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DESIGINING PATCH ANTENNA BY THE COMBINATION OF SQUARE AND SYMETRICAL T FRACTAL SLOTS

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Abstract: During this style of patch antenna combining sq. and Symetrical T shape slots by cutting totally different shape slots on rectangular patch this paper introduces a decent return loss, sensible gain and by experimentation determined on IE3D software. This style is succeeded by cutting multi shapes in Symmetrical T shape slots pattern combining with sq. slots & putting an edge feed line as input. The radiation diagram of the projected fractal as antennas maintained due to the self-similarity and Central-symmetry of the shapes. By realization this we will build multiband antenna, as a result of identical form is found at totally different scale. During these style fractals as patch antenna is projected on a FR4 substrate whose thickness is 1.524mm and relative permittivity is 4.4 and brought on top of the bottom plane at height of 6 millimeter. Details result's measured and simulated results of the iteration area unit premeditated & mentioned.

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INTRODUCTION

In communication system there are many reasonably patch antennas are used. It's some limitation patch antenna may be a multi band, wide-beam antenna made by etching the antenna component pattern on metal trace that's guaranteed to the insulating nonconductor substrate. Patch antenna may be a form of no directional antenna which might be mounted on flat surface. It consists of a flat rectangular plane or "patch" of metal, mounted over a bigger sheet of metal known as a ground plane. Patch antenna is made on numerous form of nonconductor substrate whose nonconductor constant rage from a pair of 2.2 to 12 lithography processes accustomed create PCB. Microstrip or patch antennas are getting terribly helpful as a result of which will be written directly on to a PCB. Patch antennas are turning into terribly helpful at intervals the itinerant market. Patch antennas are accessible at terribly low price, it's low profile & it may be simply fictitious. These aren't dear to manufacture and style due to its easy ecluidian physical pure mathematics. These are flare weighted, conformal formed, capable of multiband frequency operations. These are extremely correct, simply fitted to circuits, prosperous to plane & non-planer surfaces and is simpatico with MMIC style. All of those options create microstrip antennas wide enforced in several applications, high performance aircrafts, wireless communication satellite and missile applications etc. but microstrip antennas even have some limitations, narrow beam dimension. Poor gain, high return loss being a heavy limitation. Totally different style models area unit projected to beat these limitations, and one among the success strategies projected by numerous researchers is cutting slots on that. During this paper we tend to introduce a patch antenna victimization cable feed sq. and Symmetrical T shape slots cut on the oblong patch. Main objective of this work is to style such a patch antenna build multiband antenna. IE3D has totally different graphic interface for model generation with automatic meshing, and uses a field thinker supported full wave, method-of-moments to resolve current distribution on 3D and multilayer structures of general form.

II FRACTAL SLOTS

Fractal may be a length that doesn't showing neatness return to an entire variety or irregular fragments. Its length is also infinite whereas fitted to a finite length while not ever-changing its properties. Fractals area unit the geometries that's found in nature and describe a composite set of geometries starting from self just like different irregular structure however at totally different scale. Fractals haven't a predefined size this property makes their important use in antenna style theory terribly promising. Fractal patch antenna engineering is an rising field that employs shape ideas for formulating new sorts of antennas with notable characteristics. The distinctive properties of fractals like self-similarity and fill in properties alter the belief of

antennas with regarding characteristics like multi-band operation. A self-similar image is one that consists of scaled down copies of itself. This property of self-similarity of the geometry aids within the style of shape antennas with multiband characteristics. The self-similar current distribution on these antennas is anticipated to cause its multiband characteristics. The space-filling property of fractals tends to fill the world occupied by the antenna because the order of iteration is multiplied. Higher order shape antennas exploit the space-filling property of antennas. Fractal antennas and arrays additionally exhibit lower side-lobe levels. Fractals are applied with success for multi-band operations antennas, loops and patch antennas. It's been discovered that like approach lead to reduction of the input electric resistance information measure.

