International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

DESIGN OF ELLIPTICAL MICROSTRIP PATCH ANTENNA USING HFSS

Vodala Chakshu[1]

Abstract - *-The paper purpose of this paper is to propose a Elliptical micro strip patch antenna design operating in c band using HFSS. HFSS design is used to calculate the antenna dimensions, for some given resonant frequency, aspect ratio, dielectric constant and height of substrate. The network showed high success rate as the results of HFSS Ansoft simulation.*

***Key Words*: Micro-strip patch antenna, HFSS simulation**

1. INTRODUCTION

Micro-strip antenna is preferred as compare to other radiators in modern communication systems like cellular phones, personal computer cards for wireless local area network.Micro-strip patch antennas have low profile which is conformable to planar and non-planar surfaces, and also have easily fabrication ability using printed circuit board technology. When a particular patch shape and excited mode are selected, they are very versatile in terms of resonant frequency, polarization, radiation pattern, and impedance.In this work Elliptical micro strip patch antennas (EMSA) are the ones under consideration as their geometry presents greater potentials for a variety of electrically small low-profile antenna applications. These patch antennas are used for high performance spacecraft, aircraft, missile and satellite applications, where size, weight, cost, performance, ease of installation, and aerodynamic profile are constraints. The elliptical shape has been proposed in this design because of several advantages like providing larger flexibility in the design, more degrees of freedom compared to the circular polarization and circular geometry is achieved with single feed. The involvement of Mathieu's and modified Mathieu's function in mathematical analysis geometry makes the least analyzed regular shape geometry of elliptical patch.

2. ELLIPTICAL MICROSTRIP ANTENNA

Elliptical patch antenna is shown in Fig. 1, where a is the semi major axis, b is the semi minor axis and a is the effective semi-major axis. The radiated fields cause two modes that are perpendicular to each other and have equal amplitude, but are 90 out of phase. The feed position is located along the 45º line between the major and minor axis of the elliptical patch. An elliptical patch antenna has optimum dimensions.

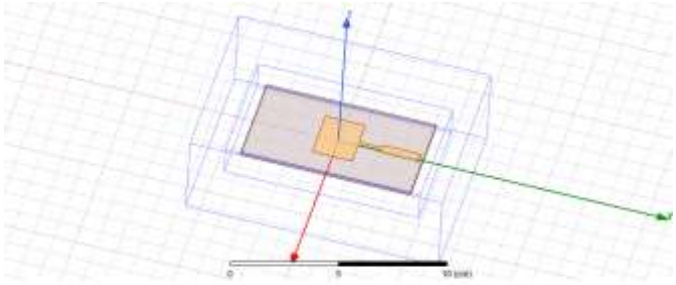

Fig.1 HFSS design of Elliptical patch antenna

3. RESULTS

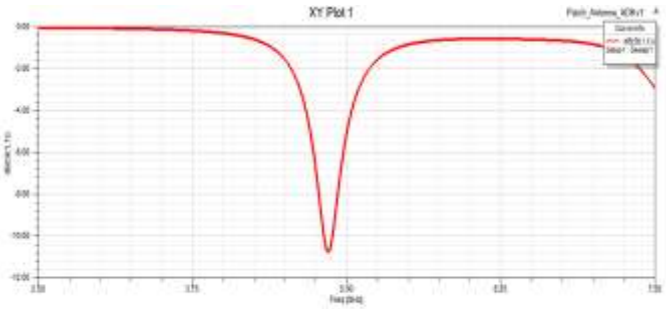

Fig.2 Return loss

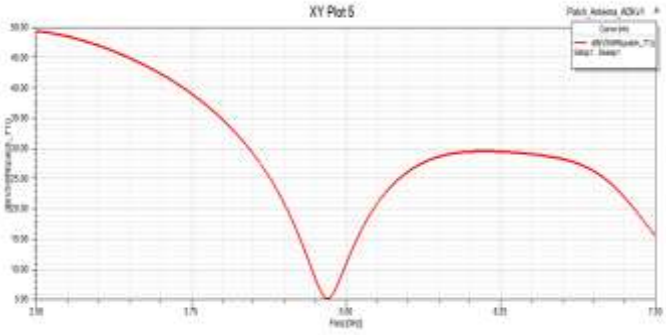

Fig.3 VSWR

The antenna operates at 4.86 GHZ as shown in Fig.2 for Elliptical Micro-strip patch antenna. The vswr has

a gain of 50 dB as shown in Fig.3.These results find in resemble the criteria met by the micro-strip antenna.

