Repeated Plus Shape Slot Fractal Antenna For WiMAX/WLAN Application

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Abstract— This paper describes a repeated plus shaped slot fractal antenna .This antenna show multiband behavior due to self similarity in their structure. Proposed Antenna achieves wide bandwidth ranging from 2.20 GHz to 3.51 GHz. This antenna utilized dielectric substrate which has dielectric constant 4.4 and thickness 1.6mm. Proposed antenna show percentages bandwidth 45 and it offer gain 3.05dBi, directivity 3.32dBi and antenna efficiency 93.98% at resonant frequency 2.41 GHz. So this plus shape slot fractal antenna shows various applications for WiMAX/WLAN.

Keywords: Fractal Antenna, Multiband antenna, WLAN, WiMAX

I. INTRODUCTION

In the field of wireless communication micro strip patchAntenna plays a vital role. Micro strip patch antenna show various advantages for low profile communication system like low cost, low weight, flexibility and ease of integration with active devices. For monolithic microwave integrated circuit micro strip patch antenna show a good solution.

Micro strip patch antenna show some limitation like low bandwidth, low gain and it cannot process multiband .so for overcome this limitation many type of miniaturization technique ,like utilizing high dielectric substrate , applying reactive and resistive load and increasing the electrical length of antenna have been proposed and utilized .

Fractal geometry of antenna is a good solution for obtain better bandwidth result. Fractal geometry patch structure increases its effective electrical length at the same time reducing their overall geometrical size. Fractal antenna shows feature that it has a self similar structure and space filling properties. Fractal shaped structure has various advantages like multi band, wide bandwidth and reduced antenna size. Fractal antenna uses a self –similar design to maximize the length or increase the parameter on inside sections or the outer structure of material that can receive or transmit electromagnetic radiation within a given total surface area or volume[1].

In the present work, a plus shape patch is taken as a base shape and its iteration are placed touching the base shape.[2]Due this iteration performed the proposed antenna called as a repeated plus shaped slotted fractal antenna[3]. The substrate material play very important role in deciding the size and bandwidth of antenna [4]. For given antenna glass epoxy substrate utilized which has the dielectric constant 4.4 and the thickness of dielectric is 1.6mm.

II. ANTENNA DESIGN CONSIDERATION

The design of proposed antenna is shown in Fig 1. The ground plane length and width are taken 38mm and 40mm. For ground plane we utilized glass epoxy substrate which has dielectric constant 4.4 and height of plane 1.6mm [5]. The resonant frequency of antenna is 2.41 GHz. For making plus shape slotted patch we utilizing square patch which has side 2mm [6]. Line feed technique is used for feeding the antenna [7]. Line feed has length 2mm and width 13mm.

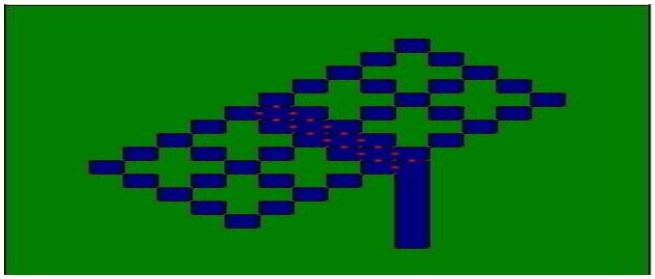

Fig. 1: Geometry of proposed plus shape slotted fractal Antenna.

Table 1 shown all specification for designing of plus shape slot fractal antenna.

S.N.	Parameters	Value
1.	Design resonance frequency	2.41GHz
2.	Dielectric constant	4.4
3.	Substrate height	1.6mm
4.	Ground plane length	38mm
5.	Ground plane width	40mm
6.	Side of square patch	2mm

Table 1: Antenna parameter specification

III. SIMULATION RESULT AND DISCUSSION

Plus shape slot fractal antenna for WiMAX/WLAN application simulated and analyzed by using IE3D software version 9.0 which is resonated at frequency 2.41 GHz . The percentage bandwidth of fractal antenna is 45 % and the antenna efficiency of proposed antenna is found to be 93.98%. The proposed antenna offer gain 3.05dBi and directivity 3.32 dBi .VSWR of proposed fractal antenna is in between 1 and 2 over entire frequency band.

Fig 3 to 8 shown different characteristic of plus shape slotted fractal antenna.

