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Standard Sierpinski Carpet Fractal Antenna with Coaxial Probe Feed

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Abstract:- This paper includes design of microstrip patch antenna which is fed by coaxial probe feed. This patch antenna operates at 1.434GHz with substrate FR4 (lossy), whose dielectric constant is of 4.4. And then iterations are introduced in this antenna up to 2nd iteration and this antenna is giving multiband and multifrequency properties with the help of fractal geometry. In 1st iteration operates at bands with the center frequencies of 2.332GHz and 2.6387GHz. In 2nd iteration it operates at bands with the center frequencies of 2.324Ghz, 2.649GHz, 4.8GHz.

Keywords: patch antenna, sierpinski carpet fractal antenna, return loss.

I. INTRODUCTION

Fractals are like never-ending geometrical shapes. They are two types of them 1) deterministic 2)random. They have most important properties of self similarity and space filling. And this is the most important team in designing of fractal antenna. Fractals can be seen in nature too like snail shale, flowers, tree leave, snow flacks etc. fractal antennas are widely used in defense applications and in wi-max, wi-fi, WLAN etc.

In sierpinski there are two types 1)sierpinski carpet and 2) sierpinski gasket. Here sierpinski carpet is selected and simulation done up to 2nd iteration in CST microwave studio-2012. Sierpinski carpet antenna design starts with microstrip patch antenna and then antenna is divided into 9 equal parts and then middle square is removed which is called 1st iteration, then again remaining 8 squares are equally divided in 9 squares and then their middle squares are Removed which is called 2nd iteration and this how iteration are goes on.which is self similarity property of fractals and here square is self similar.

II. PATCH ANTENNA

Microstip patch antenna introduced in late 1970s then arraying of them developed because of their advantages like low cost, compact in size. In microstrip patch antenna rectangular patch is mounted on dielectric substrate and substrate is covered by ground plane of copper.

Geometry of microstip patch antenna with coaxial probe feed is shown in figure 2.1.
Physical parameters of antenna are shown in table 2.1
Simulation of patch antenna is shown in figure 2.2
Return loss plot is shown in figure 2.3

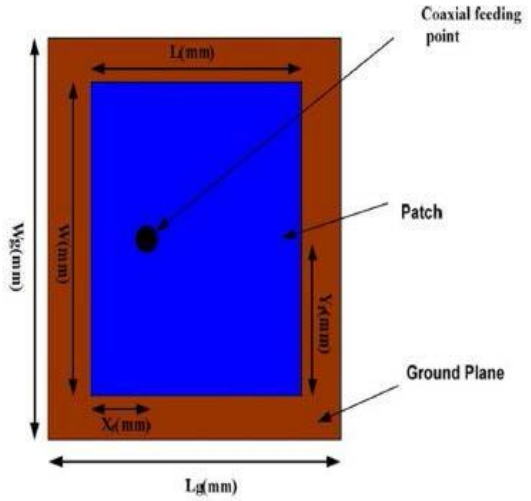

Figure 2.1 microstrip patch antenna geometry

Parameters	Size in mm
Width of patch	61.42
Length of patch	48.18
Height of substrate	1.6
Thickness of patch	0.02
Width of ground	2*w
Length of ground	2*l
Inner radius of cable	0.5
Outer radius of cable	2.5

Table 2.1 parameters of patch antenna

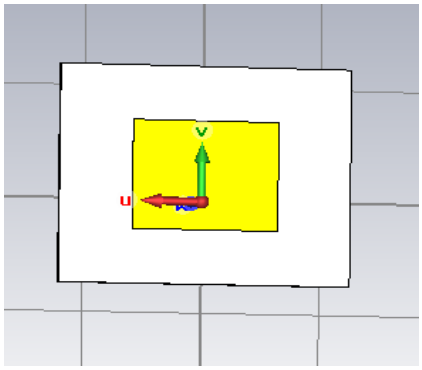

Figure 2.2 simulation of patch antenna

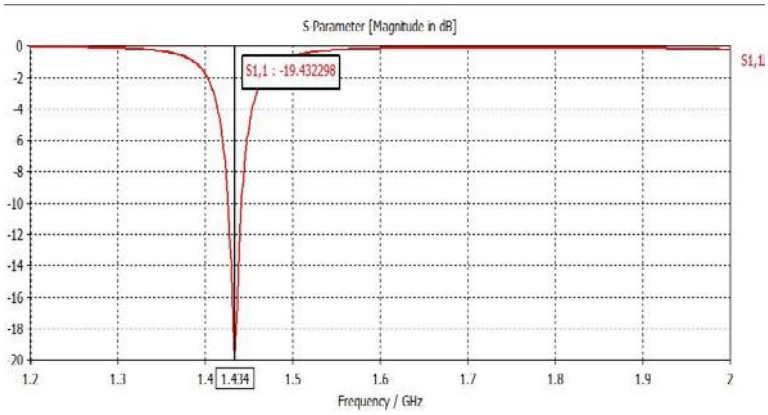

Figure 2.3 return loss plot of patch antenna

SIERPINSKI CARPET FRACTAL ANTENNA

Figure 3.1 shows simulation of 1st iteration of standard sierpinski carpet fractal antenna and figure 3.2 shows return loss plot of antenna which shows antenna operating at two frequencies of 2.332GHz and 2.6387GHz.

