Jupiter Publications Consortium

Vol. 3 Iss.4, pp. 18-21, 29th Mar, 2018
ISSN Print : 2454-1435 © 2018, IJRMMAE
ISSN Online : 2454-1443 © 2018, IJRMMAE
http://www.ijrmmae.in

International Journal of Research in Mechanical, Mechatronics and Automobile Engineering (IJRMMAE)

Fractal Tree Patch Antenna for Wireless Applications

Dr.H.Naganna
Department of Information Technology,Shadan College of Engineering and Technology HYD,T.S,INDIA
Received 02, February 2018 | Accepted 29, March 2018

Abstract - This paper gives a fractal tree patch antenna for multiband applications. The proposed antenna consists of scaled variations of round patch with a square slot and rectangular connectors. The antenna has been printed on FR4 epoxy substrate with thickness 1.6mm and relative permittivity of 4.4. All simulations in this work have been carried out by way of using the High Frequency Structure Simulator software (HFSS 13). The proposed antenna with fractals produces a penta-band operation for the S, C, X, Ku and K band applications.
Index Terms - Circular patch, Fractal, Multiband.

I. INTRODUCTION

Wireless communication is one of the terrific areas in the communication field. To accommodate special requirements in wi-fi verbal exchange we want to design multiband antenna. The patch antenna is commonly used in verbal exchange structures due to the fact of its more than a few benefits such as simple design, high efficiency, low profile and low fabrication cost. The main disadvantage of early patch antenna designs consists of the enormously large size and the narrow bandwidth. Different designs have been developed to overcome the inadequacy in the characteristics of patch antennas and the problem lies in the graph of compact antennas for UWB purposes [1-5].

The fractal nature of the antenna shrinks its size, barring the use of any factors such as capacitors, inductors and diodes. This makes the fractal antenna a fantastic design for wideband and multiband applications. The key characteristic of the fractal antennas is the repetition of their motif over two or extra iterations. The fractal antennas are very compact, multiband or wideband, and have beneficial purposes in cellular and microwave communications.

Nowadays a lot of fractal antennas are added with one of a kind shapes [6-9]. A pentagonal shape with Koch fractal etched internal the patch is developed in [10]. A hexagonal fractal antenna for UWB and multiband operation is brought in [11].

This paper gives a tree structured fractal antenna for multiband applications. The antenna offers suitable performance in five one-of-a-kind frequency bands (3.35–7.47 GHz, 9.28–11.84 GHz, 12.78–14.35 GHz, 14.7–16.52 GHz and 18.3–25 GHz) and is appropriate for military, radar, satellite applications. Section II offers the details of the antenna design. Section III discusses simulations and optimizations of performance of the antenna. The results are discussed in area IV. Conclusion is summarized in Section V.

Jupiter Publications Consortium

Vol. 3 Iss.4, pp. 18-21, 29th Mar, 2018
ISSN Print : 2454-1435 © 2018, IJRMMAE
ISSN Online : 2454-1443 © 2018, IJRMMAE
http://www.ijrmmae.in

International Journal of Research in Mechanical, Mechatronics and Automobile Engineering (IJRMMAE)

II. ANTENNA DESIGN

The geometrical construction of the fractal tree starts with a circular patch with a square slot. Figure 1 shows the base shape of the proposed fractal geometry.

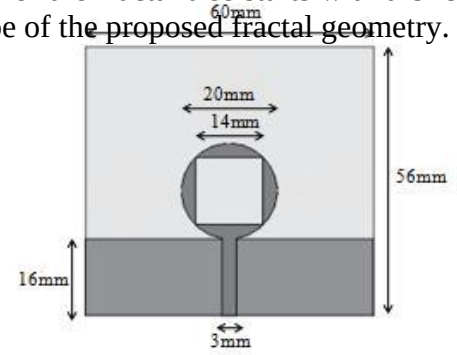

Figure 1 Base shape

The penta-band fractal tree antenna introduced here consists of a partial ground plane and 50-Ω microstrip feed line and is printed on the FR4 epoxy substrate of relative permittivity 4.4 and loss tangent tan δ= 0.02 with thickness of h =1.6mm. The proposed antenna is designed by way of scaling the base shape and arranging it outside the base shape as shown in Figure 2.

