Design and Analysis of Size Deduced Square Printed Patch Antenna with Transmission Line Feed

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Abstract- *One layer, patch patch antenna patch printed box feed box is proposed to connect,. The resonance frequency was achieved using simple triple correction. We have achieved the proposed antenna using UWB (Ultra Wide Band) and Low Voltage Low Voltage (VSWR). The characteristics of the proposed antenna are designed using an MOM-based electromagnetic analyzer, IE3D. The proposed antenna for introducing the correction in the feed box provides good resonance frequency; return loss, VSWR, radiation pattern and antenna gain. The design of a small tape antenna to improve bandwidth and gain routing is a challenge to the connection. This paper suggests designing a Micro-Square Square-Patch antenna with enhanced bandwidth and gain routing. The simulation results give a significant improvement in terms of gain guideline and bandwidth.*

Index Terms- ***layer, Transmission Line, Patch, Gain, Wide Band***

I. INTRODUCTION

Microstrip patch antennas have attracted the attention of researchers over the past few decades. However, the latent antennas in narrow bandwidth and low gain is one of the major defects [1-2]. This is one of the problems that researchers around the world are trying to overcome. Over the years, authors have devoted their investigations to the creation of new designs or forms of the original antenna, which to a certain extent produce wider bandwidths. The patch antenna was quickly used in various areas such as space technology, aircraft, missiles, mobile communications, GPS and broadcasting. Antennas with lightweight patch, small size, low cost, simple manufacturing, easy integration with circuits. More important is that they can be made in different shapes such as rectangular, triangular, circular, square etc. [3]. Several techniques have been proposed to achieve high bandwidth. These techniques include: the use of parasitic elements either in the same layer or in another layer [6-8], the use of thick substrates with low dielectric constant [4], and cleft correction [5]. We have used a thick dielectric substrate with low dielectric stability that provides better efficiency, greater bandwidth and better radiation. However, such a configuration will increase the size of the antenna. In order to design a microstrip antenna, higher dielectric constants should be used that are less efficient and lead to a narrower bandwidth. A compromise must therefore be reached between antenna dimensions and antenna performance. This paper provides an outline of procedures for the design of microstrip antenna using the transmission line feed for satellite communication. Unlike slotted antennas, there are other antennas such as DRA (aerial resonance buffer), fractional antenna, etc. to reduce antenna size [15-20]. Hard to design fractal antennas and DRA need to high substrates are not readily available.

II. ANTENNA STRUCTURE

The design of microstrip patch antenna mainly depends on three parameters, namely substrate, constant insulation, high substrate and resonance frequency. In this paper, there are three specific parameters: resonance frequency (fr) = 3.6 GHz, electrostatic constant (εr) = 4.4, buffer height of the substrate (h) = 1.6 mm. Fig.1 represents the designed Microstrip Patch antenna.

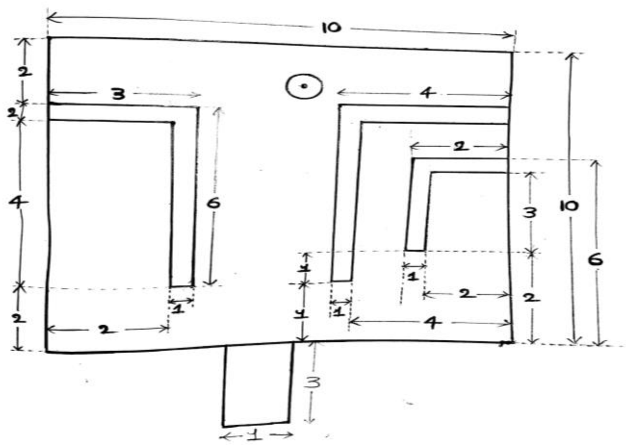

Figure 1: proposed Antenna configuration

We design the proposed antenna with FR4 substrate named PTFE with dielectric constant 4.4 and height 1.6mm. Here we cut three inverted L-shaped slots named L1, L2 and L3 with added one slit with the patch which gives the affect on resonance frequency and we achieve our desired frequency for the application for which it is intended. We also use the transmission line feed for getting our desired operating frequency and we done all the simulation using IE3D electromagnetic solver and we consider the centre of antenna as a point [0,0] and we design our proposed antenna according to that configuration.

III. SIMULATED RESULTS AND ANALYSIS

Different parameter analysis of the proposed antenna is performed and displayed. Several antenna parameters have been investigated to improve bandwidth and antenna loss and loss. Figure 2 shows the simulation return loss for the proposed antenna.

