International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 04 | Apr -2017 www.irjet.net p-ISSN: 2395-0072

DESIGN AND FABRICATION OF TRIANGULAR SHAPE MICROSTRIP PATCH ANTENNA USING LANTHANIDES

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Abstract – *This research has been done on Microstrip patch antenna due to its imperative properties such as light weight, low profile, simple to fabricate and easy to integrate with RF devices. In this paper, dreadfully tiny dimensional triangular shape microstrip antenna is designed by using double doping LANTHANIDIES. The substrate permittivity (dielectric constant) is studied by responsible capacitance at corresponding frequency range. This antenna is compact, small, simple to design and fabricate with proposed substrate material. The performance of the designed antenna was analyzed in term of its bandwidth, gain, directivity, return loss, and radiation pattern.*

Key Words: Triangular shape, Microstrip patch antenna, Lanthanides, Return loss, Band width

1. INTRODUCTION

Microstrip patch antennas have been attractive due to their conformal properties. These antennas are preferred for satellite and mobile communication due to their advantages of small size and low manufacturing cost. A microstrip antenna consists of a very thin metallic patch placed a small fraction of a wavelength above a conducting ground plane. The strip and ground are separated by a dielectric sheet referred to as substrate. The radiating element and feed lines is normally photo etched on dielectric substrate.

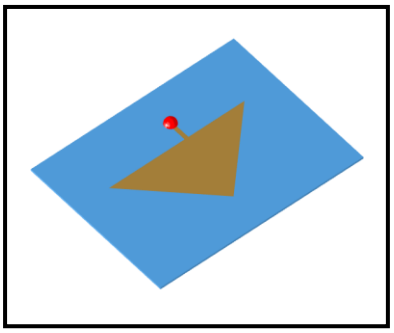

Fig -1: Triangular Shape Antenna

The radiating patch conductor is generally of copper and can assume any shape square, rectangular, circular, elliptical, triangular or any other desired configuration. Square, rectangular, dipole and circular are the most common because of ease of analysis, simple fabrication and their attractive radiation efficiency.

2. DESIGN OF TRAINGULAR MICROSTRIP PATCH ANTENNA

The Microstrip patch antenna has been designed with three layers such an ground plane, substrate and patch. From these the lanthanides are used for substrate material preparation. The microstrip line feed is connected with 50ohm impedance for higher efficiency.

Table -1: Dimension of Isosceles Triangular

Dimension of triangular patch antenna	
Permittivity	0.9
Base dimension	5.1cm
Height	5cm
Substrate height	1.5mm

2.1 Patch design and Layout:

The design of isosceles triangular shape microstrip patch antenna design with above mentioned dimension with microstrip line feed technique. The layout is simulated in HFSS software with 3GHz operating Frequency. Three dimensional layout is showing in Fig 2.

The dielectric substrate is used for design of substrate layer with permittivity 0.9. The substrate height is 1.5mm. These parameters are decides the efficiency of antenna. Base and height dimension are decided by substrate dimension and frequency.

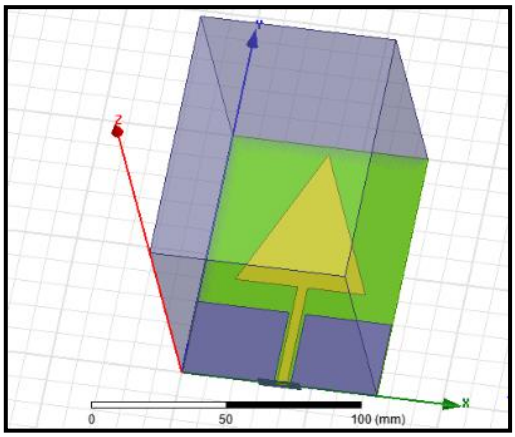

Fig -2: Layout of Isosceles

The triangular patch has been connected with microstrip line feeding technique. The impedance matching is 50 ohm with lumped port connection. The radiating element has minimum ratio dimension. The dielectric capacity of substrate material helps to improve the radiation efficiency with dual band characteristics. The optimum design is operated at 1-3GHz frequency range.

2.2 Results:

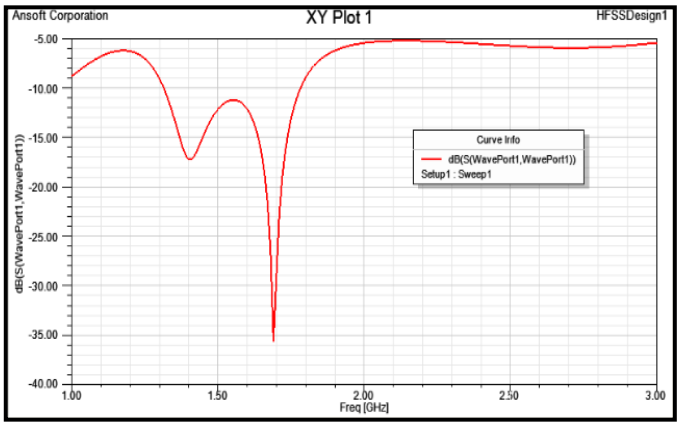

Fig -3: Return Loss (S11)

From Fig-3 , the isosceles triangular yields the dual band characteristics. The couple of resonating frequencies are radiated such as 1.4GHz and 1.7GHz. The lowest curve shows the return loss -17dB and the highest curve becomes --36dB respectively.

