Slotted T- Shape Antenna for Video Transmission

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***Abstract*—This paper presents the design and implementation of antenna based upon fractal concept. The antenna design has concentric T shape slots rectangular patch. It is demonstrated that the proposed antenna probe feed and is simulated on IE3D Zeland software. This antenna can completely cater for various video application ranging from 1.27-to-3.8 GHz and best suited for FPV/Video Downlink Flying in terms of range and most importantly, interference with a 2.4 GHz TX/Rx Radio.**

***Keywords:* Microstrip patch, T- shapes Slots, IE3D, Miniaturization, and Iterations.**

I. INTRODUCTION

In present scenario telecommunication systems require antennas having smaller dimensions than those in the conventional ones [1]-[6]. For many years, various antennas for multiband operation have been studied for communication and video transmission systems [7], [8]. To fulfill the present need fractal antennas provides the better alternatives and are preferred over conventional patch antennas as these are not only small and lightweight, for easy installation, but also because they have wideband [5], [6], [9]- [12]. There are a variety of approaches that have been developed over design, the years, which can be utilized to achieve one or more of these design objectives. For instance, an excellent overview of .various useful techniques for designing compact (i.e., miniature) antennas may be found in [13] and [14]. Moreover, a number of approaches for designing large-band, antennas have been summarized in [15]. The article describes the design of T- shapes slots on rectangular patch antenna. Performance simulations of the antenna are carried out with IE3D software, which is based on the method of moments [16].

II. ANTENNA DESIGN

The geometry is shown in Fig.1 is T-shape slot on a rectangular patch. The dimensions of proposed antenna are shown in Fig. 1 on rectangular patch. The ground plane are same and is 70x70 mm .The height of the dielectric substrate slab is 1.6 mm and having relative permittivity of 4.4 and loss tangent 0 .02. The Fig.1 shows dimensional view of proposed antenna Fig.2 and Fig. 3 show the iterated geometries. The geometric construction of this fractal shape starts with a T-shape as shown in Fig.1.By adding another T-shape, the first iterated version of the new fractal geometry, as shown in the Fig. 2, the first Iteration is created. The process is repeated in the generation of the second iterated geometry. The proposed iterated geometries are shown in shown in Fig.2 and Fig. 3. A coaxial probe feed F1 is given at the top centre position of the T-slot.

