

## Comparison of Triangular Shape Microstrip Patch Antenna and E Shape Microstrip Patch Antenna

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**Abstract:** This paper presents the Comparison of various parameters of Triangular Shape Microstrip Patch Antenna and E Shape Microstrip Patch Antenna. The antenna is designed with wideband operating frequency for wireless application. The antenna is simulated using Ansoft HFSS software, using FR4 substrate with dielectric constant of 4.4 and thickness of 1.6mm. The performance of the designed antenna was analyzed in term of bandwidth, return loss, VSWR, and radiation pattern. The antenna is designed to meet the best possible result. Antenna designed is operating on 2.4 GHz frequency.

**Keywords:** E shape antenna; Triangular shape Antenna; Microstrip antenna.

### I. Introduction

The smart antennas play an important role in today's wireless communication, such as Mobile and satellite communication, WiMAX, Global Positioning System (GPS), Wireless Local Area Networking (WLAN) Radio Frequency Identification (RFID), and medicinal applications. Wireless communication applications are compatible with small, low cost, low profile antennas. So most antenna designers preferred microstrip patch antenna for various wireless communication applications according to C.A.Balanis [1]. Microstrip patch antenna meets all this requirements. A Microstrip patch antenna is a type of antenna that offers a low profile; i.e. it is thin and has easy manufacturability, which provides an advantage over many traditional antennas. Microstrip patch antennas are probably the most widely used type of antennas today due to their advantages such as light weight, low cost, low volume and compatibility with integrated circuits and easy to install on the rigid surface. MPA (Microstrip Patch Antenna) can be easily designed to operate in dual-band, dual or circular polarization or multi-band application. They are important in many commercial applications. [2]

Microstrip patch antenna are mechanically robust when mounted on rigid surfaces and capability of dual and triple frequency operations. All these features, attract many researchers to investigate the performance of patch antenna in various ways. [3]

The main objective of this paper is to design a patch antenna which gives a better performance individually and after getting better results that patch can be used in modified antenna to increase the bandwidth by applying various bandwidth enhancement techniques.

#### 1.1. Design and Configuration

To compare the various parameters of antenna firstly the triangular microstrip patch antenna is designed using Ansoft HFSS software. Fig 1.1 shows Triangular MSA (Microstrip patch Antenna) designed at a frequency 2.43 GHz. After simulation we got VSWR as 1.27 shown in fig 1.2 and return loss as -18.26 dB as shown in fig 1.3. the Directivity of the designed antenna is 4.8 and the bandwidth of antenna is 60 MHz

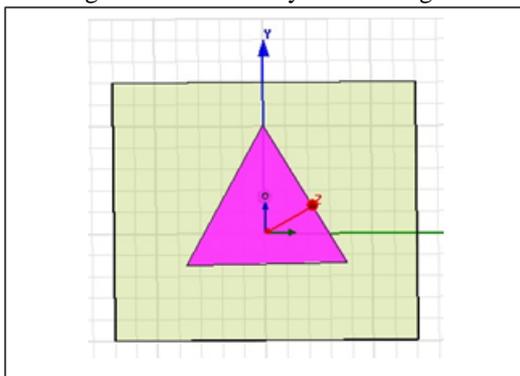


Fig 1.1 Design of Triangular Patch Antenna

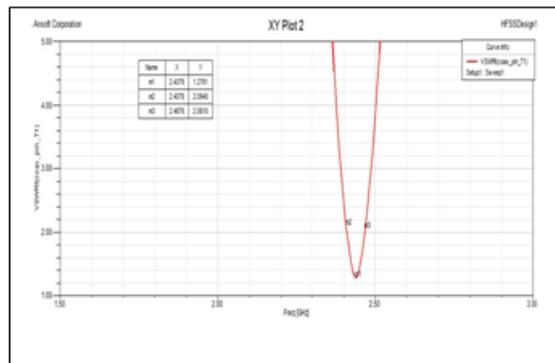


Fig 1.2 VSWR Graph of Triangular Patch Antenna

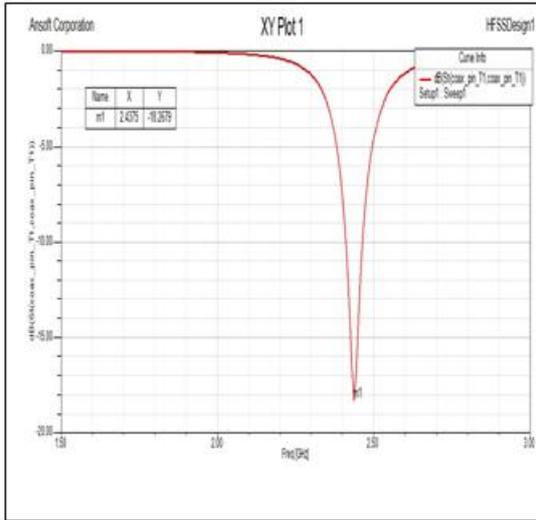


Fig 1.3 S11 Graph of Triangular Patch Antenna

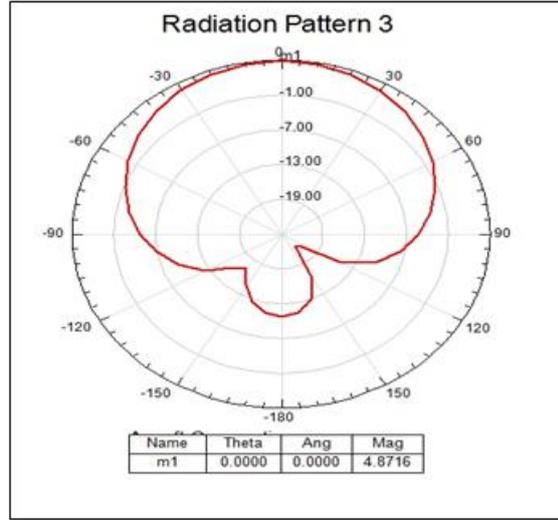


Fig 1.4 Radiation Pattern of Triangular Patch Antenna

Table 1: Values obtained after Simulation for Triangular Patch Antenna

Parameter	
Type of MSA	Triangular Patch Antenna
Freq(GHz)	2.43
Return loss (dB)	-18.26
VSWR	1.27
Bandwidth (MHz)	60
Directivity	4.8

From the table 1 we can observe that value of Bandwidth is very less for WLAN. In view to increase the bandwidth new shape .i.e. E shape patch was designed.