III. MICROSTRIP LINE FEED

In edge feed technique, a conducting strip is connected on to the patch directally. The conducting strip has smaller size wide as compared to the patch and this sort of feeding technique has the advantage that the feeding edge may be engraved on identical substrate to supply a flattened structure.
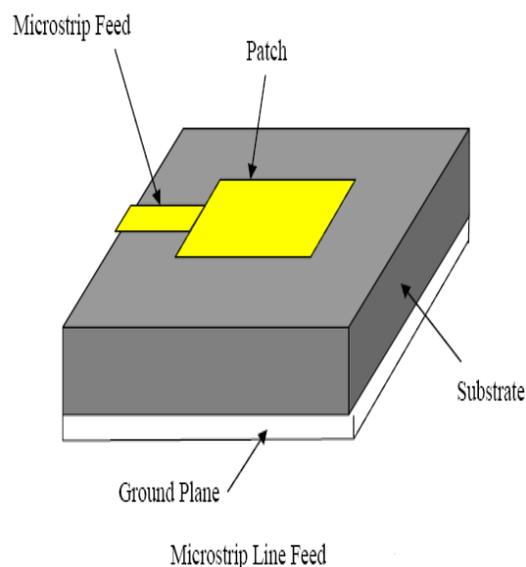

Figure 1: Microstrip line feed

Advantages of edge feeding are reducing in size, low profile and easy to fabricate. The main purpose of the factral cut in the patch is to built multiband antenna. This can be achieved by properly adjusting the factral position. Hence this technique is easy in all present feeding

schemes, since it provides ease of fabrication & simplicity in patterning as well as impedance matching. If we use the thick dielectric substrate increases surface waves and spurious feed radiation also increases, which produces aperent bandwidth of the antenna. The feed radiation also leads to undesired cross polarized radiation.

IV. ANTENNA DESIGN

Designing an antenna in the multi band meant that the antenna dimension could be complex which is not desired. Considering this objective is to design a reduced size wide band microstrip antenna. The design idea was taken from multiband antennas to make the antenna to work in a different band of frequencies of the many broadband antennas, square patch antenna was chosen. Hence the chosen shape of the patch was cutting of different Square and Symetrical T fractal slots in iteration I. The software used to model and simulate the Microstrip Patch Antenna using combining Square and Symetrical T fractal slots by IE3D. This software is used to calculate and graph of return loss, VSWR, radiation pattern, gain, smith chart and other parameters.

ITERATION I

1. The geometry of iteration I of proposed microstrip patch antenna using Symmetrical T fractal slots presented in fig.2 with front (top) view. The design of iteration I is achieved by cutting Symmetrical T fractal slots on a rectangular microstrip antenna. In the centre one crown square fractal slot is taken and 4 Symmetrical T fractal slots are taken on each corner of the central slot. The dimension of the central crown square fractal slot is 10mm-10mm(length-width) and the dimensions of each of the four corner Symmetrical T fractal slots .Horizontal arm length=3,width=1 and vertical arm length=2,width=1.
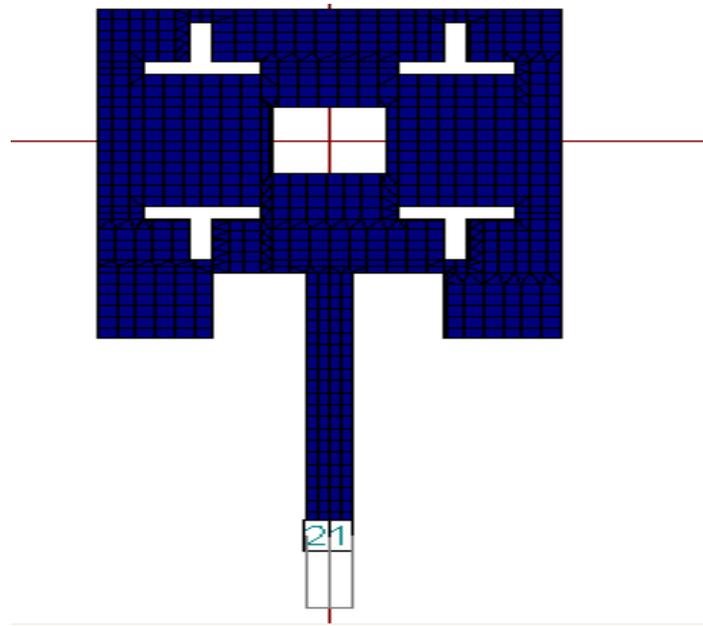
Figure 2 Geometry of iteration 1 with t=1.524, Permittivity=4.4 and grid size=.025 ,l=20,w=20, Horizontal arm length=3,width=1 and vertical arm length=2,width=1.

