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A Double Plus Shaped Microstrip Patch Antenna

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Abstract **- This paper describes a new microstrip patch antenna which is presented by using a IE3D software .These antenna is named as *"A Double plus Shaped microstrip patch antenna"* . Simulation results has been obtained which states that the microstrip patch antenna possess predictable multi band characteristics. The result shows that the designed antenna can operated in single frequency bands .the resonating behavior makes this antenna suitable for different type of applications.**

Index Terms **— Patch Antenna , Microstrip antenna, Multiband band.**

I. INTRODUCTION

With the advance of wireless communication systems and increasing importance of wireless applications in recent years.[1]Microstrip patch antenna(MPA) has attracted wide interest due to its important characteristics, such as light weight, low profile and low cost, mechanically robust, simple to manufacture, easy to integrated with RF devices, allow multi-frequency operation to be achieved ,etc. However , its further use in specific systems is limited because of its relatively narrow bandwidth.

A patch antenna is a popular type of microstrip antenna which is also known as a flat panel antenna. It derives its name from the fact that it is formed by suspending a single metal patch over another larger metallic plate with a dielectric sheet in between the two pieces. Some patch antennas use dielectric spacers between the two plates instead of a continuous sheet in order to achieve better bandwidth. The increased production and use of portable electronic equipment has increased the need for a reliable and compact antenna. Patch-type microstrip antennas have met this need, and are now built-in to cellular phones, palm electronic devices, ,as well as laptop computers and wireless local area network (LAN) equipment.[2][3] A patch antenna assembly is commonly enclosed in a protective white or black plastic case, called a radome , in order to shield the antenna from inclement weather and make it easier to mount. Patch antennas are thin, lightweight, and relatively simple to construct, modify or customize. These antennas are commonly fabricated into rectangular, square, elliptical, or circular shapes. A patch antenna can be designed to receive and transmit over a wide range of frequencies using the self similarity properties associated with the structures.

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II. LITERATURE REVIEW

(i) Microstrip patch antenna (MPA) is generally used in modern communication devices , and a large part of day –to – day communication is done through it study of literature of past few year shows that , the leading work on MPA is focused on designing compact sized microstrip antenna.

(ii)[4]The printed research in printed antenna technology points to development of antennas in compact with efficient radiation characteristics.

(iii) Microstrip antenna are often referred as patch antenna because the radiating element is normally a patch. It comes in different shapes such as square , rectangular, circular etc.

(iv)[5]Microstrip Patch Antenna (MPA) have many advantages over conventional antennas which makes them suitable for a wide variety of applications. However, a major drawback of these antenna is low bandwidth . various techniques have been proposed by researchers to enhance its bandwidth.

III .PROPOSED work

The antenna is designed by *IE3D* structure simulator engine by zeland software . the geometry of an antenna is substitute on a finite rectangular ground plane of dimensions (30mm × 40mm) ,the patch element has been printed on the top of substrate (ztop = 1.6, $E_{r=}$ 4.4, loss of tangent =0.02) , the feed point has been given on the lower of the rectangular surface .

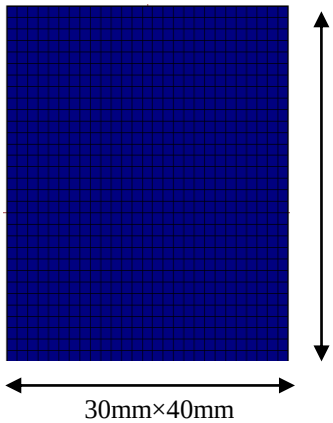

Fig-1 Base Shape

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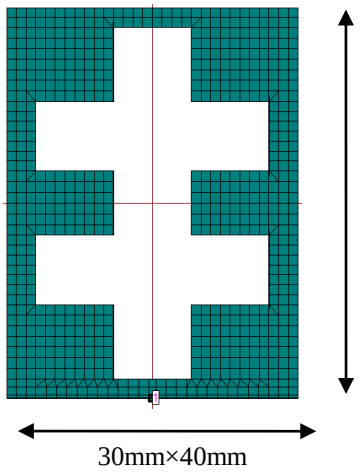

Fig-2 Final Shape

The patch is printed on the ground plane substrate of relative permittivity E_r =4.4. (fig-1) is the base shape which is of rectangular shape and (fig-2) is the final patch shape which of ice cream shaped. The various parameters that have been optimized are length and position of the aperature , length of the open circuited microstrip stub ,and the air gap between the substrates.

