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Single & Double Diamond Circular Microstrip Patch Antenna

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Abstract— **In this paper; a single and double diamond shape circular microstip Patch Antenna is presented. It is a compact design of radius 30 mm on duroid substrate with dielectric constant of 2.33, thickness of 1.6 mm and fed by a coaxial feed technique. The proposed antenna resonates at 1.88 GHz return loss of -17.16dB with satisfactory radiation properties. The parameters that affect the performance of the antenna in terms of its frequency domain characteristics are investigated. The antenna design has been simulated on IE3D, an electromagnetic (EM) simulation software tool. This antenna is good for mobile and wireless applications.**

Index Terms— **Circular microstrip patch antenna, IE3D**

I. Introduction

In high performance aircraft, spacecraft, satellite, and missile applications where size, weight, cost, performance, ease of installation, low profile, easy integration to circuits, high efficiency antennas may be required. Presently there are many other government and commercial applications, such as mobile radio and wireless communication.[1]To meet these requirements microstrip antenna can be used. These antennas are low profile, conformal to planar and non-planar surface, simple and inexpensive to manufacture using modern printed circuit technology, mechanically robust when mounted on rigid surface, compatible with MMIC designs and when the particular shape and mode are selected they are very versatile in terms of resonant frequency, polarization, field pattern and impedance. Microstrip antenna consist of a very thin metallic strip (patch) placed a small fraction of a wavelength above a ground plane. The patch and ground plane are separated by dielectric material. Patch and ground both are fabricated by using conducting material.[2]

However the major disadvantage of the microstrip patch antenna is its inherently narrow impedance bandwidth. Much intensive research has been done in recent years to develop bandwidth enhancement techniques.[9] These techniques includes the utilization of thick substrates with low dialectic constant .The use of electronically thick substrate only result in limited success because a large inductance is introduce by the increased length of the probe feed, resulting few percentage of bandwidth at resonant frequency. The purpose of this work is to design a microstrip patch antenna using commercial simulation software like IE3D [10]. The IE3D by Zeland Software Inc. has been recently considered as the benchmark for electromagnetic simulation packages. It is a full wave, method of moment (MOM) simulator solving the distribution on 3D and multilayered structures of general shape. The primary formulation of the IE3D is an integral equation obtained through the use of Green's functions. In the IE3D, it is possible to model both the electric current on a metallic structure and a magnetic current representing the field distribution on a metallic aperture.

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II. PROPOSED ANTENNA DESIGN

In this paper, the performance of single and double diamond circular microstrip patch antenna on coaxial fed has been investigated t. It may be contended that the bends and corners of these geometries would add to the radiation efficiency of the antenna, thereby improving its gain [7]. The proposed antenna is designed on Duroid epoxy substrate having the dielectric constant of 2.33 and 0.02 loss tangents. In this designing Circular patch is taken that radius is 30 mm as shown in figure 1 & 2. The single and double diamonds is cut along the Y-axis on circular patch. The length of diamond is 12 mm and width of diamond is 15 mm respectively. The angle between length and width in the diamond is 45 degree. The length and width of diamond can be change according to the basic circular patch. The angle between length is width is 45 degree is taken due to maximum result can be obtained.