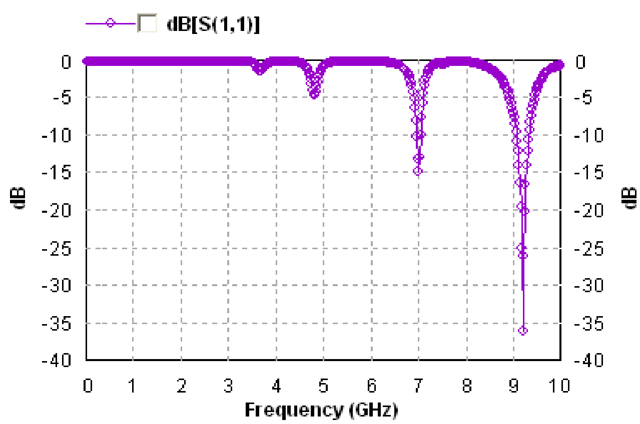

Fig 2: Return Loss Pattern

Since the aperture is cut in the correct position of the antenna, the resonance frequency operation is obtained at large values of the frequency ratio with a significant loss of antenna return. The first resonance frequency of the proposed antenna is obtained at f1 = 7.01 GHz with a return loss of about -14.71 dB and a bandwidth of about 83.60MHZ. The second resonance frequency is obtained at f2 = 9.70 GHz with a return loss of -35.74 dB and a bandwidth of about 264.07 MHz.

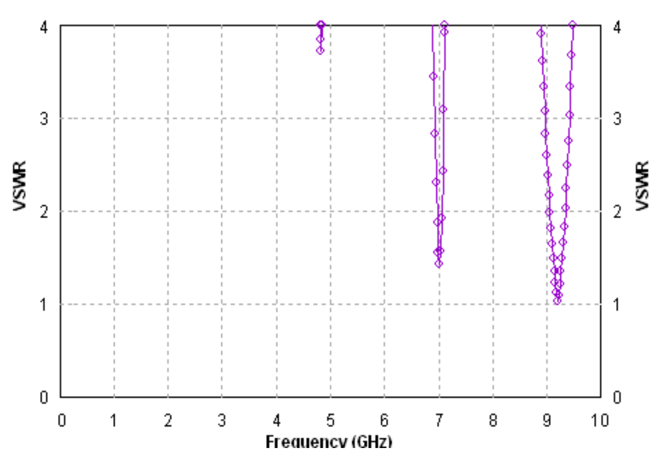

Fig 3: VSWR Pattern

Figure 3 illustrates the VSWR simulation scheme against the suggested resonance frequency. VSWR for the first resonance frequency (7.01 GHz) is 1.44. The second resonance frequency is obtained at f2 = 9.70 GHz with a value of 1.06. These values are within a 2: 1 range.

III.I. Simulated Radiation Pattern

E-plane and H-plane radiation patterns for each resonance frequencies are illustrates in Figure 4 to Figure 7.