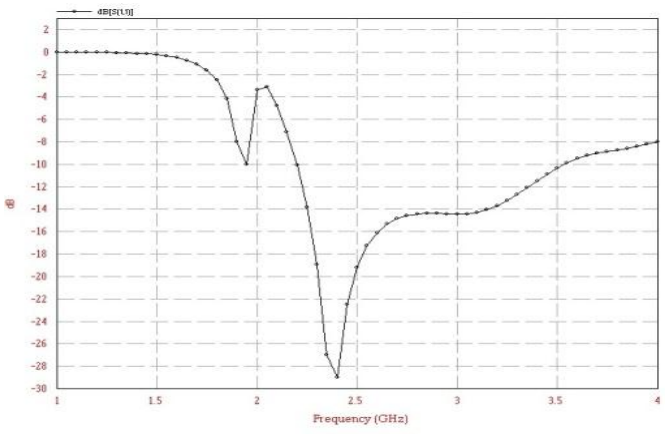

Fig. 2: shown the graph of resonant frequency of plus shape slotted fractal antenna. Resonant frequency in graph is 2.41GHz.Frequency band of antenna 2.2GHz to 3.51GHz.

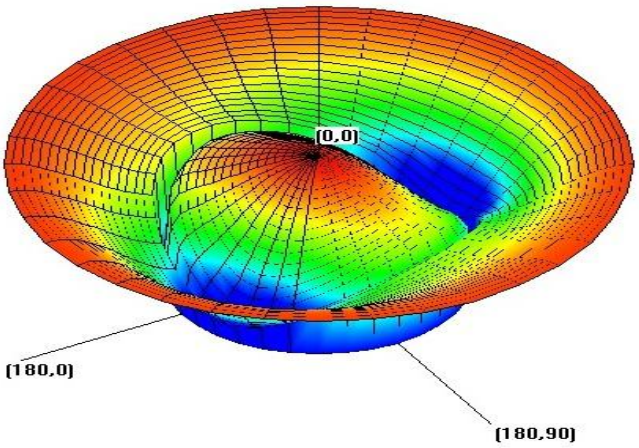

Fig. 3: shown the radiation pattern of fractal antenna

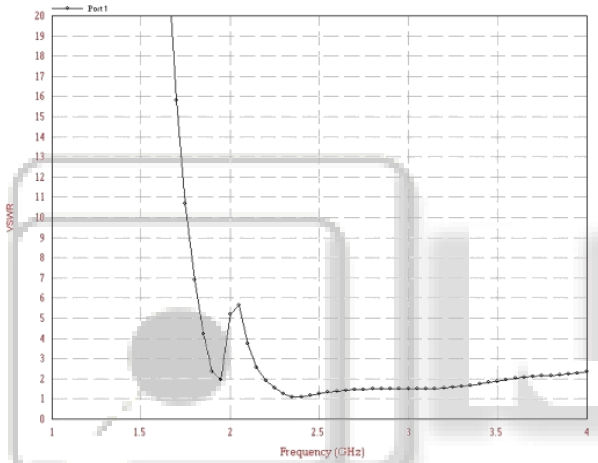

Fig. 4: shown the graph of radiation pattern of fractal antenna. VSWR of proposed fractal antenna is in between1 and 2 over entire frequency band which shown in fig.

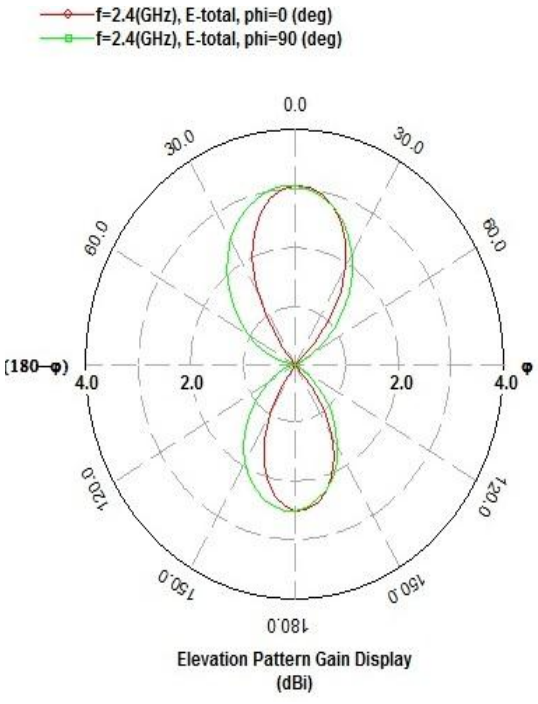

Fig. 5: shown the 2-d polar plot of plus shape slot fractal antenna. Fig shown Bi -directional radian pattern.

