas also have simplicity in structure, compact size and good radiation performances. In future work, it will be used for different substrates and their performance analyzed.

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