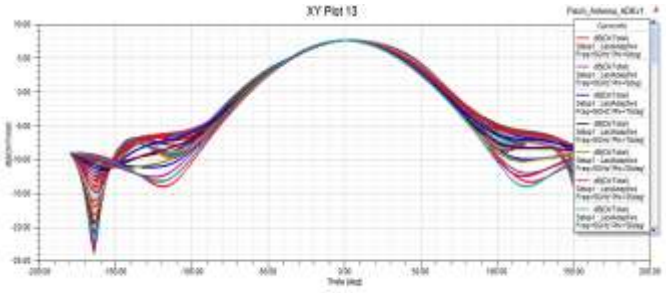

Fig.4 Total Directivity

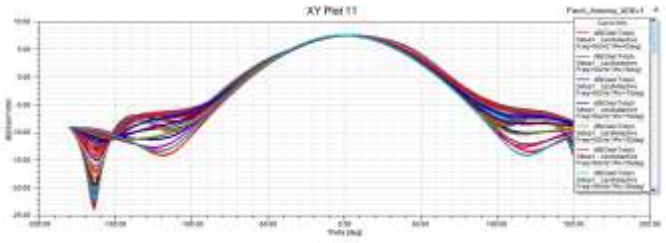

Fig.5 Total Gain

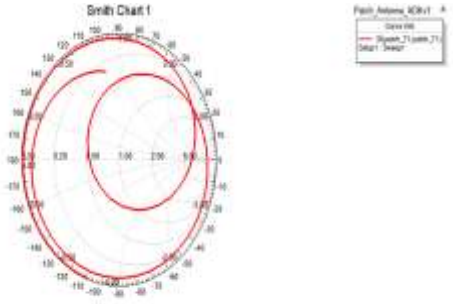

Fig.6 Smith Chart

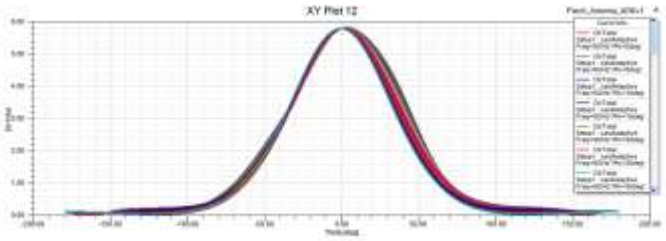

Fig.7 Directivity

Micro-strip antenna of circular or rectangular shape usually radiate linearly polarized waves. Circular polarization may be obtained by using multiple feeds or by altering the shape of a rectangular micro strip antenna. An elliptical patch on a microwave printed circuit board can be made to radiate circularly polarized waves. Such an antenna requires only one feed and its geometrical shape is simple enough to permit theoretical analysis .

The effects of the fringe field at the edge of the elliptical patch and those of the dielectric substrate are taken into account in the below mentioned formula.

Antenna Parameters:

	Quantity	Freq	Value
	Max U	5GHz	3.1088 mW/sr
	Peak Directivity		5.819
	Peak Gain		5.6729
	Peak Realized Gain		3.9067
	Radiated Power		6.7136 mW
	Accepted Power		6.8865 mW
	Incident Power		10 mW
	Radiation Efficiency		0.97489
	Front to Back Ratio		63.699
	Decay Factor		0

Fig.7 Antenna Parameters

4. CONCLUSION

Elliptical shaped Micro strip Patch Antenna has been analyzed. It has been observed that to improve the bandwidth and gain of elliptical shaped antenna, a MIMO technique is used. The results obtained by using HFSS for elliptical micro-strip patch antennas are in good agreement with available targeted results as compare to results calculated from theoretical approach. Using these HFSS models, various possible dimensions can be obtained to achieve high bandwidth and High gain.

5. REFERENCES

[1] S. A. Long, L. C. shen, D. H. Schaubert, and F. G. Farrar, "An experimental study of the circular polarized elliptical printed-circuit antenna", IEEETrans. Antennas Propag., Vol. AP-29, No. 1, 95- 99, January 1981.

[2] P. Mythili, and A. Das, "Simple approach to determine resonant frequencies of microstripantennas", IEE proc. Microw. Antennas Propag., Vol. 145, No. 2, 159-162, April1998.

[3] N. Kumprasert, "Theoretical study of dual resonant frequency and circular polarization of elliptical microstrip antennas", IEEE AP-S International Symposium, Vol. 2, 1015-1020, July2000.

[4] A. Mishra, G. B. Janvale, B. V. Pawar, and P. M. Patil, "The design of circular microstrip patch antenna", J. Electromagnetic Analysis &Application,Vol. No. 2, 444-449, July 2010.

[5] Rishabh Kumar,Virendra, Ashish Saxena, "Elliptical Micro-strip Patch Antenna For Circular Polarization Design Using HFSS", IRJET,Vol. No. 3,1408-1411,Dec 2016.