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Design a Multi Operating Frequencies Broadband Microstrip Patch Antenna for Wireless Communication

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ABSTRACT: In this paper a broadband microstrip patch antenna is design for broad band communication. This article is presented for compactness and broadband wireless communication. The proposed design is covering the frequency ranges from 4.78 GHz to 10.5 GHz. The simulated results of the proposed microstrip patch antenna parameters such as return loss; bandwidth, radiation patterns, VSWR and gain are presented. The proposed antenna is designed using Ansoft Designer software and two operating frequencies are obtained at the frequencies 5.8 GHZ and 9.9 GHz in the frequency range from 4.78 GHz to 10.5 GHz.

KEYWORDS: Microstrip patch, Rectangular ground plane, Wireless communications, and Ansoft designer

I. INTRODUCTION

The Microstrip patch antenna is very popular for used in wireless & satellite communication due to their low profile, light weight, low volume and thin profile characteristics. The patch substrate material is used to reduce the size of microstrip patch antenna. However normal microstrip patch antennas operate primarily at a single frequency and have narrow impedance bandwidth which limits the frequency range over which the antenna can perform satisfactorily [1-6].Now days the demand of dual band and multi band antennas are gradually increasing side by side. The demand of board band high gain microstrip patch antenna is also increased rapidly. These wideband performance characteristics of microstrip patch antennas, for a wide class of topologies can be found. Several patch antennas have been proposed in recent times for broadband operation [7-11].To enhance the bandwidth of the antenna, different slots and slits are loaded in the ground plane and as well as in the microstrip patch. With the increase of bandwidth, the swept gain of the antenna reduced significantly. In the modern wireless communication system broadband and high gain antenna is very demandable. In this article design of the wide band, rectangular V-shaped microstrip patch antenna has been developed from the knowledge of the design. In this paper simulated results are verified with experimental data & the results will show a large bandwidth, higher gain & minimum return loss. The proposed antenna is simulated using Ansoft designer software. That is why in this paper to meet these demands the microstrip patch antenna has been modified to exhibit large bandwidth of 77%. The simulation is carried out by using Ansoft designer simulation software to analysed its performance.

II. ANTENNA DESIGN

The ground plane, microstrip patch and proposed microstrip patch antenna are show in Figure 1, Figure 2 and Figure 3 respectively. All the geometrical parameters and dimensions of the proposed antenna are show in Table 1. For designing this antenna FR4 substrate (permittivity $\mu = 4.2$, width $h = 1.6$ mm and loss tangent 0.0016) has been used and for simulation of antenna geometry, Ansoft designer simulation software is used.

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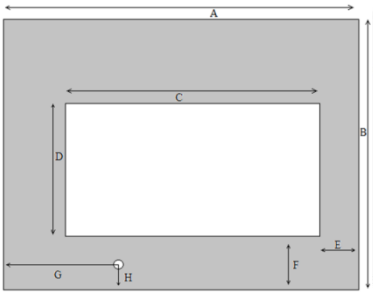

Fig.1. Ground plane of proposed antenna.

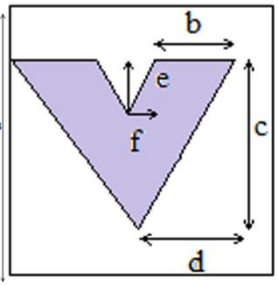

Fig.2. Proposed mmicrostrip patch.

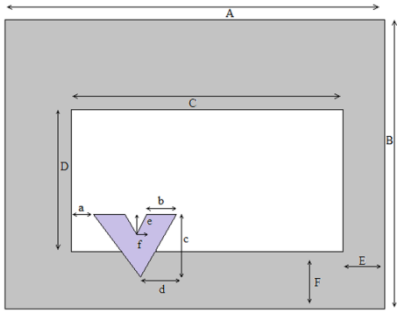

Fig.3. Proposed microstrip patch antenna.

TABLE 1
GEOMETRICAL PARAMETRIC DIMENSION OF PROPOSED ANTENNA. (ALL DIMENSION ARE IN MM)

Parameters	Dimension	Parameters	Dimension
A	39	H	6
B	40	a	2
C	29	b	5
D	17.33	c	11.11
E	4	d	7
F	10	e	2
G	15	f	2

III. ANTENNA RESULTS

Figure 4 shows the reflection coefficient versus frequency response of the proposed antenna. The conventional microstrip antenna shows narrow bandwidth. In this proposed design antenna a slit is incorporated in the ground plane. The effect of the slit enhanced the bandwidth and swept gain. The simulated results show that the reflection coefficient is decreased with the frequency increased. The simulated results also show that the return loss of the proposed antenna minimum at the frequency position of 5.8 GHz and 9.9 GHz respectively. The simulated minimum return losses are (-37.16 dB) and (-34.83 dB) respectively. The proposed antenna gives batter responses at two resonance frequency. Figure 5 and Figure 6 show the simulated swept gain and VSWR of proposed microstrip patch antenna at the frequency range from 4.7 GHz to 10.55 GHz respectively. The Figure 7 and Figure 8 respectively show the behaviour of the transmitted signal radiation pattern at two resonance frequency. The proposed antenna -10dB reference bandwidth is considered. In this article 77% bandwidth is achieved of the frequency range 4.7 GHz to 10.55 GHz with maximum positive swept gain (+3.5dBi) at the frequency 5.8 GHz. The proposed antenna is simulated using Ansoft designer software.