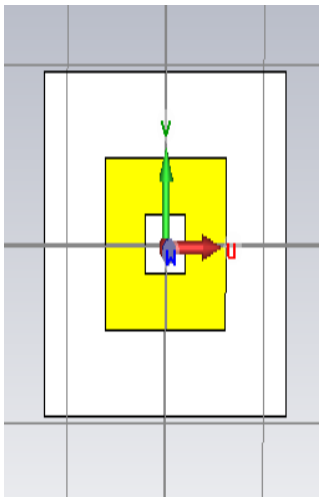

Figure 3.1

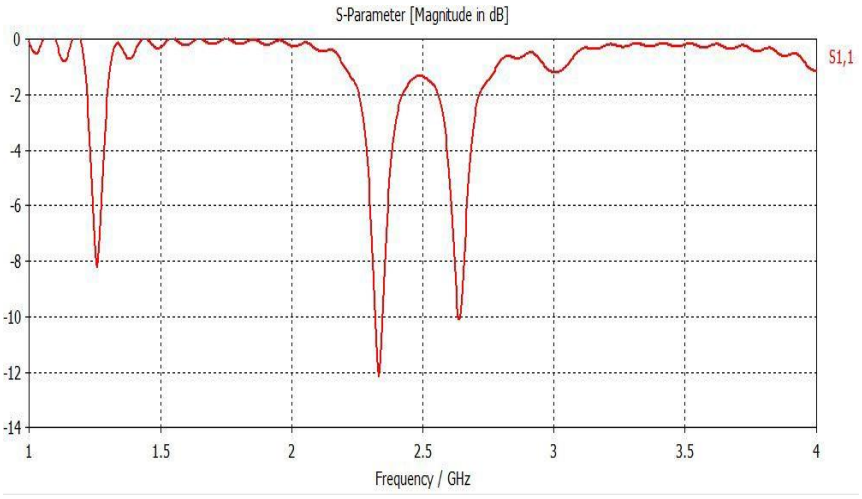

Figure 3.2

figure 3.3 shows second iteration simulation and figure 3.4 shows return loss plot which shows antenna can operate at multiband and multifrequencies with center frequencies of 2.324GHz, 2.649GHz, 4.8GHz.

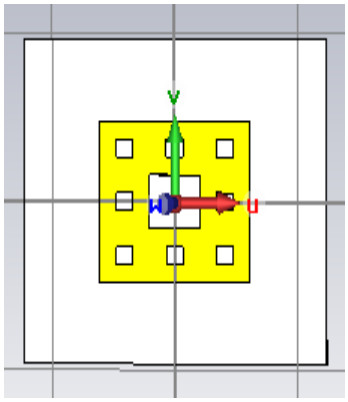

Figure 3.3

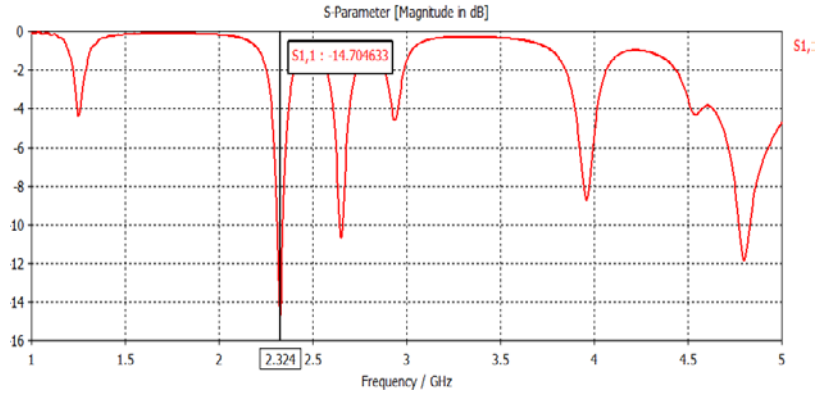

figure 3.4

No of iteration	Frequencies in GHz	Return loss in db
0th	1.434	-19.33
1st	2.332 2.6387	-12.02 -10.09
2nd	2.324 2.649 4.8	-14.70 -10.47 -11.823

Table 3.2

Conclusion: From this paper it can be concludes that as fractals are introduced in antennas they provide multiband and multifrequencies properties. And also size is reduced and cost also reduced by great extent.

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