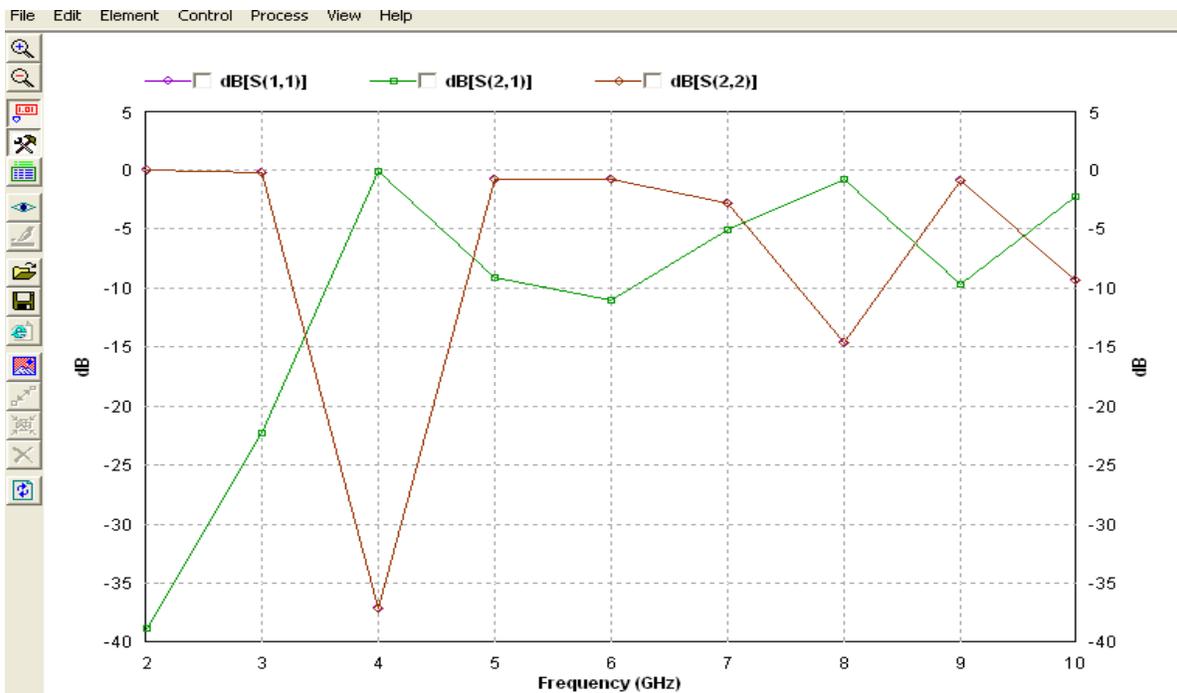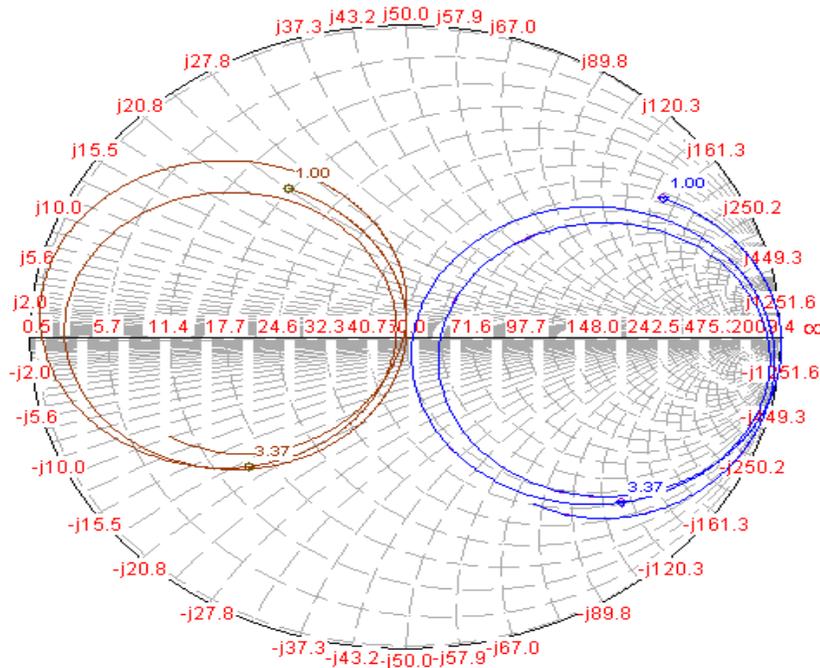**Figure 3 Return loss vs. Frequency curve of iteration I for proposed antenna**