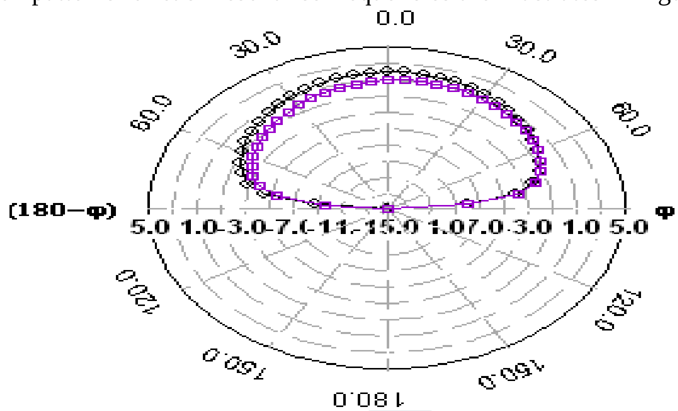

Fig 4: 7.01 GHz Electric Field Pattern

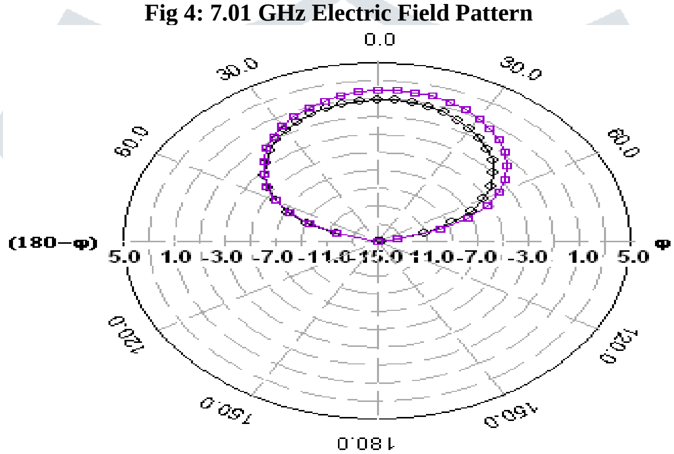

Fig 5: 7.01 GHz Magnetic Field Pattern

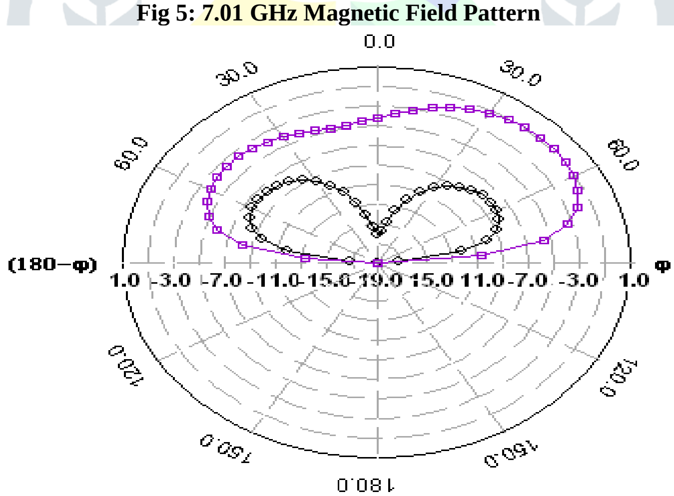

Fig 6: 9.70 GHz Electric Field Pattern

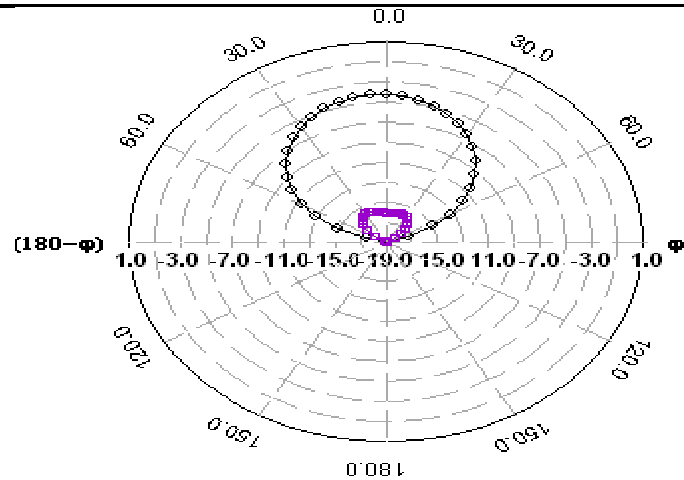

Fig 7: 9.70 GHz Magnetic Field Pattern

Cumulative results shows in Table I and Table II which is illustrated below:

TABLE I: FREQUENCY WITH GAIN

ANTENNA STRUCTURE	RESONANT FREQ. (GHz)	FREQ. RATIO	3 DB BEAM WIDTH (^{0})	ABSOLUTE GAIN (dBi)
1	f_1= 7.01		166.98 ^{0}	4.43
	f_2= 9.70	f_2/f_1=1.381	136.79 ^{0}	-0.85

TABLE II: FREQUENCY WITH RETURN LOSS

ANTENNA STRUCTURE	RESONANT FREQUENCY (GHZ)	RETURN LOSS (dB)	10 DB BANDWIDTH (MHz)	VSWR
1	f_1= 7.01	-14.71	83.60	1.44
	f_2= 9.70	-35.74	264.07	1.06

IV. CONCLUSION

Single layer, single transmission line feed printed patch antenna whose theoretical investigations were performed using an electromagnetic solver IE3D. When three inverted L-shaped slots named L1, L2 and L3 with added one slit added, significant improvement shows a return loss maximum of -35.74 dB and VSWR value of about 1.44. Another result observed that 166.98^0 is wide beam for the intended applications. If we change the types of the feed point, the results give a narrower bandwidth of 10dB and fewer signals.

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