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"Designed and Simulation Modified H 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 "Designed and simulation of modified H shaped microstrip patch antenna". A simulation result 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 three different frequency bands with bandwidth of 2.68%, 10.23%, 5.60%.the resonating behavior makes this antenna suitable for different type of applications.*
Keywords: *Patch Antenna, Microstrip antenna, Multiband, narrowband, Radome.*

I. INTRODUCTION

With the advance of wireless communication systems and increasing importance of wireless applications in recent years. 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. 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. [1]-[2]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. A patch antenna assembly is commonly enclosed in a protective white or black plastic case, called a radome [3]-[4] 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[5].

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 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.

II. DESCRIPTION OF PROPOSED ANTENNA

The antenna is designed by *IE3D* structure simulator engine by zeland software and is fed by single coaxial probe feed .After feeding the antenna structure are further simulated over IE3D simulation software. These simulations are continuous till an optimum result is obtained.

2.1 DESIGN OF MODIFIED SHAPED

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, $\varepsilon_{r\,=}$ 4.4, loss of tangent =0.02) , the feed point has been given on the lower of the rectangular surface .

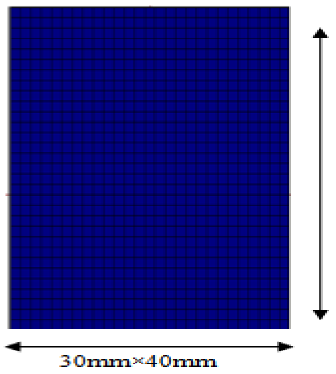


Fig- (2.1) base shape

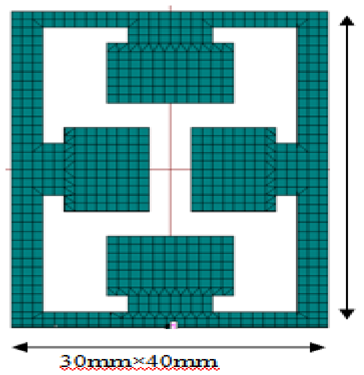


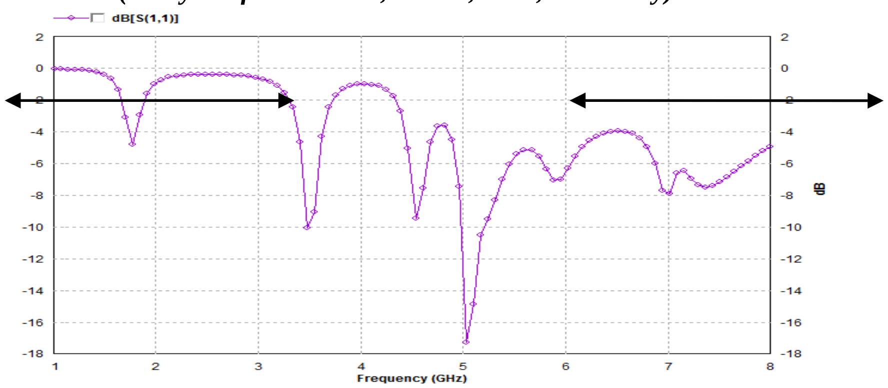
Fig-(2.2) 1st iteration

The patch is printed on the ground plane substrate of relative permittivity ε_r =4.4. (fig-(2.1)) is the base shape which is of rectangular shape and (fig-(2.2)) is the 1st iteration. The various parameters that have been optimized are length and position of the aperture, length of the open circuited microstrip stub, and the air gap between the substrates.

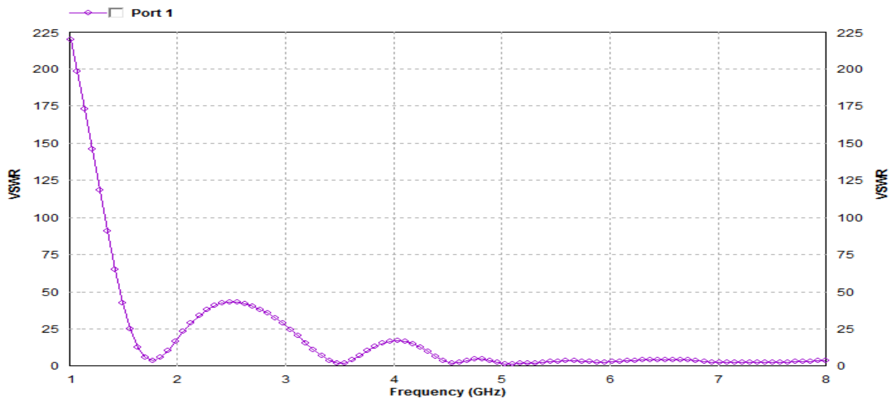
III. Computer Simulation and Result's

The iterations of the microstrip patch antenna were examined by using the IE3D simulation software tool. the frequency lies between (1GHZ – 8GHZ) upto 80 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.