IV . SIMULATION AND RESULTS

The iterations of the microstrip patch antenna were examined by using the IE3D simulation software tool . the frequency lies between (1GHZ – 8GHZ) upto 100 number of frequencies. The simulation of this antenna structure provides good result and makes this antenna suitable to work in two to three different frequency bands.

The most important parameter which is to be analyzed is the bandwidth of the antenna , for analyzing the bandwidth of an antenna return loss curve is drawn and studied in Fig-3

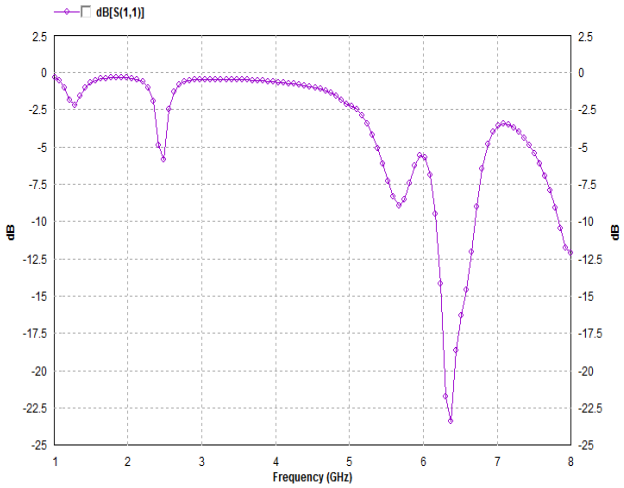

Fig-3 Return Loss Curve of the Designed Antenna Structure

By analyzing the curve in the fig-3.we can see frequency band named F1 rafter calculating we can see that the frequency bands F1=7.766% at 6.374GHZ which makes the antenna structure suitable different types of applications.

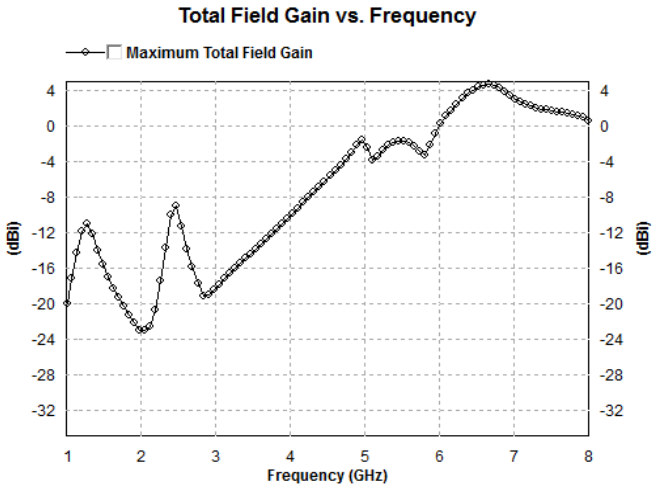

Fig-4 Total Field Gain VS Frequency

Another parameter is the gain of the antenna. The Gain VS Frequency Graph is illustrated in the Fig-4 is used to find gain of the antenna .The curve shows gain of 3.613 at 6.374GHZ.

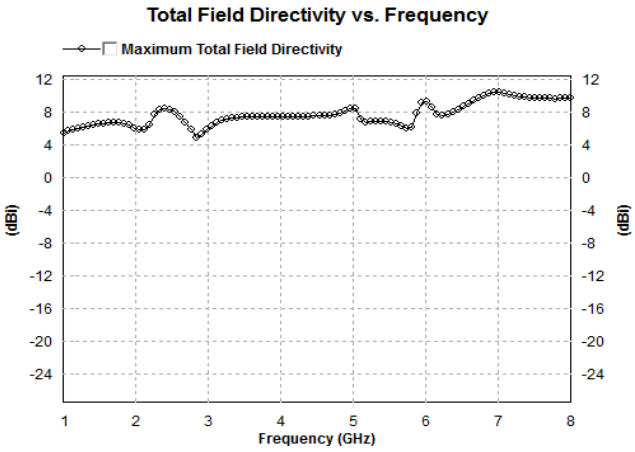

Fig-5 Total Field Directivity VS Frequency

Directivity is another important parameter of an antenna which is closely related to antenna gain, The Total Field Directivity VS Frequency curve is illustrated in Fig-5. The graph shows a directivity having a maximum value of 8.026dbi at 6.374 GHZ