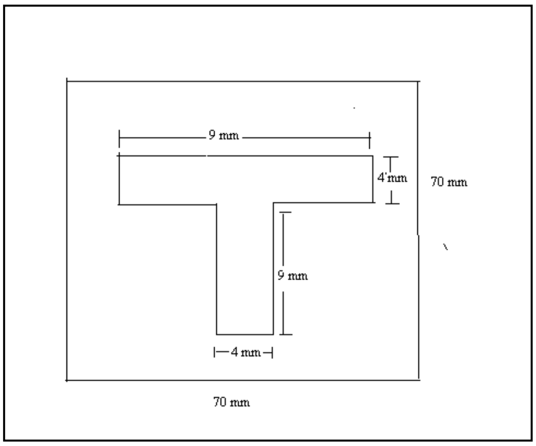

Fig.1: Geometry of the proposed T-shape slotted antenna

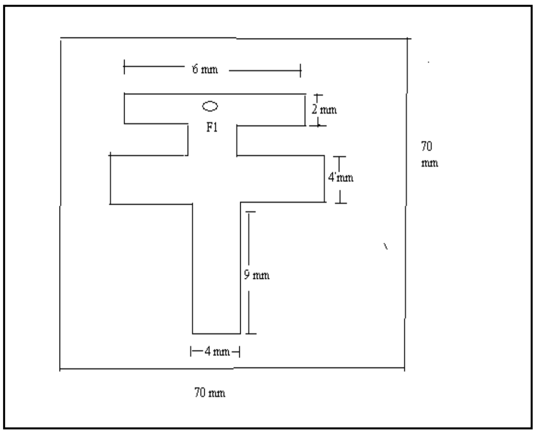

Fig.2: Geometry of the proposed first iterated T-shape slotted antenna

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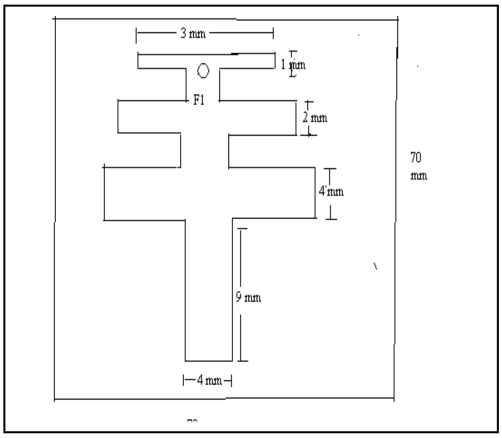

Fig.3: Geometry of the proposed second iterated T-shape slotted antenna

III. SIMULATION RESULTS

The performance of this antenna is simulated and optimized by "IE3D" 14 version of Zeland. This is used to calculate the return loss, directivity, gain and radiation efficiency for performance analysis of the antenna. Fig.6 represents the current distribution display. The Fig. 4, 5 and 8 shows the return loss curve for antenna geometry for the T – shape, 1^{st} and 2^{n} iterations. Analyzing of return loss curve it is found that the proposed antenna operates in the range from 1.2 GHz to 3.1 GHz: at frequency 1.31 GHz the value of return loss comes to be -7 dB as shown in Fig.4 as its first resonance frequency. Table 1 shows the comparative analysis of all the three iteration of slotted T-shape antenna. It is clear that the resonance frequency is decrementing when we proceed from lower iteration to higher iteration the same is also elaborated in tabular form Table 1 So from these it is quite clear that the iterative fractal behavior of this antenna is verified. From the analysis of the Table 1 given below it can also be demonstrated that resonant frequency of antenna decreases as number of iteration increases. A single layer T-shape slotted rectangular microstrip patch antenna for wireless applications is designed and proposed. The proposed antennas have all the advantages of iterative fractal incorporating the fractal design approach. The resonance frequency of the same size antenna decreased from 3.1GHz to 1.28 GHz along-with satisfactory radiation characteristics Furthermore, this antenna has many advantages such as easy fabrication, low cost and compact in size. Therefore, such type of antennas can be useful for FPV/Video Downlink Flying in terms of range and most importantly, interference with a 2.4 GHz TX/Rx Radio. Apart from above shown parameters the proposed antenna has the promising radiation patterns in 3- dimension as shown in Fig. 7. It is clear that the resonance frequency is decrementing when we proceed from lower iteration to higher iteration the same is also elaborated in tabular form Table 1 So from these it is quite clear that the iterative fractal behavior of this antenna is verified. From the analysis of the table given below it can also be demonstrated that multiband nature of antenna increases as number of iteration increases.

No. of iterations	Resonant Frequency (GHz)	Return Loss(Decibels)
0	3.8	-7
1	1.31	-11
2	1.28	-28

Table 1: Comparative resonant frequency and return loss on increasing the number of iterations