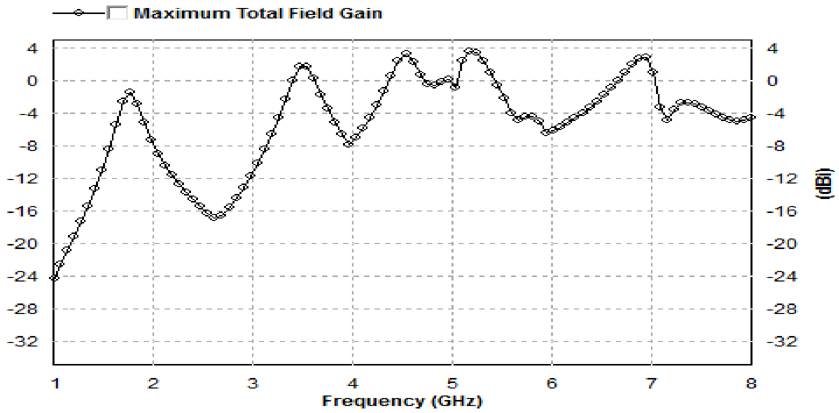
3.1 BASE STRUCTURE-: (Analysis of Return loss, VSWR, Gain, Directivity)



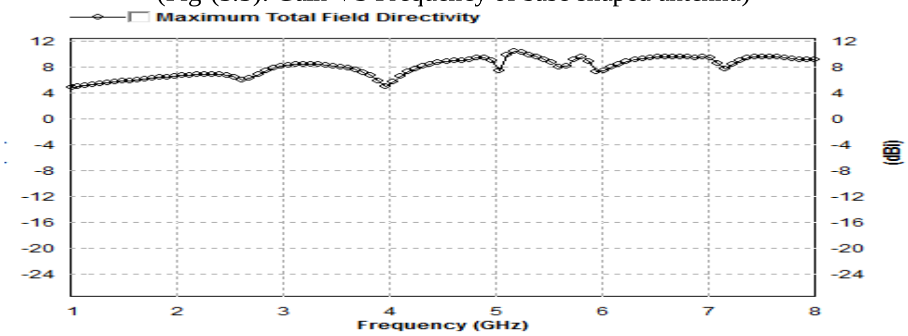
(Fig-(3.1): Return loss curve of base shape)



(Fig-(3.2): VSWR curve of base shaped antenna)



(Fig-(3.3): Gain VS Frequency of base shaped antenna)



(Fig-(3.4): Directivity VS Frequency graph of base shaped antenna)

The most important parameters which is to be analyzed is the bandwidth of the antenna , gain ,VSWR, directivity for analyzing the bandwidth of an antenna we need return loss curve is drawn in Fig-(3.1) and studied in By analyzing it we can see that different frequency bands named F1,F2, respectively. after calculating we can see that the bandwidth of different frequency bands F1=4.05% at 3.475GHZ , F2=4.21% at 5.031GHZ , which makes the base antenna structure suitable for two different types of applications. Another parameter is the gain of the antenna. The Gain VS Frequency Graph is illustrated in the Fig-(3.3) is used to find gain of the antenna .The curve shows gain of F1 is 1.674dbi at 3.475GHZ and F2 is 0.875dbi at 5.031GHZ . 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-(3.4). The graph shows a directivity having 8.184dbi at F1 and 9.800dbi at F2 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 two bands as shown in Fig-(3.2). This base structure does not provide good gain and directivity so we will cut the base shaped into a structure with same feed then we get.