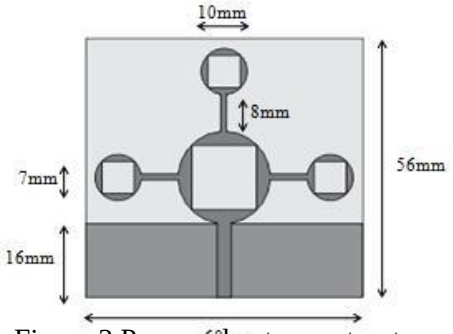

Figure 2 Proposed antenna structure

III. SIMULATIONS AND OPTIMIZATIONS

The performance of the antenna and determination of the parameters was once analyzed with the aid of simulating using High Frequency Structure Simulator software. Return loss traits of designed antenna for exclusive new release degrees are depicted in Figure.3.

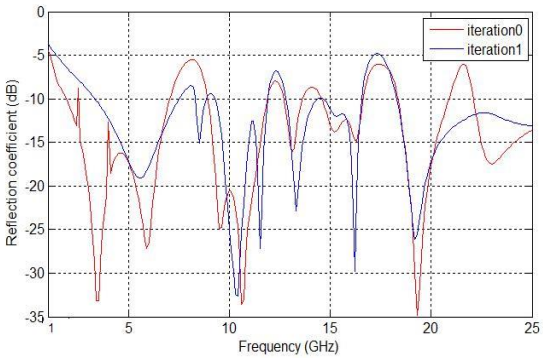

Figure 3 Return loss of proposed antenna structure for various iterations

The similarly iterations are not regarded considering that the antenna measurement will expand with the iterations. The antenna used to be simulated on one-of-a-kind substrates having unique dielectric regular and thickness and the results are illustrated in Figure 4..

.

Jupiter Publications Consortium

Vol. 3 Iss.4, pp. 18-21, 29th Mar, 2018
ISSN Print : 2454-1435 © 2018, IJRMMAE
ISSN Online : 2454-1443 © 2018, IJRMMAE
http://www.ijrmmae.in

International Journal of Research in Mechanical, Mechatronics and Automobile Engineering (IJRMMAE)

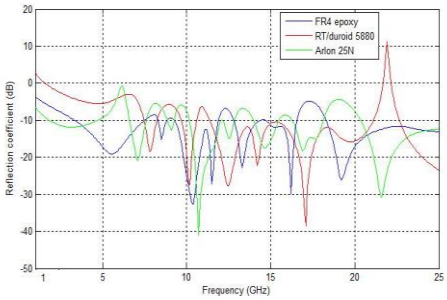

Figure 4 Return loss of proposed antenna on different substrates

IV. RESULTS

The designed penta-band antenna has the capability to operate on various frequency bands. Figure 5 indicates the ensuing antenna return loss response. From the consequences the measured bandwidths are from 3.35–7.47 GHz, 9.28–11.84 GHz, 12.78–14.35 GHz, 14.7–16.52 GHz, and 18.3–25 GHz for S11 ≤ -10dB which corresponds to VSWR < 2.

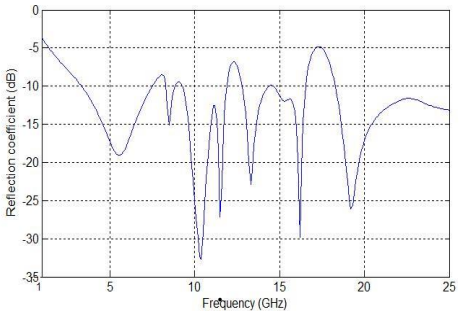

Figure 5 Return loss of proposed antenna

The simulated VSWR of the proposed antenna is shown in Figure 6 which satisfies the values of proposed antenna.

