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A Design of Sierpinski Fractal Antenna for Dual Band And Effect Of Inserting Grid On Performance Parameter

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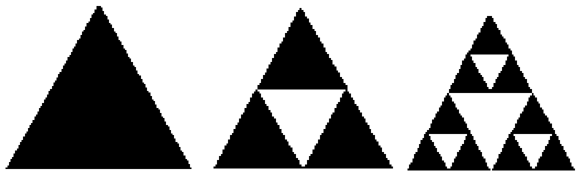
Abstract- **In this paper a dual band Sierpinski fractal antenna is proposed and result is taken by means of simulation after that a layer of low permittivity is inserted between the ground plane and the conducting plane and effect is also taken in account. So this is the two fold antenna which radiate efficiently at 520 MHz and 2.775 GHz. This frequency range can be effectively used in future telecommunication purposes in LTE.**

Key words-**Dual Band, Sierpinski Fractel, LTE application.**

I INTRODUCTION

Today the fractal antenna has a variety of use due to low cost, low profile, multiband and broadband nature. There are many structure have been proposed that will be used in future of telecommunication technology. Fractals are the small geographical structures that repeat themselves. This antenna is also a fractal antenna based on sierpinski fractal shape [1]-[4]. In this paper this antenna exhibits good impedance matching at centre frequencies. The Sierpinski gasket is named after the Polish mathematician Sierpinski who described some of the main properties of this fractal shape in 1916.The original gasket is constructed by subtracting a central inverted triangle from a main triangle shape as shown in Fig. 1. After the subtraction, three equal triangles remain on the structure, each one being half of the size of the original one. This is the first iteration of the Sierpinski fractal generation. One can iterate the same subtraction procedure on the remaining triangles and if the iteration is carried out an infinite number of times, the ideal fractal Sierpinski gasket is obtained. In such an ideal structure, each one of its three main parts is exactly equal to the whole object, but scaled by a factor of two and so is each of the three gaskets that compose any of those parts. Due to this particular similarity property, shared with many other fractal shapes, it is said that the Sierpinski gasket [5] is a
self-similar if a fractal antenna[6]-[8] is based on this type of geometry that will be multiband in nature.



Original triangle 1st iteration
2nd iteration
(Stage 1) (Stage 2)
(Stage 3)

Figure 1. Sierpinski fractal generation up to 2nd Iteration

II. ANTENNA DESIGN:

With the help of research paper [1].firstly a dimension of 33×76 mm of ground plane is taken. On ground plane firstly a triangular patch at 0.8 mm is formed whose dimensions are given below. For radiating plane dielectric constant is taken 3.38 i.e Arlon Material with loss tangent 0.0025. εr=3.38, δ=0.0025

a	b	c	d	e	f	g	h	i	j
76	33	5	0.5	36.71	18.73	10	43.81	39.3	43.02

Table: Dimension of Antenna Geometry in mm

Part:1

The Geometry is given in figure 2.This structure is simulated by means of coaxial cable whose feed line dimension is also given. Simulated structure gives return loss less than -10 dB in two frequency f1 and f2. at centre frequency and f1=0.518GHz, S11 is - 10.88dB and at f2=2.802GHz,S11 is -16.43dB .So it exhibit good impedance matching at both centre frequency. All the simulated data have been obtained by means of an electromagnetic simulator based on the method of moments (MoM) and ground plane is taken infinitely spread in all dimensions.

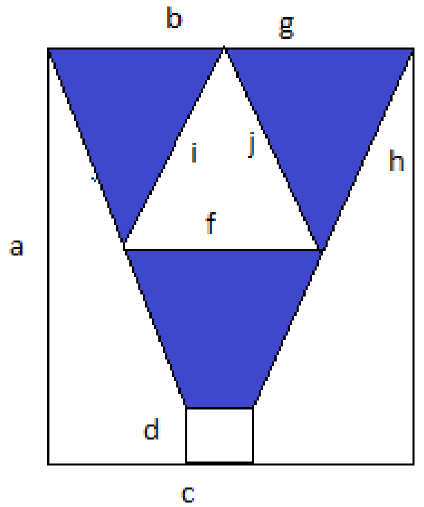


Figure 2: Antenna Geometry

III. EXPERIMENTAL RESULTS

Result at centre frequency f1 and f2 is shown figure 3 and figure 4,figure 5 and figure 6.