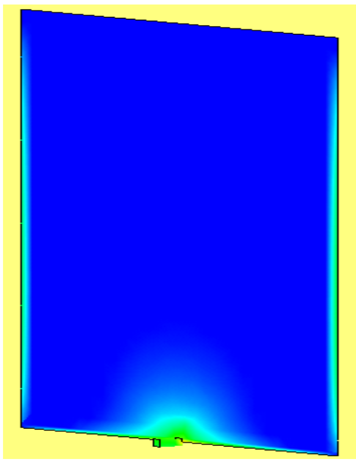


Fig-(3.5) current distribution of base shape

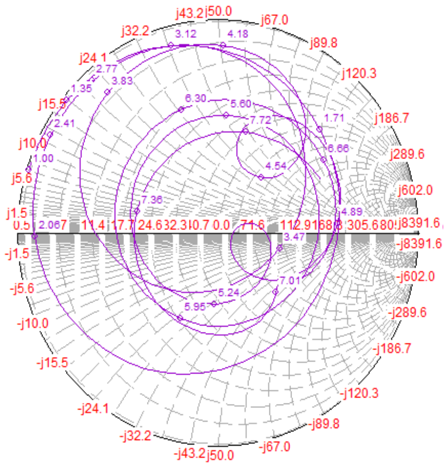
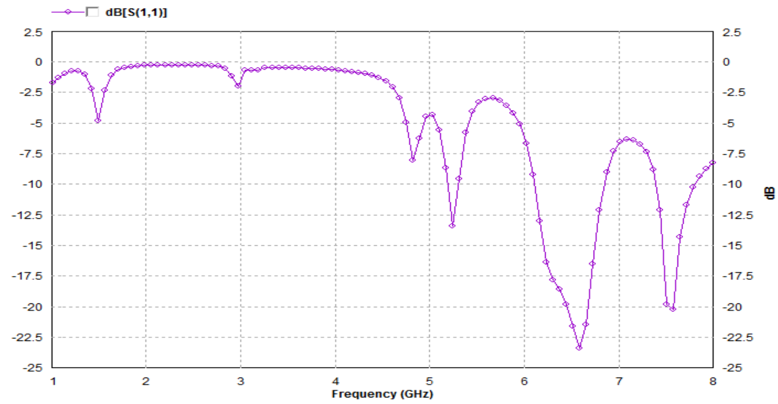
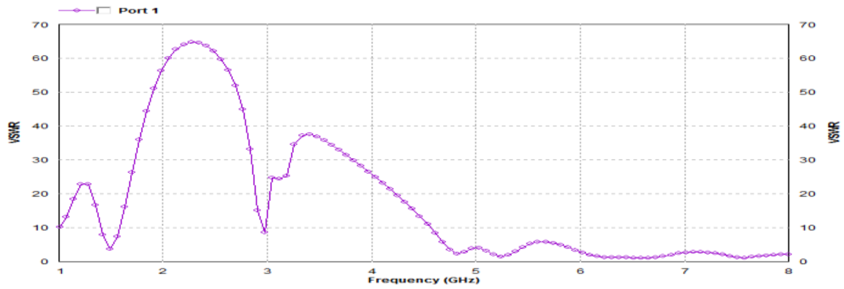


Fig-(3.6) smith chart of base shape

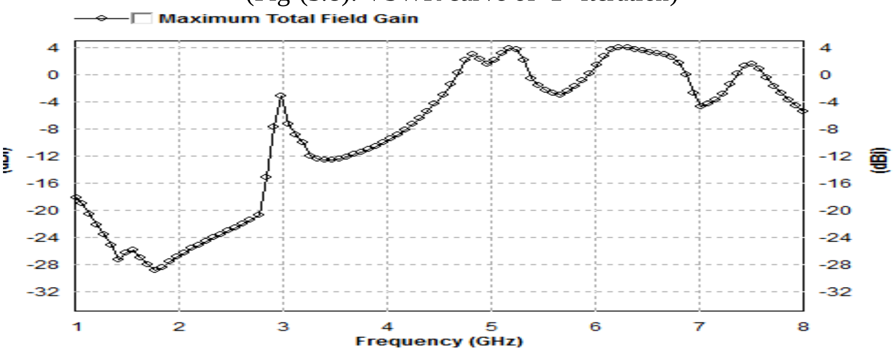
3.2 FINAL PATCH STRUCTURE-: (Analysis of Return loss, VSWR, Gain, Directivity)