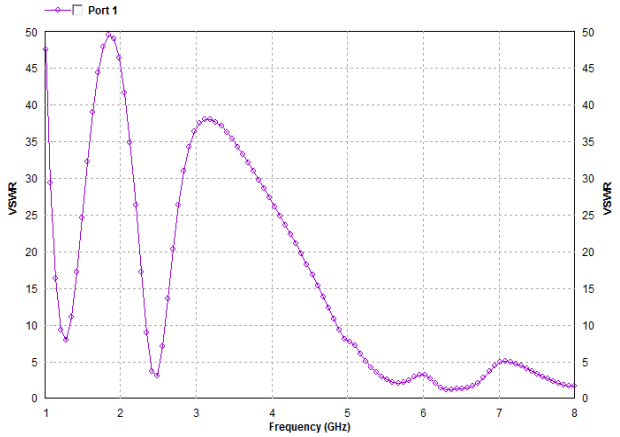

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Fig-6 VSWR curve

The VSWR curve is another important parameters it should be less than 2 for an antenna to work properly. It is less than 2 in all three bands as shown in Fig -6

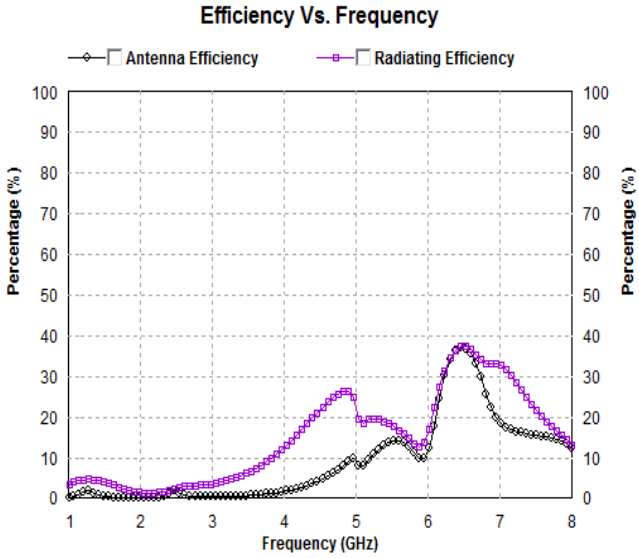

Fig-7 Efficiency VS Frequency

Antenna efficiency and radiation efficiency are very important terms,which is used to analyze whether the antenna is efficient or not ,and whether the antenna is radiating properly or not. The curve is described in Fig-7 Antenna efficiency 36.20%,radiation efficiency 36.37%

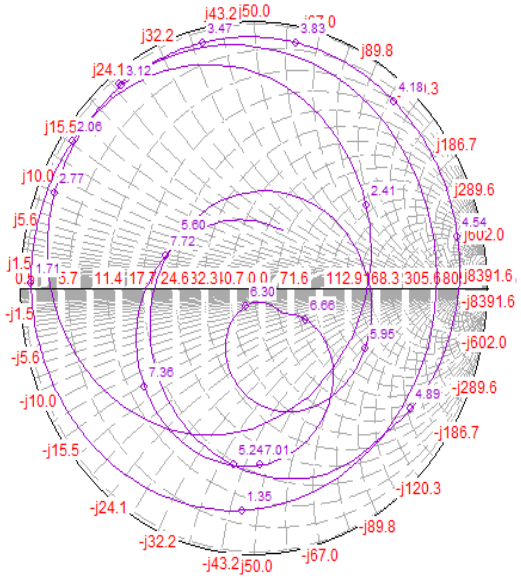

Fig-8 smith chart of antenna

V CONCLUSION

"A double plus shaped microstrip patch antenna" with single Band characteristics has been successfully demonstrated .The antenna structure also provides a good amount of gain and directivity efficiency is about 37% which is quite good enough. it's frequency lies between(5-8)GHz and it can be used for various military and wireless application like Lan,wimaxe tc.

Analyzing this type of structures we can further provide increment in the gain and bandwidth of the antenna.

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REFERENCES

[1] J.J. Huang, F.Q. Shan and J.Z. She Tsinghua University ,China "Progess in Electromagnetics Research Symposium 2006, Cambridge, USA, march 26-29" vol2 no1 page 57to59.

[2] Howel "Microstrip Antennas ,"IEEE International Symposium on Antennas and Propagation , Williamsburg Virginia , 1972 pp. 177-180.

[3] Sachendra N. Sinha, Senior Member, IEEE, and Manish Jain "IEEE antennas and wireless propagation Letters" vol 6.2007

[4] "A Novel approach of miniaturization of slot Antenna ", Azadegan R, Sarabandi,K, IEEE transcations as,antenna and propagation vol 5; issue 3 march 2003

[5] Fan Yang and Rahmat Samii,Y, "Applications of electromagnetic bandgap (EBG) structures in microwave antenna designs" microwave milimetres wave technology p.p. 528-531 , Aug 2002.

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