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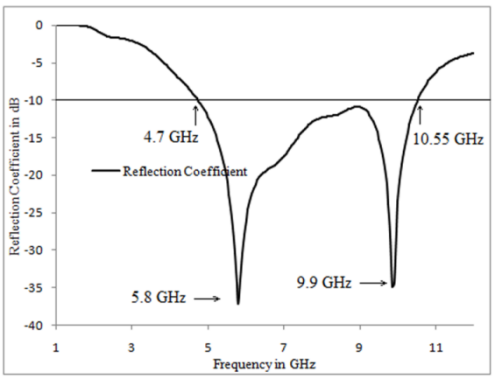

Fig.4. Reflection coefficients versus frequency

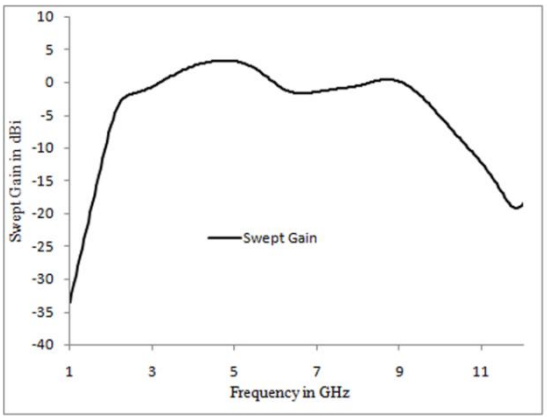

Fig.5. Swept gain versus frequency.

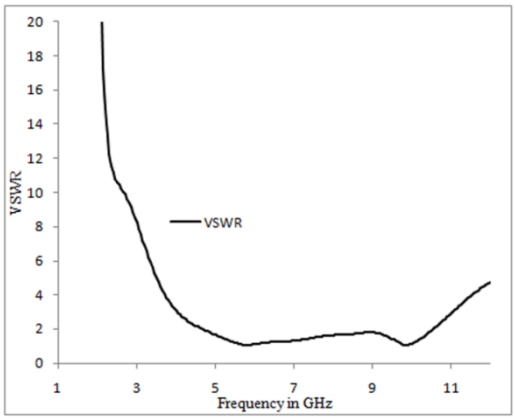

Fig.6. VSWR versus frequency response.

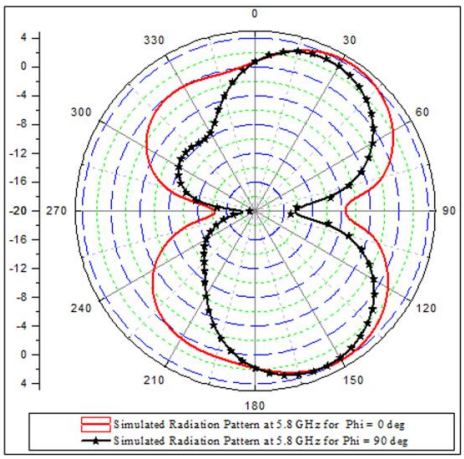

Fig.7. Radiation patterns of proposed antenna at 5.8 GHz.

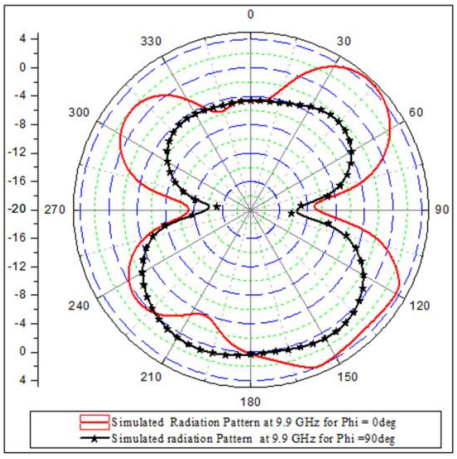

Fig.8. Radiation patterns of proposed antenna at 9.9 GHz

IV. CONCLUSION

In this paper, a compact broad band V shaped microstrip patch antenna is designed for modern communication system. The simulated results show that the proposed antenna exhibit positive swept gain and large impedance bandwidth up to 77%. The proposed antenna simulated results are in good

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parity with the theory. Compactness of the antennas is significantly enhanced. The Size reduction 70% is achieved .The proposed antenna is very useful for C-band and X-band application.

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BIOGRAPHY

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