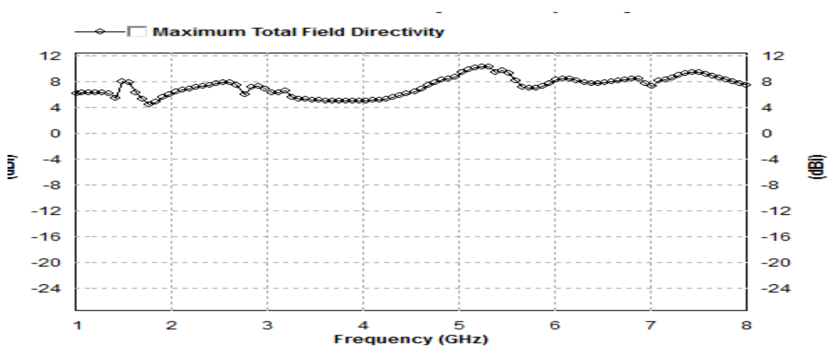
(Fig-(3.7) Return loss curve of 1 iteration)



(Fig-(3.8): VSWR curve of 1st iteration)



(Fig-(3.9): Gain VS Frequency graph 1st iteration)



(Fig-(3.10): directivity Vs Frequency graph 1st iteration)

The most important parameters which is to be analyzed is the bandwidth of the antenna , gain ,VSWR, directivity for analyzing the bandwidth of an antenna we need return loss curve is drawn in Fig-(3.7) and studied it By analyzing it we can see that different frequency bands named F1,F2,F3 respectively. After calculating we can see that the bandwidth of different frequency bands F1=2.68% at 5.242GHZ, F2=10.23% at 6.586GHZ and F3=5.60% at 7.576GHZwhich makes the base antenna structure suitable for three different types of applications. Another parameter is the gain of the antenna. The Gain VS Frequency Graph is illustrated in the Fig-(3.9) is used to find gain of the antenna .The curve shows gain of F1 is 3.587dbi , F2 is 3.09dbi and F3 is 0.718dbi . 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-(3.10). The graph shows a directivity having 10.324dbi at F1 and 7.836dbi at F2 and 9.161dbi at F3. 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 two bands as shown in Fig-(3.8). These base structures provide good gain and directivity now we compare smith chart of both shapes.

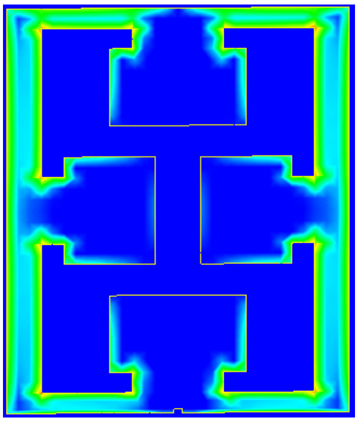
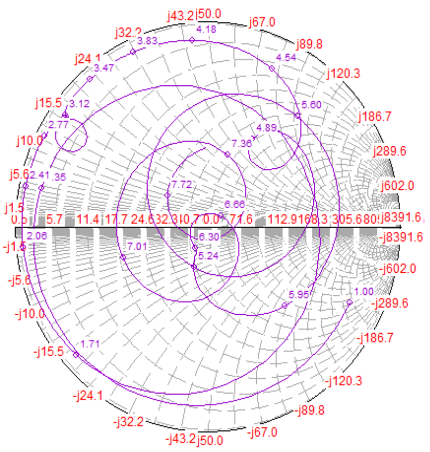


Fig-(3.11) current distribution of final patch shape



(Fig-(3.12) smith chart of 1st iteration)

3.3 TABLE-1 comparison table of both antennas

S.NO	SHAPE	FREQUENCIES	RETURN LOSS	BANDWIDTH	GAIN
1.	BASE SHAPE	F1	-10.08	4.05%	1.674
2.		F2	-17.27	4.21%	0.857
1.	FINAL PATCH SHAPE	F1	-13.39	2.68%	3.587
2.		F2	-23.37	10.23%	3.09
3.		F3	-20.23	5.60%	0.718

IV. CONCLUSION

"Design and simulation of modified H shaped microstrip patch antenna" with Multi-Band characteristics has been successfully demonstrated .This antenna works in three different frequency bands as shown in the return loss curve. The antenna structure also provides a good amount of gain and directivity .the antenna efficiency and radiation efficiency which is quite good enough. Its frequency lies between (2- 8) GHz and it can be used for various military and wireless applications.

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

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