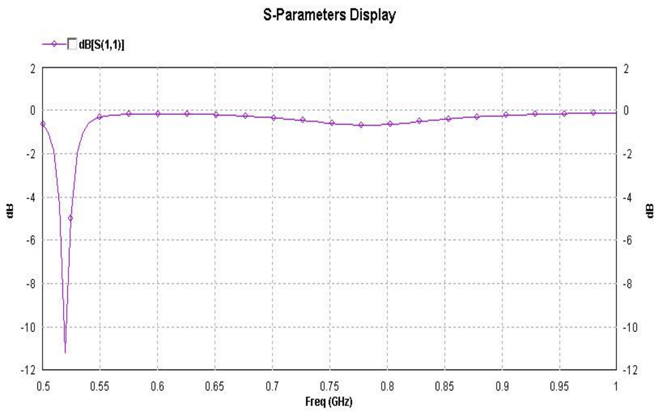


Figure 3:S11 parameter at centre frequency f1

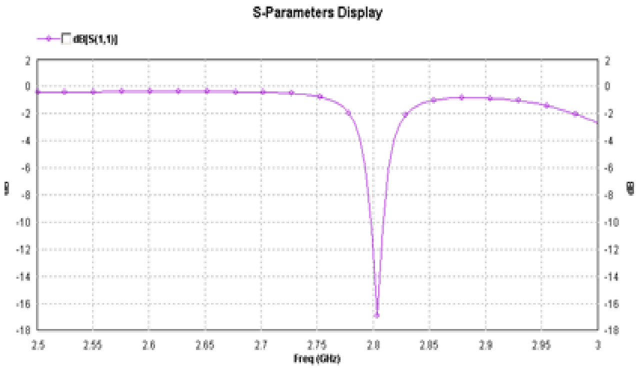


Figure 4: S11 parameter at centre frequency f2

Part: 2

After the design of part 1 a layer of dielectric constant 1.006 is placed between ground plane and the radiating plane which has thickness of 0.2 mm. By using this type of structure although there is reduction in return loss in both centre frequency but still less than -10dB and significant increase in radiation efficiency and gain. All the performance parameter also has increment value.
Centre frequency has also slightly variation
At f1= 520 MHz s11= -10.35dB
f2= 2.775GHz s11= -13.092dB

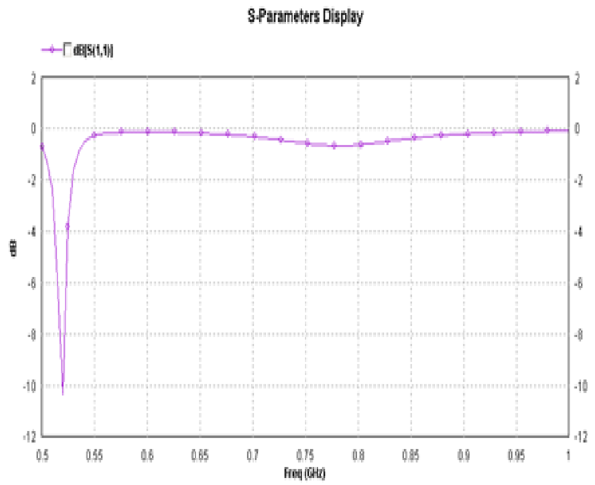


Figure 5: S11 parameter at centre frequency f1

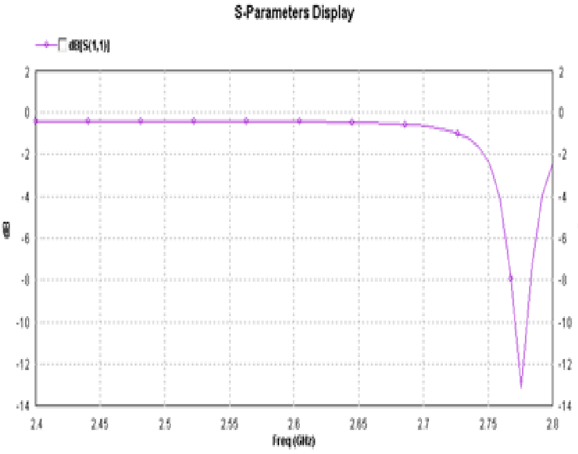


Figure 6: S11 parameter at centre frequency f2

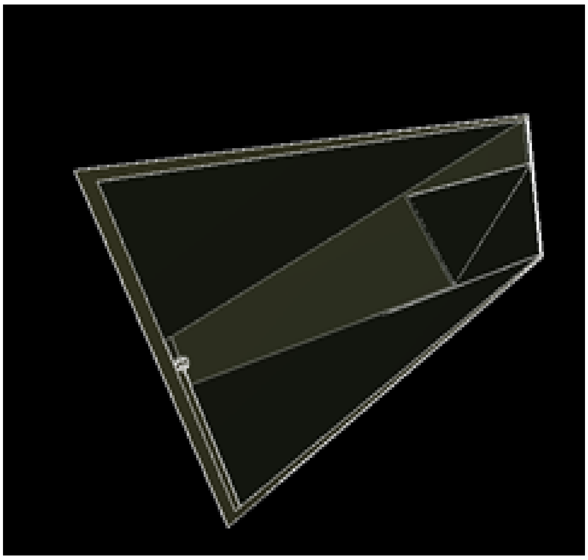


Figure 7: 3D Geometry of Proposed Antenna

In Figure 7 a layer of dielectric constant 1.006 and thickness of 0.2mm is inserted between ground plane and Radiating plane. This antenna exhibits maximum gain greater than 5dB at both centre frequencies.

IV.CONCLUSION

This paper is attempted to give an overview of designing a fractal patch antenna in stacked configuration, The proposed antenna is designed in which a second stage of the Sierpinski gasket (1st iteration) is used as a the Upper patch and fed with coaxial probe. This antenna has good impedance matching at frequencies 520MHz and 2775 MHz that can be very useful in future applications in telecommunication.

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