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# DUAL FEED TRIANGULAR SLOTTED MICROSTRIP PATCH ANTENNA

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**ABSTRACT :** Microstrip patch antenna widely used in communication area because it offers low profile, narrow bandwidth, high gain, and compact in size. It has big disadvantage of narrow bandwidth. To improve the bandwidth a Triangular slot technique is used, it is efficient to enhance the bandwidth of antenna. The feeding point of antenna is very important for efficient operation, so coaxial feeding technique is applied to microstrip patch antenna for impedance matching. A Triangular slot microstrip patch antenna is designed successfully which attains a bandwidth of 5.36% at -10dB return loss with centre frequency of 8.7GHz and also it attains maximum directivity of 8.569dBi. It is designed by cutting four Triangular slot into the patch of antenna, because of this resonant slot, the antenna gives good enough bandwidth. This antenna is best suitable for X-band frequency spectrum. The proposed antenna is designed and simulated using IE3D software.

**Keywords :** Directivity, Feed Position, Microstrip Antenna, Return loss, Triangular slot Patch.

## I.INTRODUCTION

Microstrip patch antennas are a well suited for wireless communication and satellite communication systems due to their attractive features of small size, low cost and weight, conformability, and ease of manufacturing, so these antennas have been developed in the last decades increasingly [1-2]. In many applications, the main issue of microstrip patch antennas is their limitation of bandwidth. In recent years, many efforts have been dedicated to the bandwidth improvement of microstrip patch antennas. Many techniques have been employed for achieving wide bandwidth [3-7].

In this paper we introduced Triangular slot patch which has been presented the good bandwidth improvement. The rectangular MSA has been realized by cutting Triangular slot yields broader bandwidth. Triangular slot patch antenna is optimized for simplicity in design and feeding is proposed. The slot introduces a resonant mode whose frequency can be controlled with respect to the patch resonance frequency by tuning the slot dimensions, and the broader bandwidth is obtained [8]. The Triangular slot patch antenna is consist of rectangular patch with coaxial probe feeding is shown in figure 1[8-9]. Triangular slot slot introduces the capacitive component in the input impedance to counteract the inductive component of the probe. Also to compensate the increasing inductive effect due to the slots, thickness of the substrate is increased; therefore as thickness increases the bandwidth increases accordingly [8-9]. Parameters of the antenna such as return loss, VSWR and directivity are discussed in this paper. The method of moments is used for analysis. The proposed configuration was optimized using the IE3D software.

"spectrum holes" in a time and location-varying radio environment without causing harmful interference to Primary Users (PUs). This opportunistic use of the spectrum leads to new challenges to the varying available spectrum. Using a Trust-Worthy algorithm, it improves the trustworthiness of the Spectrum sensing in CR-Networks.

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## II. TRIANGULAR SLOT PATCH ANTENNA

The geometry of Triangular slot patch antenna is depicted in figure 1. The antenna has a single patch of length L, width W and infinite ground plane separated by substrate of single dielectric materials with relative permittivity of 4.1. The radiating patch is fed by a coaxial probe at a position ($X_f$,$Y_f$) for proper excitation of the antenna over a broad bandwidth. Centre frequency chosen for this design is 8.7GHz. First rectangular microstrip patch antenna is designed than Triangular slot is cut inside the patch, which is symmetrical to center of patch.

Rectangular Microstrip antennas without Triangular slot have large inductive reactance in the input impedance of patch, due to thick substrate. So Triangular slot introduces a capacitive component in the input impedance that compensates for the inductive component of the coaxial probe.

## III. DESIGN OF TRIANGULAR SLOT PATCH ANTENNA

Design of microstrip patch antenna depends mainly upon three parameters, namely substrate and its dielectric constant, height of the substrate and resonant frequency [10]. In this paper, selected three parameters are: Resonant Frequency (fr) = 8.7GHz, Dielectric constant (εr) = 4.1, Height of the dielectric substrate (h) = 1.5mm. Dual coaxial probe feed is applied at location 1 is (0, 6) and location 2 is (6,8). The width of antenna is 20mm and length is 16mm. Four Triangular slot is inserted in to the rectangular patch antenna.