Now E- Shape microstrip patch antenna is designed using Ansoft HFSS software. Fig 1.5 shows E-Shape MSA (Microstrip patch Antenna) designed at a frequency 2.41 GHz. After simulation we got VSWR as 1.11 shown in fig 1.6 and return loss as -25.49 dB as shown in fig 1.7 the Directivity of the designed antenna is 5.0 and the bandwidth of antenna is 95 MHz

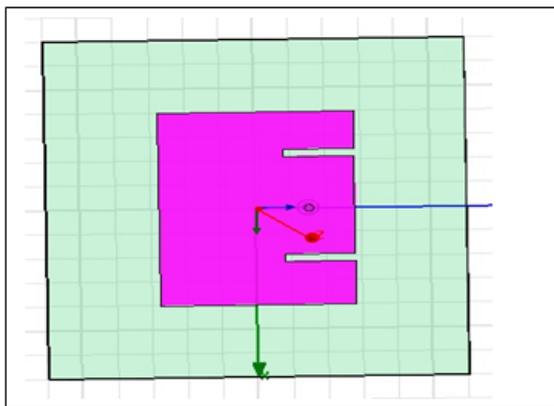


Fig 1.5 Design of E-Shape Patch Antenna

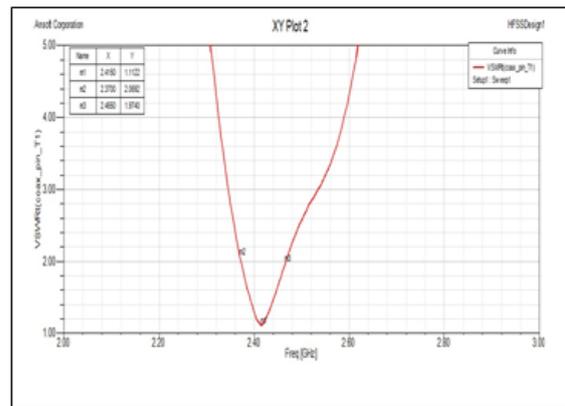


Fig 1.6 VSWR Graph of E-Shape Patch Antenna

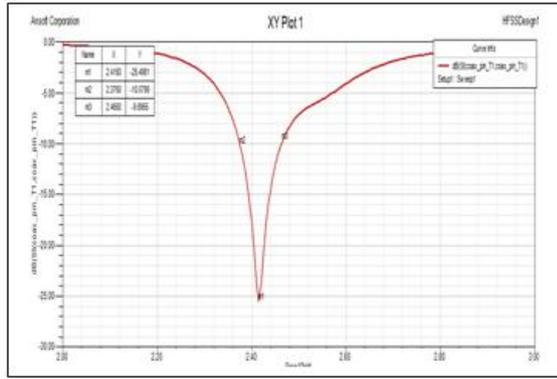


Fig 1.7 S11 Graph of E-Shape Patch Antenna

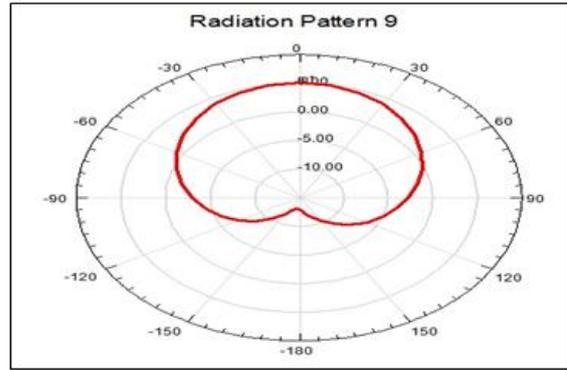


Fig 1.8 S11 Graph of E-Shape Patch Antenna

Table 2: Values obtained after Simulation for Triangular Patch Antenna

Parameters	
Type of MSA	E-Shape Patch Antenna
Freq(GHz)	2.41
Return loss (dB)	-25.49
VSWR	1.11
Bandwidth (MHz)	95
Directivity	5.0

From table 2 we can observe the value of bandwidth for E shape patch which is greater than the triangular patch antenna. Table 3 shows the comparison of all parameters of triangular patch antenna and E shape patch antenna.

Table 3: Comparisons table of triangular patch antenna and E shape patch antenna.

Parameters		
Type of MSA	Triangular Patch Antenna	E-Shape Patch Antenna
Freq(GHz)	2.43	2.41
Return loss (dB)	-18.26	-25.49
VSWR	1.27	1.11
Bandwidth (MHz)	60	95
Directivity	4.8	5.0

1.2. Conclusion:

From Table 3 we can conclude that the E shape patch antenna have all the parameters better as compare to triangular patch Antenna. This E-shape patch antenna can be used further with arrays or gap coupling to increase the bandwidth to further value. For WLAN communication the expected bandwidth is above 550 MHZ which can be achieved using this E shape Patch in a modified way.

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