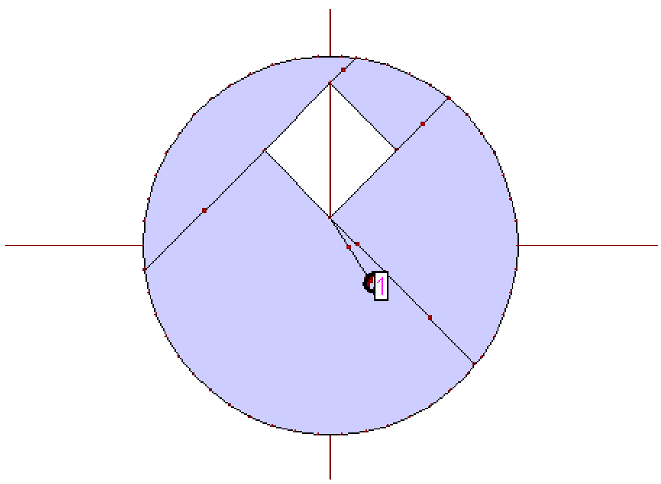

Fig. 1:- Single Diamond Circular Microstrip patch antenna

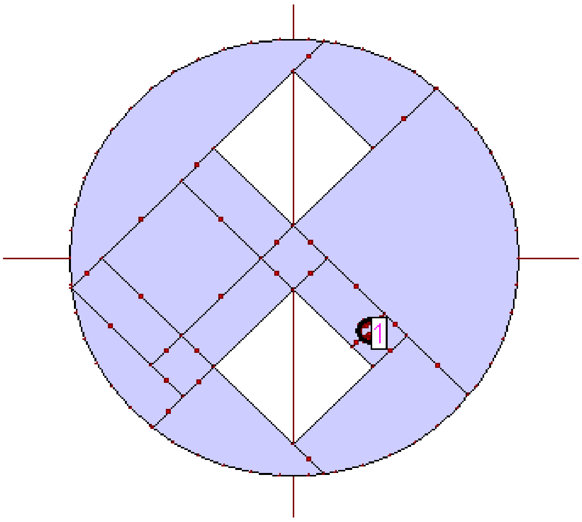

Fig. 2:- Double Diamond Circular Microstrip patch antenna

III. RESULTS AND DISCUSSION

The results of both single and double diamond antenna are shown here: that is return loss, VSWR, Smith Chart and Radiation Pattern etc. In the both circular antenna design we can see that if we reduce size of antenna the all output parameters are remain same. In this we can design compact size antenna.

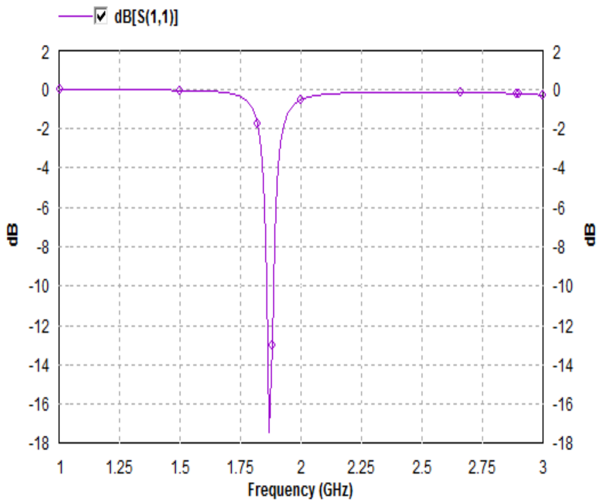

Fig. 3 :- Return loss of single diamond circular microstrip patch antenna

Fig.3 shows that the antenna resonates at 1.88 GHz with return loss of -17.16 dB. This design can be used in IEEE 802.11a Wireless LAN application and in C band applications.

