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Fractal Slot Antenna for Satellite and RFID Applications

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ABSTRACT: There are different types of antennas available to distinct application A fractal antenna uses self-similar design to maximize the length, or increase the perimeter of material that can receive or transmit electromagnetic radiation within a given total surface area or volume. and it increases electrical length, this proposed antenna design can be used in Satellite digital radio and RFID applications. In Wireless communications antennas plays a major role to direct the field in one all directions.. This paper also presents the detail step of designing fractal antenna. By using the slot structure to improve the return loss, gain, directivity .ADS software is used for designing of antenna

KEY WORDS: fractal slot, RFID, satellite digital radio, Maxwell's equation.

I.INTRODUCTION:

a. Fractal antenna:

Among these fractal types, Koch curve, sierpinsky gasket, carpet has variety of applications of operating in multiband .it has a wide application in the design of miniaturized wire antenna due to its unique self-similarity nature . to make a compact antenna with more conductivity can be achieved using this fractal structure. Under the expanding need of size reduction in Antenna design with low profile, fractal theory can help provide a great number of solutions for miniaturized antenna

b. Fractal with slot structure:

Fractal along with slot can help in improving return loss value which helps the antenna to operate in perfect matching condition. This selective adding of slot along the fractal length can improves matching. Probe feeding is used to feed the antenna. It is a simpler and one of the perfect methods of feeding

II.ANTENNA CONFIGURATION

Fractal Length	60mm
Width	19mm
Slot Width	0.5mm
Slot length	2mm

III.ANTENNA DESIGN

Koch curve with third iteration is designed for the dual band frequency of operation.
The fractal antenna is fed through various feeding technique as micro strip line feeding, inset feeding, coaxial feeding, proximity coupling feeding and aperture couple feeding [3]. We are using probe feeding with 50ohm impedance matching

c. Substrate material

FR4 is the fire retardant dielectric material with permittivity of 4.4 and loss tangent of 0.0022 and the thickness is 1.6mm.this material of substrate is chosen because of its low cost and low profile can exhibit good radiation of patch or antenna conductor.

IV.STRUCTURE DESCRIPTION AND OPERATION

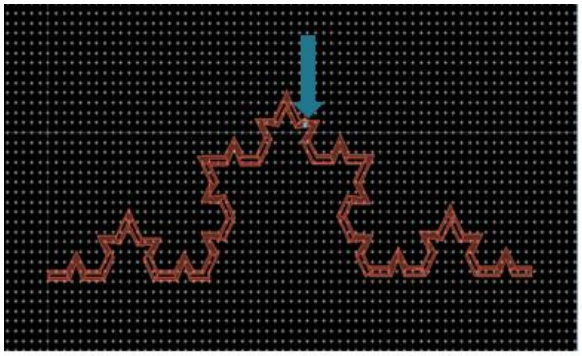
This antenna is designed for the half wavelength .i.e. 60mm and its cumulative distance through different iteration increases conductivity and electrical length.

The total structure is simulated using ADS 2013 layout simulation. when the design is done in millimeter layout it does the simulation process through meshing .Method of Momentum which solves Maxwell's differential equation to get the necessary electric as well as magnetic field components and radiation pattern for further analysis of performances.

The simulations are carried out using four different meshes: two generated by commercial application (Ansoft Designer), and two by a custom meshed (CGSM). For each mesh generator, 10 or 15 cells per wavelength are used. The following parameters are compared: input impedance, return loss, and peak accepted gain. Two different frequencies are presented. The results obtained using different meshes are found to be very similar.

