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A Multiband Modified Circle Fractal Antenna for wireless Applications

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Abstract— In this paper, a modified circle fractal antenna is proposed for wireless applications. The antenna under investigation is fed by a 50 ohm microstrip line. The basic shape of the fractal antenna is a circle which is modified with a monopole and iteration of self similar design. Wide bandwidth of 2.62 GHz and 5.73 GHz is obtained between 1.26-3.88 GHz and 4.73-10.86 GHz respectively. Various parameters of the proposed antenna is studied thoroughly and presented in the paper.

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Keywords—Monopole Antenna, microstrip feed line, wide bandwidth, gain, vswr, Returnloss.

INTRODUCTION

In recent times, wireless communication has replaced wired communication and antennas play a vital role in this transition. Microstip patch antennas are always an obvious choice due to its inherent advantages of low profile, light weight and low cost. But they usually suffer from narrow bandwidth problem [1][2]. In order to overcome this shortcoming several approaches are followed viz. making slots in the patch or stacking two patches etc [3]. But this renders the boundary conditions and cavity model invalid for design and analysis. Moreover CPW fed antennas are preferred for wireless applications because of their uniplanar geometry, easy integration with other passive elements and ease of fabrication. Fractal antennas have the advantage of small size and multiband characteristics with wide bandwidth [4]. In this paper, a novel modified circle fractal antenna is proposed for wideband applications. The main aim of this investigation is to miniaturize the antenna dimension and getting wide bandwidth [5]. The designed antenna is operating in the UWB range as is assigned by FCC. The entire antenna designs as well as simulations are performed in HFSS 2014.

THE BASIC CONCEPT

A circular monopole antenna is designed with a radius of r is 21.05mm and width, length of feedline is 2.5, 21.5mm. The dielectric substrate has a height of 1.6mm and a relative permittivity is FR4 of 4.4. The antenna is fed by a 50 ohm microstrip feed line and width of an etching circular ring is 2mm.

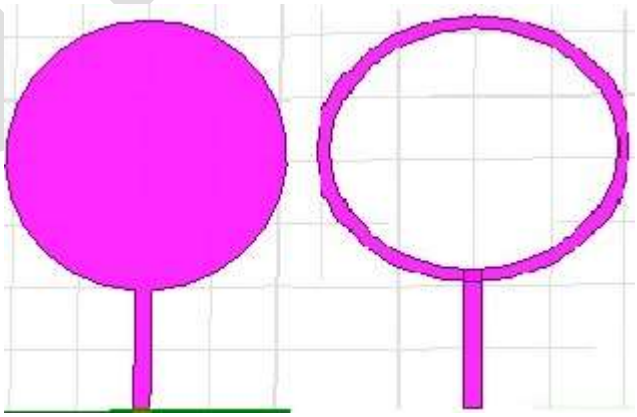

Fig. 1.1 Monopole and etching of Circular shape antenna.

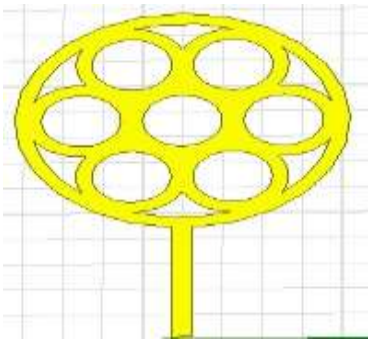

Fig. 1.2Basic concept of iteration in circular shape antenna

DESIGN OF THE PROPOSED ANTENNA

Fig.1.2 depicts the circular antenna iterate in small circular ring after etching.so, the radius r is 7mm and width of feed is 2.5mm, length of feed is 21.5mm.the dimension of the 50 ohm microstrip feed line is taken as 60 x 80 mm^2 and height of substrate is 1.6mm, permittivity is 4.4 using FR4 epoxy shown in Fig.1.3.Fig.1.4 shows a thin sheet of length 22.2mm is used as ground. The dimension of the 50 ohm microstrip feed line is taken and dimensions of ground is 13.6 x 60 mm^2.In order to achieve wide bandwidth using circle fractal modified antenna shows a Fig.1.3 and using a detailed design of the antenna in HFSS 2014. Fig.1.4 shows the back side of the antenna having half ground.