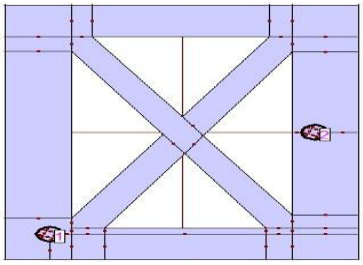

Figure 1. Designed Triangular slot Patch Antenna

## IV. RESULT & DISCUSSION

The simulation is done by varying feeding positions in all direction over the microstrip patch antenna and s-parameter ($S_{11}$) is studied and noted for each simulation, this is shown in table 2. Thus the enhanced bandwidth of Triangular slot microstrip patch antenna is obtained as 5.36% at dual probe feed. The obtained bandwidth is 466MHz.

The simulated result of $S_{11}$ scattering parameter (return loss) of single element Triangular slot microstrip patch antenna is presented in figure 2. From figure 3 the value of VSWR is within 1 to 2 in the operating range i.e. 1.07 at 8.7GHz. The directivity of this antenna is 8.569dBi as shown in figure 4. The input impedance matching and broadside radiation pattern are shown in figure 5 & 6 respectively. Triangular slotted patch antenna is matching at near 50ohm.

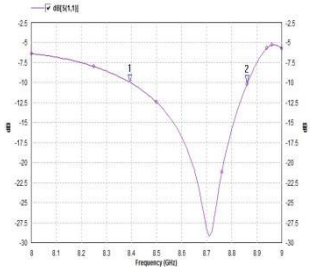

Figure 2. Return loss of Triangular slotted Patch Antenna

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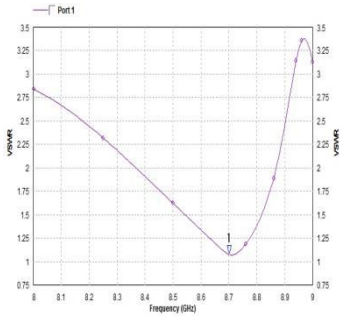


Figure 3. VSWR of Triangular slotted Patch Antenna

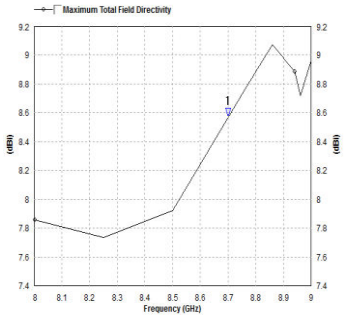


Figure 4. Directivity of Triangular slotted Patch Antenna

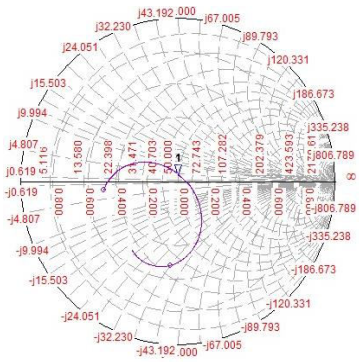

Figure 5. Smith chart

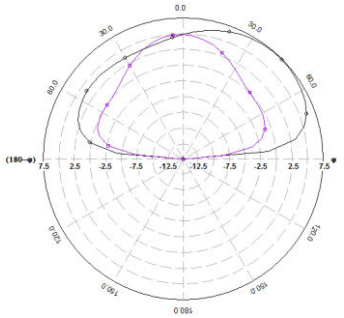

Figure 6. Radiation Pattern

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## V. CONCLUSION

The results indicates that the microstrip antenna have good broadband performance in return loss, gain and radiation pattern. The main concern is to study the bandwidth improvement of the microstrip patch antenna, it has been obtained by using Triangular slot symmetrically to one of the axis of patch. Triangular slotted microstrip antenna has been designed and simulated using IE3D software version 14, which use method of moments. This antenna gives impedance bandwidth of 5.36% at -10 dB return loss with center frequency of 8.7GHz and maximum directivity of 8.569dBi. This antenna is well suit for X-band frequency spectrum in communication area.

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