V.RESULTS AND DISCUSSIONS

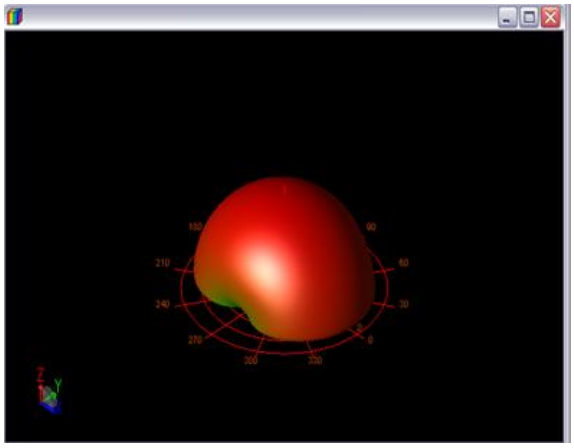
Figure 5.1 fractal with slot structure in ADS



The above structure is third iteration of koch curv and this with intermediate slots make the antenna to work with perfect matching of the port while inserting into the particular device of operation.

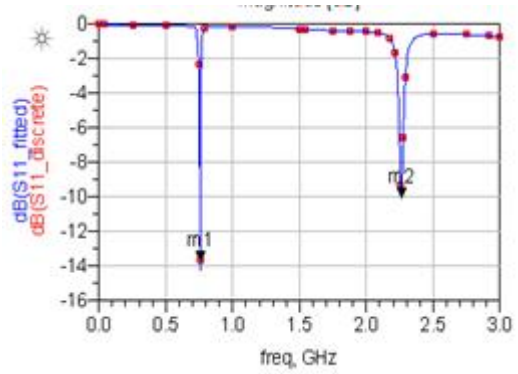
Meshing is generated for different structures through method of momentum and infinite element method this may solve the field equations in differential or integral form to obtain electric and magnetic field in phi as well as theta directions

Figure 5. 2 radiation pattern obtained at 854.6 MHz



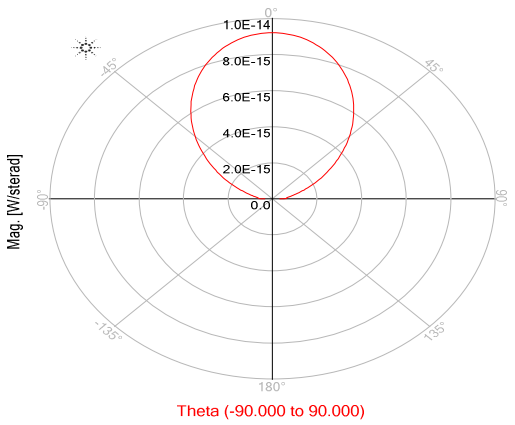
Radiation pattern is like a Omni directional pattern and it can be used for all directional reception and transmission of signal. which has more coverage throughout the area of propagation

Figure 5.3 return loss obtained at 854.6MHz and 2.3 GHz



The above return loss value indicates the antenna operating with minimum standing waves at the port. the probe feeding is given by checking the appropriate position ,to obatain maximum return loss value.

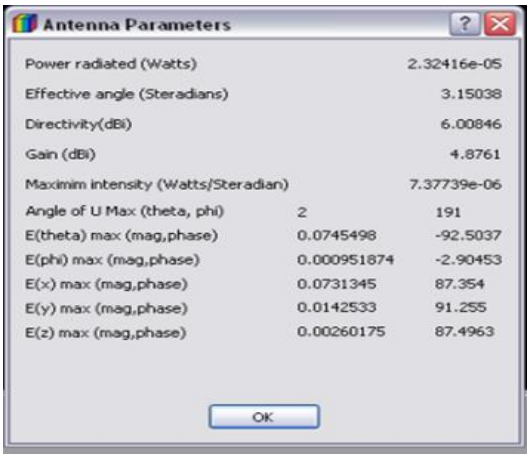
Figure 5.4 electric field distribution



ANTENNA GAIN AND DIRECTIVITY:

Gain is defining how much power radiated for the applying power and directivity is defining how efficiently the radiated power will be at given direction. and it is obtained for the proposed fractal structure is given below

Figure 5.3 gain and directivity



V.CONCLUSION

The proposed antenna has reduced mutual coupling because of its structure eliminates electrical field interference between nearby components using its reactive loading. Gain obtained is 4.8dB and directivity is 6dB.return loss -14 dB at 854.6MHz and -10dB at 2.3GHz

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