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HEXAGONAL SHAPE PATCH ANTENNA FOR WIRELESS APPLICATION

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ABSTRACT: *Antenna is one of electromagnetic device which transmits/receive data from one point to another. A small hexagonal shape Microstrip patch antenna is introduced. This antenna resonates at 1.68GHZ frequency. It achieves excellent deep return loss less than -10 dB by using FR4substrate under the Patch .The antenna has many practical applications in wireless communication. The patch design is simulated in Ansoft HFSS11 software. The result showed satisfactory performance.*

Keywords: *Microstrip patch antenna, hexagonal shape, Ansoft HFSS, Return Loss, VSWR.*

I. INTRODUCTION

The progress of modern wireless communications systems systems has increased dramatically the demand for antennas, capable to be embedded in portable, devices which serve a wireless land mobile or terrestrial-satellite network. With time and requirements, these devices become smaller in size and hence the antennas required for transmit and receive signals have also to be smaller and lightweight. As a matter of fact, microstrip antennas can meet these requirements. As they are lightweight, low profile, conformability and low costs. A Microstrip Antenna is simplest form consists of a radiating patch on one side of a dielectric substrate and a ground plane on the other side. Microstrip antenna is same like PCB Board; hence it is also called as 'Printed Antenna'. This antenna resonates for frequencies above than 1GHZ. It consists different shapes of patches like square, circular, triangular, semicircular, sectoral, and annular ring shapes etc. shown in Fig.1. In this paper hexagonal shape microstrip patch antenna proposed to design.

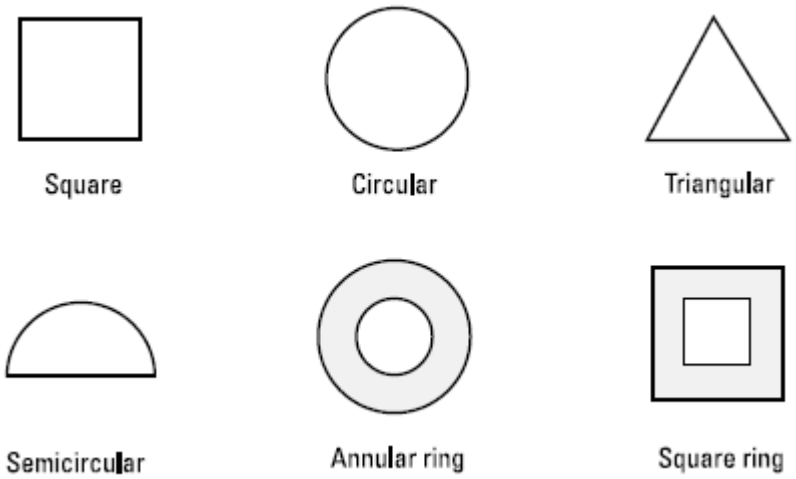

Fig.1 Different Shapes Microstrip Patches

II. ANTENNA DESIGN CONSIDERATION

The proposed antenna can be considered as hexagon-shape. The hexagon- shape patch is printed on the one of side of the dielectric substrate and other side a ground plane is printed below the patch. TABLE I show the dimensions of antenna.

TABLE. I. ANTENNA DIMENSIONS

Sr no.	Parameter	Value
1	Radius of hexagon	18mm
2	Ground plane	36x36
3	Dielectric substrate	FR4
4	Thickness of Substrate	1.6mm
5	Loss tangent of Substrate	0.02
6	Feed to Patch	Coaxial Feed

Circular equation is used to calculate the actual radius, *a* of Circular patch antenna to match at 2GHz.