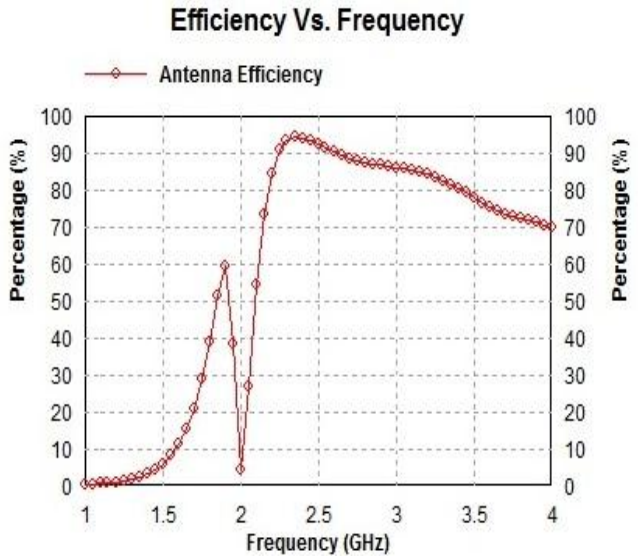

Fig. 6: shown the efficiency vs. frequency graph the antenna efficiency of fractal antenna is 93.98% at resonate frequency 2.41 GHz.

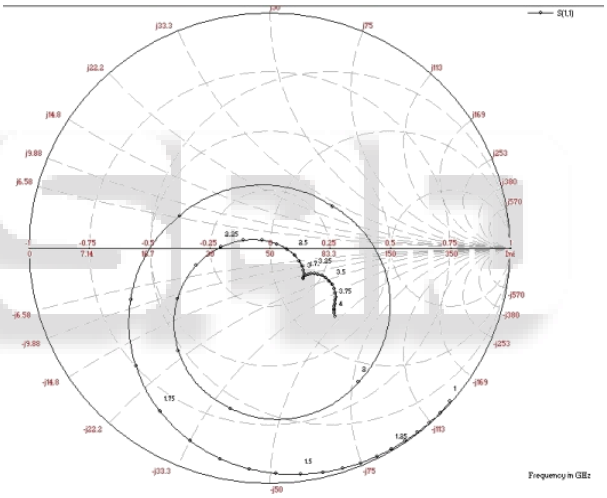

Fig. 7: shown the smith chart of fractal antenna

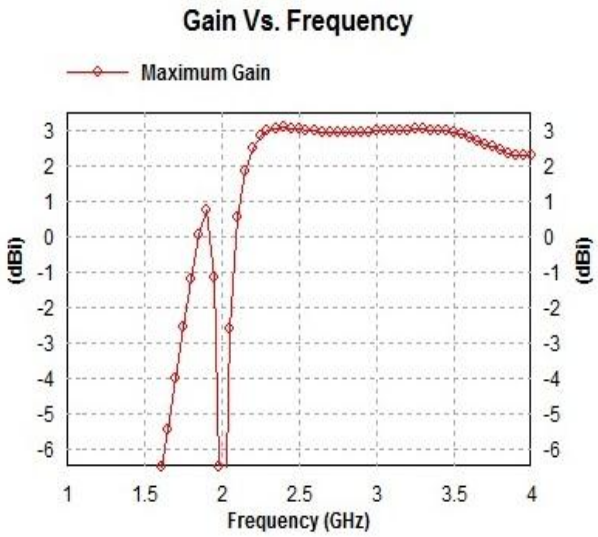

Fig. 8: shown the gain vs. frequency graph .Gain of antenna found 3.05dBi at resonate frequency 2.41 GHz.

IV. CONCLUSION

The characteristic of proposed fractal antenna studied through by IE3D simulation software. It is found that proposed repeated plus shape slot fractal antenna shows very high antenna efficiency which is equal to 93.98% and antenna cover the frequency range of 2.2GHz to 3.51GHz which is suitable for WLAN/WiMAX application[8-10]. It is found that fractal antenna provides much better result than simple patch antenna

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