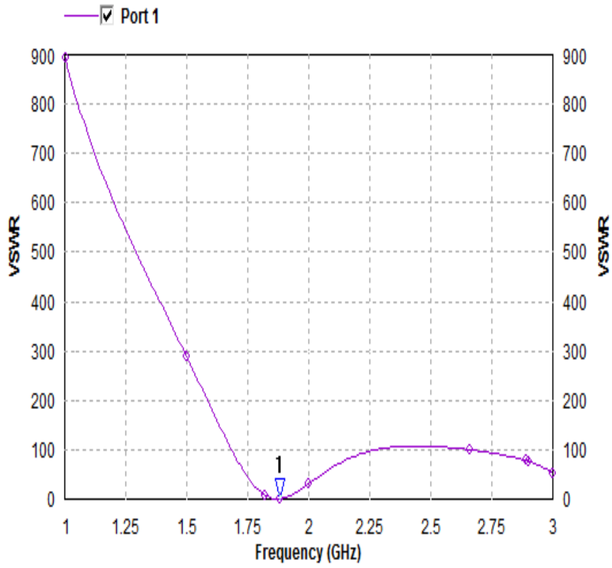

Fig. 4:- VSWR of single diamond circular microstrip patch antenna

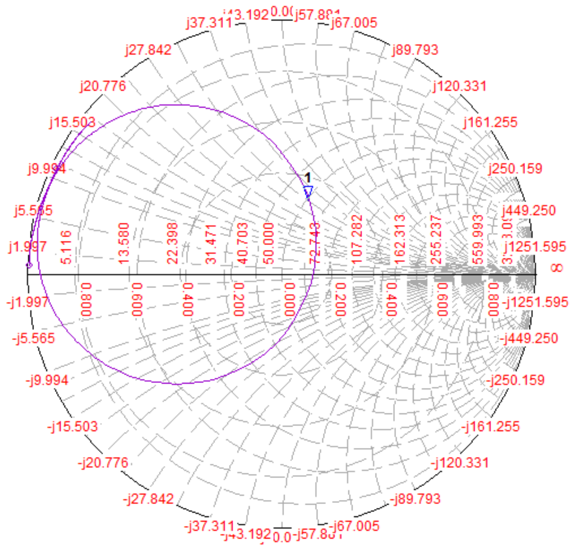

Fig. 5:- Smith Chart of single diamond circular microstrip patch antenna

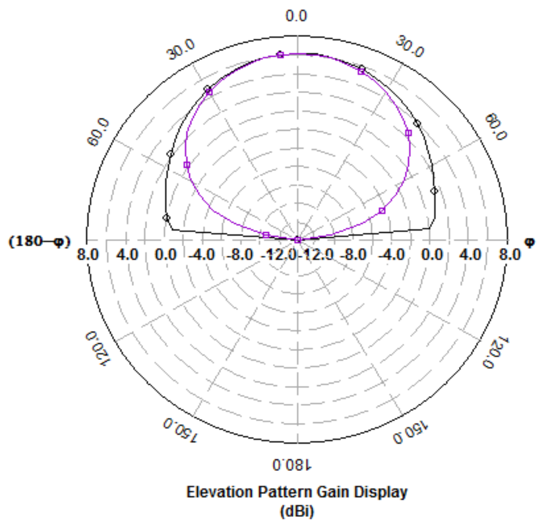

Fig. 6:- Radiation Pattern of Single diamond circular microstrip patch antenna

For Double Diamond Circular Microstrip Patch Antenna with resonance frequencies at 1.88 GHz.