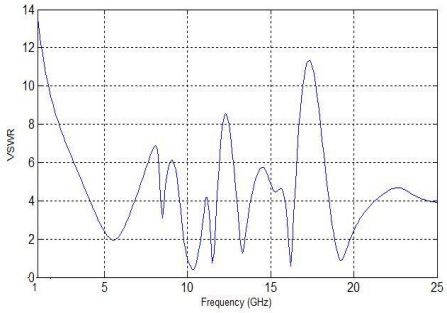

Figure 6 VSWR of proposed antenna

The antenna characteristics are tabulated in Table 1.

Table 1 Characteristics of the proposed antenna

Resonant Frequency(GHz)	Return Loss (dB)	Bandwidth (MHz)
5.5	-19.06	4120
10.3	-32.50	2560
13.2	-22.52	1570
16.2	-29.77	1820
19.1	-25.98	6700

The assessment of the designed antenna with some of the until now stated multiband antennas

Vol. 3 Iss.4, pp. 18-21, 29th Mar, 2018
ISSN Print : 2454-1435 © 2018, IJRMMAE
ISSN Online : 2454-1443 © 2018, IJRMMAE
http://www.ijrmmae.in

International Journal of Research in Mechanical, Mechatronics and Automobile Engineering (IJRMMAE)

are proven in Table 2, from the comparison the proposed antenna is determined to be compact and easy in design.

V. CONCLUSION

This paper gives the microstrip line fed fractal antenna for wi-fi applications. Antenna parameters such as return loss, VSWR two and radiation patterns are discovered two and analyzed. On analyzing the simulated consequences it shows that the proposed two antenna two exhibits accurate performance in 5 exceptional bands 3.35 – 7.47 GHz, 9.28 – 11.84 GHz, 12.78 –14.35 GHz, 14.7 – 16.52 GHz and 18.3 – 25 GHz which makes it is appropriate for a number wi-fi frequency bands of distinct applications.

REFERENCES

[1] Liang, Jianxin, et al. "Study of a printed circular disc monopole antenna for UWB systems." IEEE transactions on antennas and propagation 53.11 (2005): 3500-3504.
[2] Ray, K. P., and Y. Ranga. "Ultrawideband printed elliptical monopole antennas." IEEE transactions on antennas and propagation 55.4 (2007): 1189-1192.
[3] Dang, Lin, et al. "A compact microstrip slot triple-band antenna for WLAN/WiMAX applications." IEEE Antennas and Wireless Propagation Letters 9 (2010): 1178-1181.
[4] Cao, Wen-quan, et al. "Capacitive probe-fed compact dual-band dual-mode dual-polarisation microstrip antenna with broadened bandwidth." IET Microwaves, Antennas & Propagation 11.7 (2017): 1003-1008.
[5] Hu, Wei, et al. "Compact triband square-slot antenna with symmetrical L-strips for WLAN/WiMAX applications." IEEE Antennas and Wireless Propagation Letters 10 (2011): 462-465.
[6] Aziz, Rao Shahid, Majeed AS Alkanhal, and Abdel-Fattah Sheta. "Multiband fractal-like antennas." Progress In Electromagnetics Research 29 (2011): 339-354.
[7] Mahatthanajatuphat, Chatree, et al. "A rhombic patch monopole antenna with modified Minkowski fractal geometry for UMTS, WLAN, and mobile WiMAX application." Progress In Electromagnetics Research 89 (2009): 57-74.
[8] Hamdy, Salah, et al. "A new fractal-like tree structure of circular patch antennas for 5G multi-band and wide-band applications." Progress in Electromagnetic Research Symposium (PIERS). IEEE, 2016.
[9] Yu, Zhen, et al. "A novel Koch and Sierpinski combined fractal antenna for 2G/3G/4G/5G/WLAN/navigation applications." Microwave and Optical Technology Letters 59.9 (2017): 2147-2155.
[10] Khan, Omar Masood, et al. "Novel miniaturized Koch pentagonal fractal antenna for multiband wireless applications." Progress In Electromagnetics Research 141 (2013): 693-710.
[11] Azari, Abolfazl, and Javad Rowhani. "Ultra wideband fractal microstrip antenna design." Progress In Electromagnetics Research 2 (2008): 7-12.