$$a = F / \{[1 + (2h / \pi \epsilon_r F][\ln (\pi F / 2h) + 1.7726]\}^{1/2}$$

where

$$F = \frac{8.791 \times 10^9}{fr\sqrt{\varepsilon r}}$$

$$= 2.0275$$

$$a = \frac{F}{\{1 + 2h/\pi\varepsilon rF\,[\ln (\pi F/2h) + 1.7726]\}^{1/2}}$$

$$= 1.804\ cm\ @\ 18\ mm$$

III. GEOMETRY OF PROPOSED ANTENNA

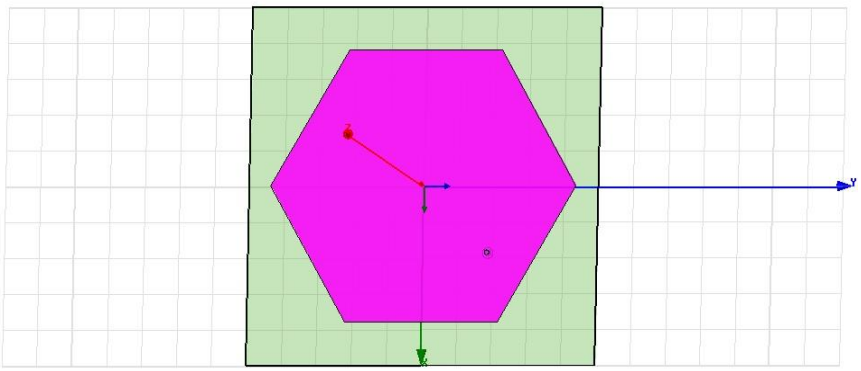

Fig 2. Proposed Antenna Geometry

IV.RESULT

S- Parameter:

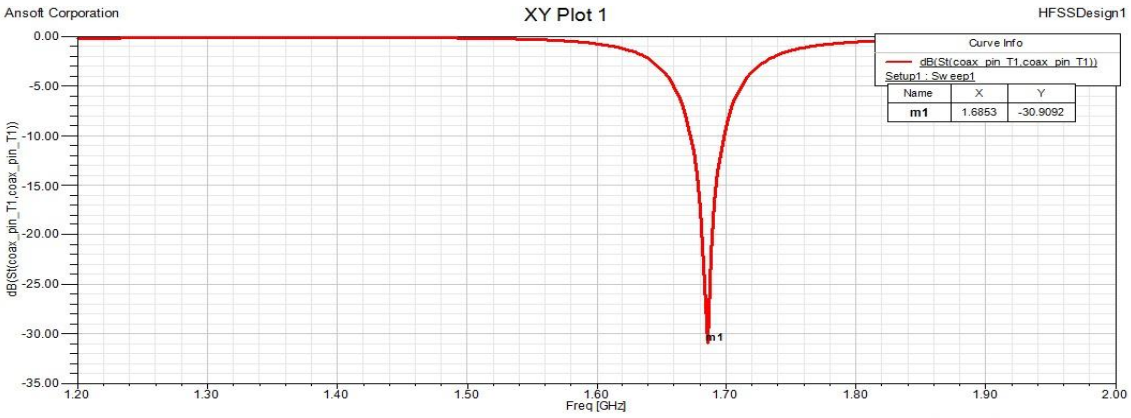

Fig. S-Parameter

VSWR:

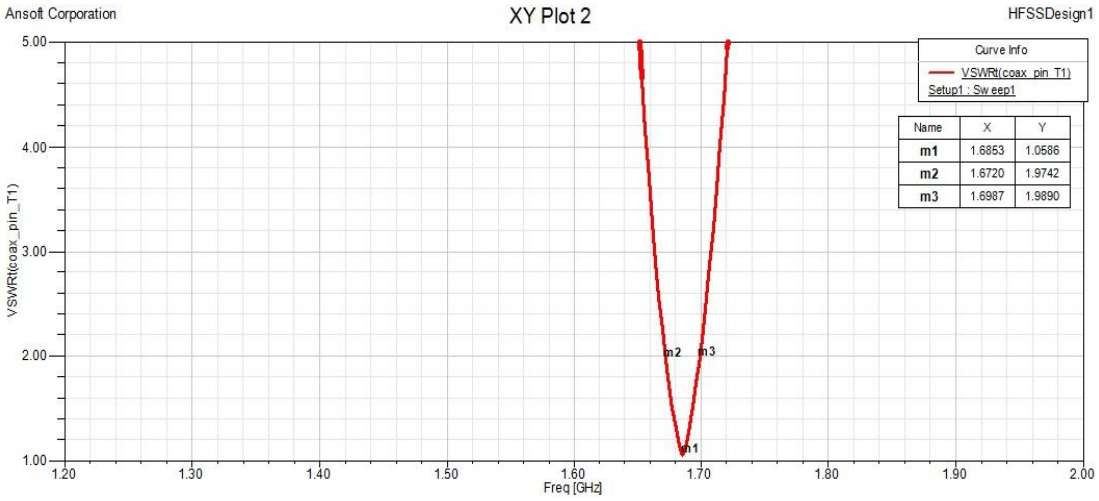

Fig .Voltage Standing Wave Ratio

Smith Chart:

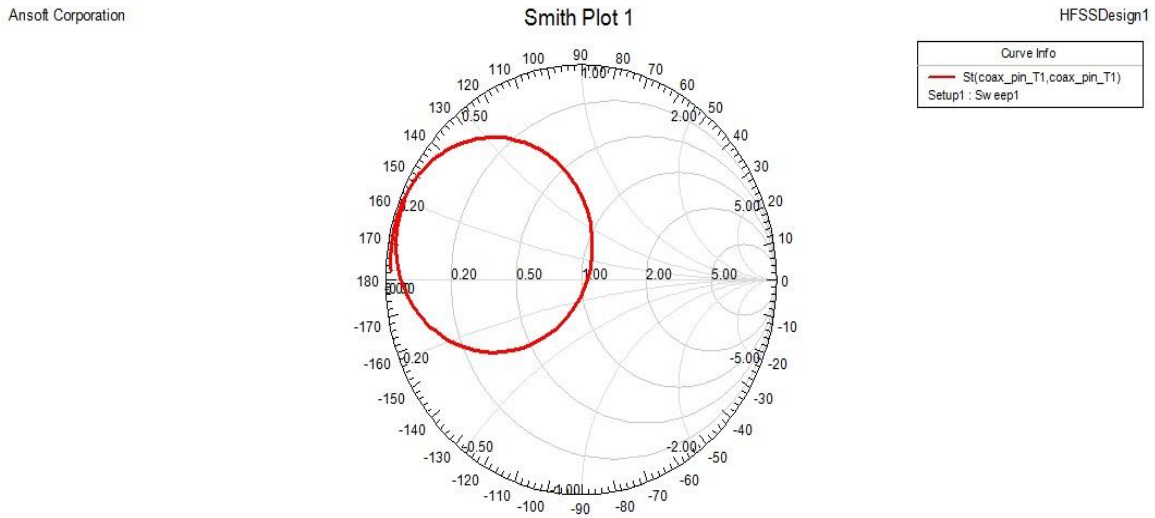

Fig. Smith Chart

Radiation Pattern:

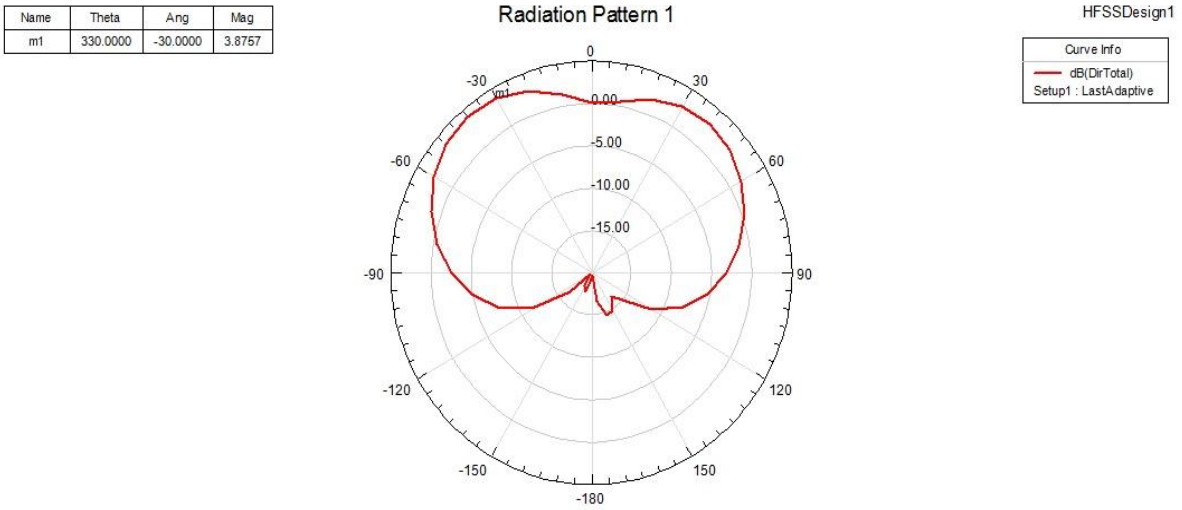

Fig .Radiation Pattern

Directivity:

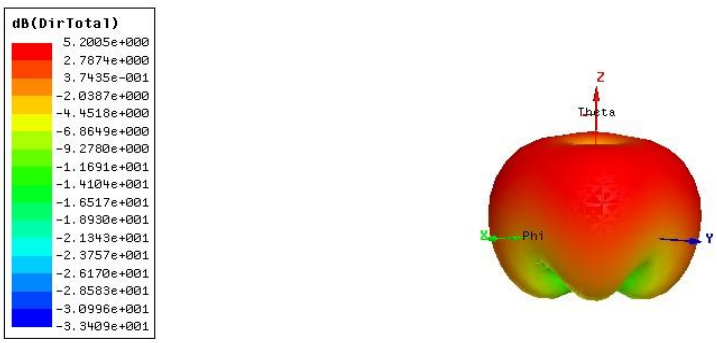

Fig. Directivity

Current Distribution:

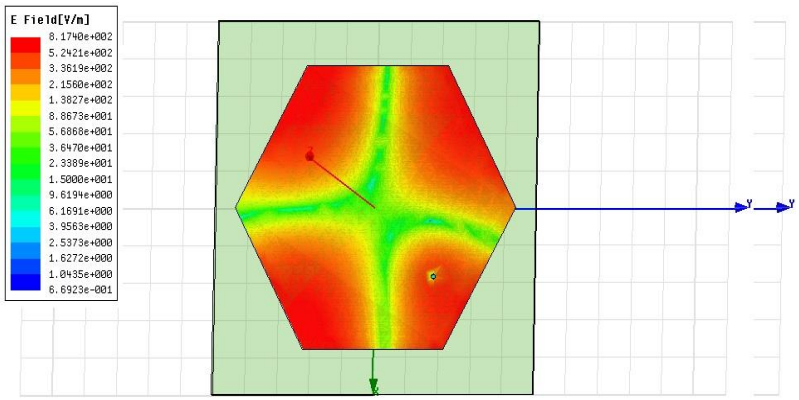

Fig. Current Distribution

V. SIMULATION RESULT

SR NO.	FRACTAL GEOMETRY	FREQ (GHZ)	RETURN LOSS	VSWR	GAIN(dB)
1.	Hexagonal patch	1.68	-30.90	1.05	5.20

VI. CONCLUSION

Hexagonal patch antenna resonating at 1.68GHz with -30.90 dB return loss is designed on Ansoft HFSS. Also got the VSWR which is less than 2 is achieved. Gain of this antenna is 5.20dB.The designed antenna is suitable for GPS and Wireless application. As compared to rectangular patch antenna hexagonal shape patch antenna give better result.

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