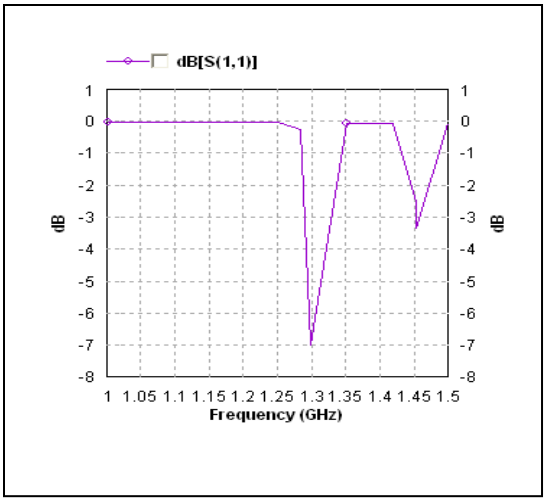

Fig.4: Simulated return loss for T-shape slot antenna

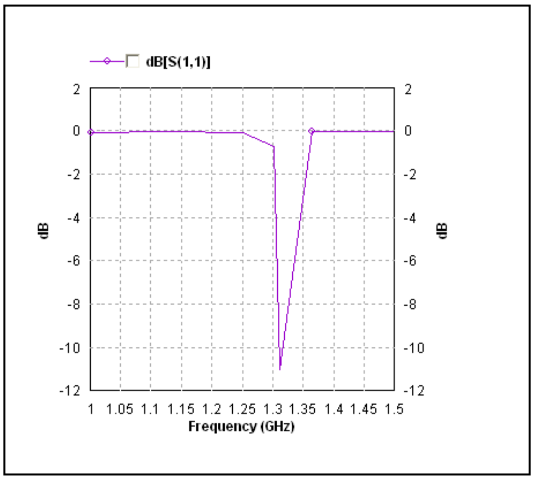

Fig.5: Simulated return loss for first iterated T-shape slot antenna

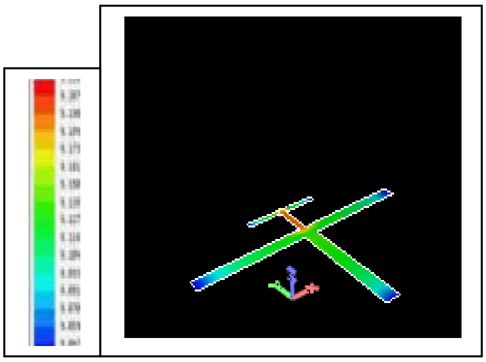

Fig.6: Simulated current distribution for first iterated T-shape slot antenna

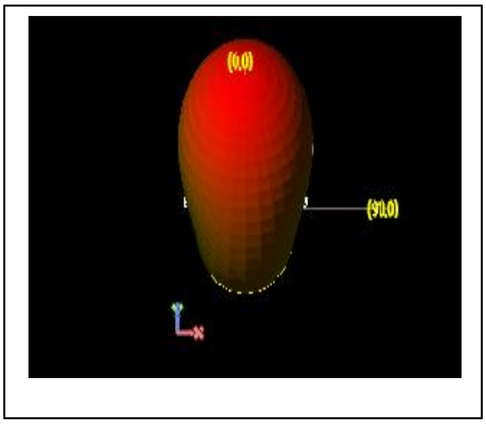

Fig.7: Simulated 3-D radiation pattern for first iterated T-shape slot antenna

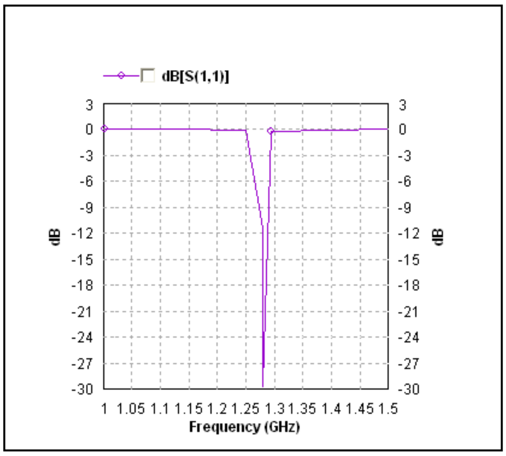

Fig.8: Simulated return loss for second iterated T-shape slot antenna

IV. CONCLUSION

A single layer T-shape slotted rectangular microstrip patch antenna for video applications is designed and proposed. The proposed antennas have all the advantages of iterative fractal. Incorporating the fractal design approach the resonance frequency of the same size antenna decreased from 3.8 GHz to 1.28 GHz along-with satisfactory radiation characteristics. Furthermore, this antenna has many advantages such as easy fabrication, low cost and compact in size. Therefore, such type of antennas can be useful for video transmission. This type of wireless applications in personal communication fulfills the requirements of video wireless transmission system applications.

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