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Figure 4 Input impedance loci using smith chart of iteration I

Table1: Results of Iteration I

Types	Iteration I
Resonant Frequency	4
Return Loss	-37
Bandwidth	83%
VSWR	1,03

V. RESULTS AND DISCUSSION

The projected antenna has been simulated by IE3D by zeland computer code Inc.[7]. It's thought-about as a benchmark for electric and magnetic attraction simulation packages. The first formulation of the IE3D is associate integral equation obtained through the employment of Green's functions. Within the IE3D software, it's attainable to model each the electrical current

on a gold structure & a magnetic current representing the sector distribution on a gold aperture during this paper sq. microstrip patch antenna combining Square and Symetrical T fractal slots is fictional on a FR4 substrate of thickness 1.524 millimetres and relative permittivity of 4.4. It's mounted higher than the bottom plane at height of half dozen millimeters. Table one shows return loss with frequency, VSWR and information measure for iteration I. Premeditated result shows resonant frequency 4GHz. Return loss for iteration I is thirty seven decibel. And total out there electrical phenomenon information measure is 83% for iteration I.

VI. CONCLUSION

Traditional broadband antennas and arrays are often analyzed with geometry to shed new lightweight on their operational principles. A lot of to the purpose, variety of recent configurations are often used as antenna parts with smart multiband characteristics. Thanks to the space filling properties of fractals, associate antennas designed from sure pattern shapes will have much better electrical to physical size ratios than antennas designed from an understanding of shapes in Euclidean space. The measure results show a most patch size reduction is achieved by the projected pattern antennas, while not degrading the antenna performances, like the return loss, radiation patterns, multiband, bandwidth and gain. The essence of this size reduction technique is loading the inductive parts on the patch edges, and loading self-similar slots within the patch, to extend the length of the present path. The essence of the upkeep of the antenna radiation patterns is that the self-similarities and centro-symmetry of the pattern shapes. The most benefits of the projected technique are: (i) nice size reduction achieved (more than four times), (ii) the radiation patterns maintained, (iii) wider operational frequency information measure achieved, (iv)no vias to the bottom, and (v) easiness of the look methodology. To the simplest of our information, this is often the foremost effective technique pro- expose for the of microstrip patch antennas up to now. The small-size patches derived from this method are often utilized in integrated low-profile wireless communication systems with success. With the aim to preserve compactness necessities and to keep up the layout as merely as attainable and keeping the belief value terribly low. In future pattern microstrip antenna reduced patch size and improved information measure are often achieved.

VII. REFERENCES

1. James, J.R. and Hall, P.S.: 'Handbook of Microstrip Antennas' (Peter Peregrinus)

2. Constantine A. Balanis: 'Antenna Theory, Analysis and Design' (John Wiley & Sons)

3. Kai-Fong Lee, Kwai- Man Luk, Jashwant S. Dahele, 'Characteristics of the Equilateral Triangular Patch Antenna' IEEE Tran. Antennas Propag.1988;36;1510.

4. C. L. Mak, K. M. Luk, K. F. Lee, 'Wideband Triangular Patch Antenna' IEE. Proc. Microwave Antennas Propag. 1999.

5. I. J. Bahl and P. Bhartia, 'Microstrip Antennas, Artech House, Dedham, MA, 1980.

6. IE3D by Zeland software Inc.

7. H. O. Peitgen, H. jurgens, and D. Saupe, Chaos and Fractals. New York: Springer-Verlag, 1990.

8. M. F. Barnsley, R. L. Devaney, B. B. Mandelbrot, H. O. Peitgen, D.Saupe, R. F. Voss, Y. Fisher, and M. Mc Guire, The Science of Fractal Images. New York: Springer-Verlag, 1988.

9. K. J. Vinoy, J. K. Abraham, and V. K. Varadan, "On the Relationship Between Fractal Dimension and the Performance of Multi-Resonant Dipole Antennas using Koch Curves," IEEE Transactions on Antennas and Propagation, AP-5 1, 9,2003,pp.2296-2303.