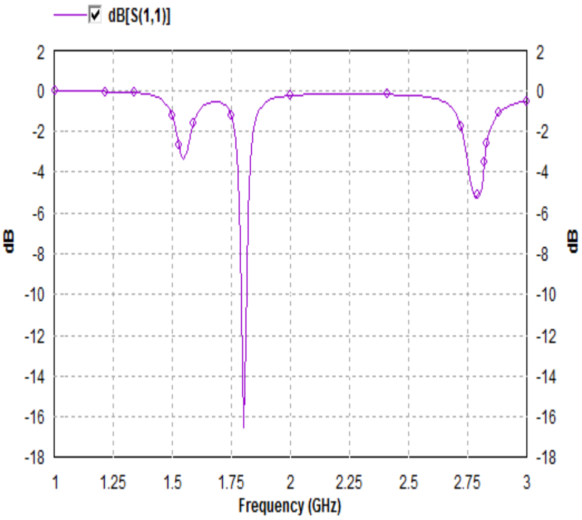

Fig. 7:- Return loss of Double diamond circular microstrip patch antenna

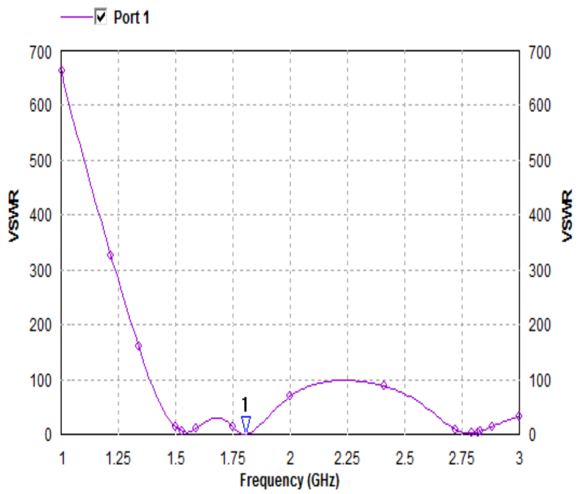

Fig. 8:- VSWR of Double diamond circular microstrip patch antenna

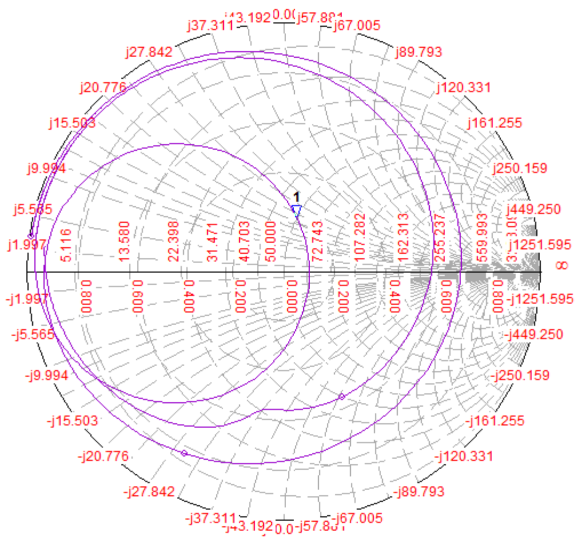

Fig. 9:- Smith Chart of Double diamond circular microstrip patch antenna

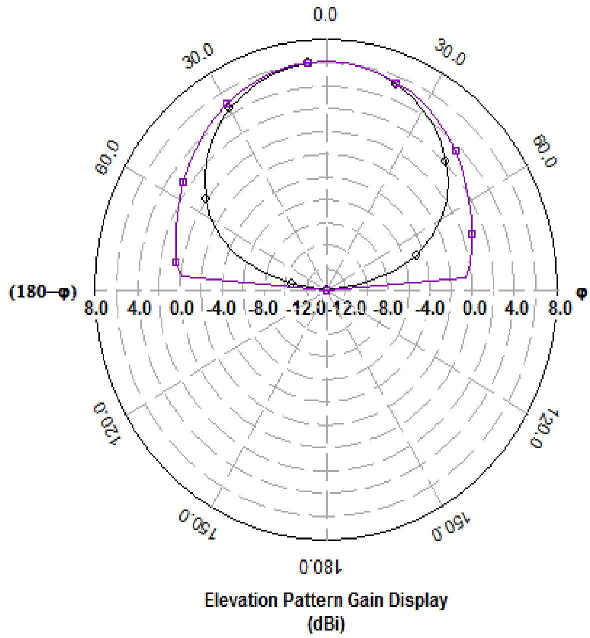

Fig. 10:- Radiation pattern of Double diamond circular microstrip patch antenna

IV. Conclusion

The concept of using circular microstrip antennas to provide printed radiating structure, which are electrically thin, lightweight and low cost, is a relatively not too old. The development of system such as Satellite communication, highly sensitive radar, radio altimeters and Missiles systems needs very light weight antenna which can be easily attached with the systems and not make the system bulky. These requirements are main factors to development of the circular microstrip patch antenna.

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