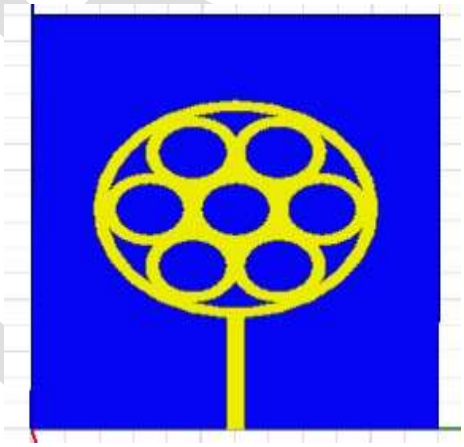

Fig. 1.3 Front View of the proposed antenna

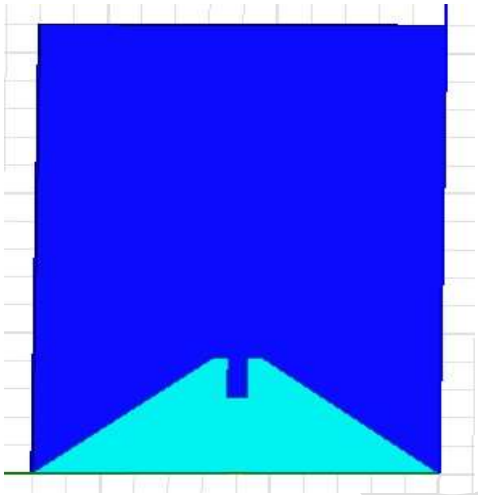

Fig.1. 4 Back side view of the proposed antenna

SIMULATION RESULTS

Fig.1.5 shows the return loss vs. frequency plot of the proposed antenna. It can be seen from the graph that the antenna resonates at 1.29,2.62GHz,3.81GHz,4.73GHz,5.24GHz, 6.88GHz and 10.74GHz having return loss of -10.58dB, -24.57dB, -10.37dB, -21.7dB, -39.74dB and -10.16 dB respectively.

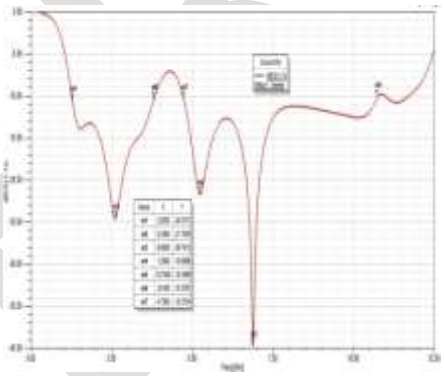

Fig. 1.5 Return Loss of the proposed antenna

Fig.1.6 shows the radiation pattern of the antenna at 3.15 GHz is 1.54dB gain respectively. Radiation patterns are obtained by

Varying theta (θ) and phi (φ) angles. Here, only θ values are varied but φ remains constant to zero value.

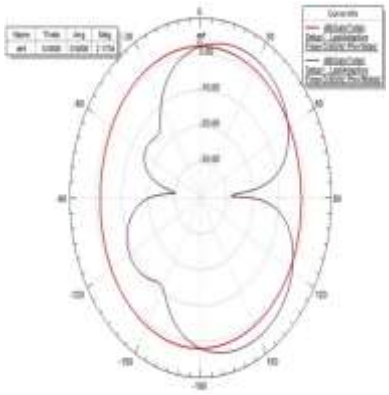

Fig.1.6 Radiation pattern of the antenna at 3.15 GHz

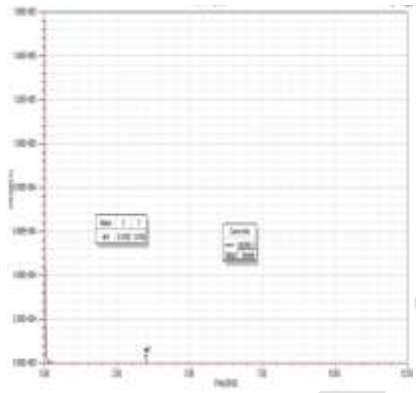

Fig.1.7 Vswr of the circle fractal antenna

CONCLUSION

In this paper, a multi band antenna is used for commercial purpose. The proposed antenna operates in 1.29-10.74GHz band which covers all the frequency range and it can cover an ultra wideband range. From above results, it is concluded that modified circle fractal geometry in circular slot antenna gives better radiation characteristics and vswr. Multi band antenna geometry has to reduce an antenna size. So, this design has shown compactness and can be incorporated for short and long range communication systems. The applications of proposed antenna are in wireless communication. Also, simulation results have been validated with measurements. This antenna will have future scope in UWB when ground of length and width change and create a notch range of 2-3GHz frequency.

REFERENCES:

[1] Daniel Valderas, Juan Ignacio Sancho, David PuenteCong and Ling, Xiaodong Chen,"Ultrawide band antennas,"2011.

[2] Osama Haraz and Abdel-Razik Sebak," UWB Antennas for Wireless Applications,"2013.

[3] J. R. James and P. S. e. Hall, "Handbook of Microstrip antennas, peter peregrinus", 1989.

[4] D. M. Pozar and D. H. Schaubert, "Microstrip Antennas, the analysis and design of microstrip antennas and arrays," 1995.

[5] H. Jones, "Fractals and chaos," 1990 .

[6] A. Sappan, " A new broadband stacked two layered microstrip antenna," *IEEE Trans. Antenna Propag.*, vol. 49, pp. 1094-1100,2001.

[7] Mustapha Iftissane, Seddik Bri, Lahbib Zenkour, Ahmed Mamouni,"Conception of Patch Antenna at Wide Band", Sept2011.

[8] Ma, T.G., and Wu, S.J.: 'Ultra wideband band-notched folded strip monopole antenna', IEEE Trans. Antennas Propag, 2007, 55, (9), pp. 2473–2479
[9] Su, S.-W., Wong, K.-L., and Chang, F.-S.: 'Compact printed ultra wideband slot antenna with a band notched operation', Microw.Opt. Technol. Lett., 2005, 45, (2), pp. 128–130.
[10] Jin Jun, Zhong Shun-Shi, "Ultra-wideband printed antennas with band notch function," Journal *of Shanghai University*, 2007, 13(2):111-115