Band width Calculation:

Bandwidth = (Upper frequency – Lower frequency)

(Center Frequency)

For first band

1.4GHz – 21% (Narrow)

For Second Band

1.7GHz – 11.7% (Narrow)

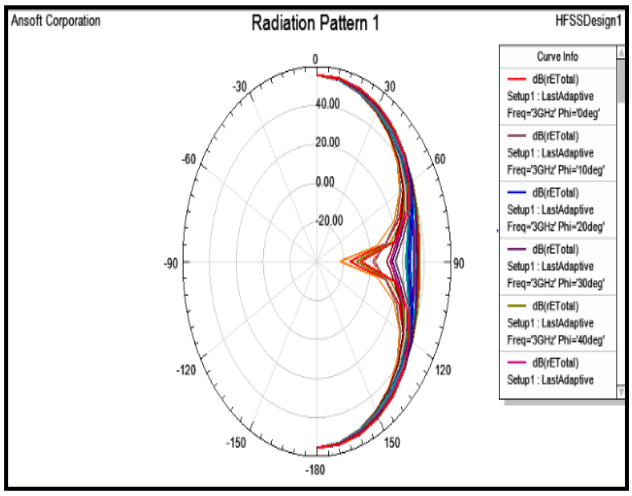

Fig -4: Radiation Pattern

The Radiation pattern shows two dimensional view for analysis of signal strength from near field range to far-field range.

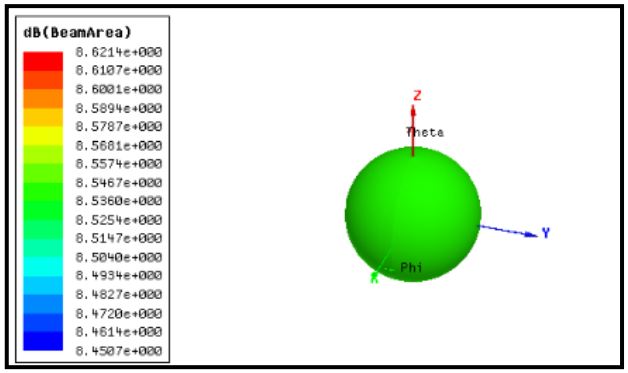

Fig -5: Beam Area

Directivity and Gain:

The directivity and gain both decide the antenna efficiency with respect to its input and output curve on corresponding frequency. The both parameters are not constant at all frequency.

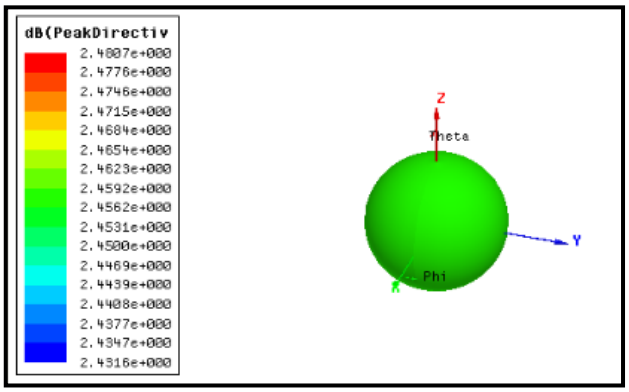

Fig -6: Peak Directivity

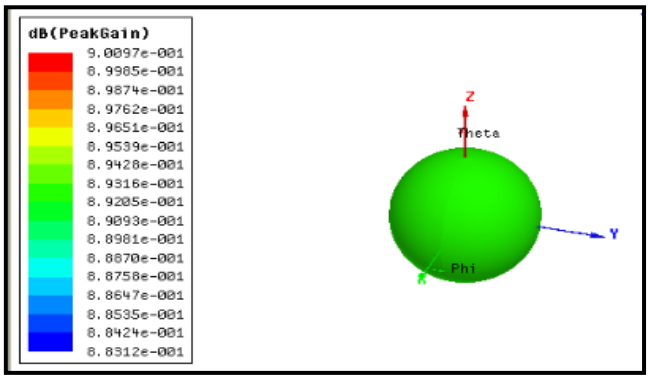

Fig -7: Peak Gain

3. CONCLUSION

Using a microstrip line feed technique we have designed Isosceles Triangular shape microstrip patch antenna. These microstrip patch antenna yields dual characteristics with Resonated frequencies of 1.4 GHz and 1.7 GHz respectively. The bandwidth of the antenna can be said to be those range of frequencies over which the RL is greater than the -15 dB. The return loss of the triangular microstrip patch antenna is dual band that is good for analyzed the different properties. Analyzed Isosceles shape microstrip patch antenna with return loss is -17 dB & bandwidth is 21% and -36 dB & 11.4% respectively. The peak gain of this design is 9db.

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