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AN ARRAY OF MONOPOLE FRACTAL ANTENNA FOR WIRELESS APPLICATIONS

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ABSTRACT

In this work,we proposed array of monopole fractal antenna for wireless applications.The proposed antenna possess two homogenous wide slot antennas. It operates over frequencies of 2.4GHz, 6GHz, 6.2GHz, 6.4GHz, 7.5GHz, 7.8GHz for wireless applications and operates over a wide band from 9.6GHz to 10.8GHz and also operates at frequencies of 12.5GHz , 13.2GHz,13.5GHz and 13.8GHz for military applications. A high gain of 9db is obtained by the array of antennas used. The returnloss and other performance characteristics of the proposed antenna are investigated by means of HFSS software.

Keywords: Array, Fractal Antenna, Monopole, Wireless applications.

I. INTRODUCTION

Microstrip patch antenna is a printed type antenna with a dielectric substrate consisting of a relative permittivity and permeability which is sandwiched in between a ground plane and a metallic patch. Microstrip patch antennas have many advantages when compared to other complex and bulky antennas such as its low fabrication cost, its light weight, low volume, and low profile configurations. But they also have some drawbacks like narrow bandwidth, low power handling capability and low gain. But with technology advancement and extensive research into this area these problems are being gradually overcome. The microstrip antennas are found in some of the useful applications like wireless communications, satellite communications, remote sensing, global positioning system etc.

Wireless communication is one among technology's biggest contribution to mankind. It involves the transfer of information over a distance without help of wires, cables or any other forms of electrical conductors or any type of operation that is implemented without use of wires. Wireless operation permits services, such as long range communications, that are impossible or impractical to implement with the use of wires. The most common use of wireless networks is to connect the laptop/moile data communication users who travel from location to location. Some of the devices used for wireless communication are cordless telephones, mobiles, GPS units, wireless computer parts, and satellite television. Another important use is for mobile networks that connect through antennas, via satellite communications. Wireless communication is used in different modes like radio frequency communication, microwave communication and infrared short range communication.

Single element antennas are sometimes unable to meet the gain or radiation pattern requirements. Combining single antenna elements in an array may be possible solution. Antenna arrays provide improved directivity compared to single radiator antenna. The directivity of an array is due to interference effects between individual elements of array, which means that spatial distribution of the elements as well as phases and magnitudes at each alement need to be turned for optimal performance. In recent years, and with the evolution of telecommunications systems,antennas bcome an indispensable tool for any wireless communication. Thus, the development of new architectures of networks require a major technological development of these antennas. It becomes imperative to have antennas with large min beam, to allow significant depositing without increasing losses due to the deformation of the radiation diagram. In this way, microstrip antennas are designed to meet the requirements posed by this development which also tends towards the miniaturization of the electronic devices. With their small dimensions and their performances, microstrip antennas are particularly adptable to the mobile equipment. Moreover, their flexibility allows them to take form of surface on which are disposed.

These antennas are proved their effectiveness and tend to replace the traditional antennas definitely. The association of microstrip in arrays , which is subject of deepened studies, permits to improve their performances and to realize particular functions adapted to some types of application such as: depositing and electronic sweeping, rejection of the jammers, synthesis of radiation diagrams with variable forms and directions. Such arrays are widely studied and many synthesis techniques are already developed .

II. ANTENNA GEOMETRY AND DESIGN

Fig.1 illustrates the geometry structure of designed array of monopole fractal antenna. The proposed antenna is printed on a substrate with relative permittivity of 2.65, a loss tangent of 0.002 and a thickness of h=1.6mm. The size of the antenna is 25×48mm2 (L×W). The proposed antenna consists of two identical fractal antenna, each set of fractal antenna has a rectangular wide slot. The line fed structure consists of a transmission signal strip line with a signal strip width W3=3.6mm, and gap between the microstrip patch and transmission signal strip is of the width 0.2mm.

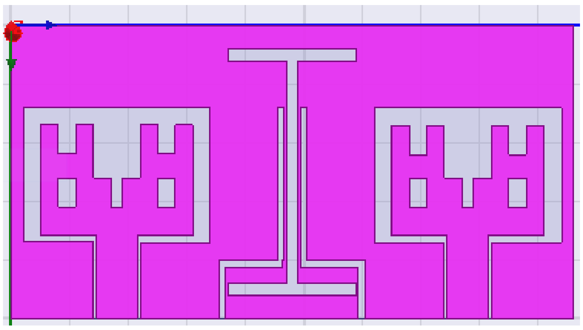


Fig.1 Front View of the Design

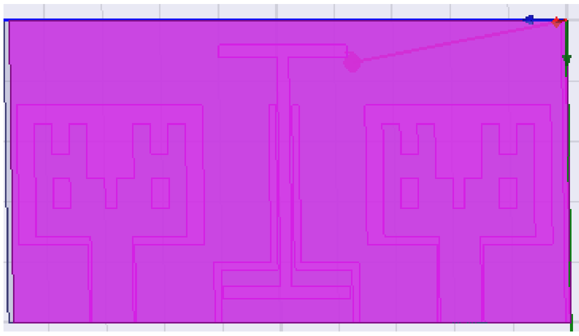


Fig.2 Back View of the Design

In order to reduce the coupling between the two fractal antennas, multiple slots were embedded in the patch on the substrate. By adjusting the dimesions of proposed multiple slots, high isolation can be achieved. The diversity antenna was investigated by means of HFSS.

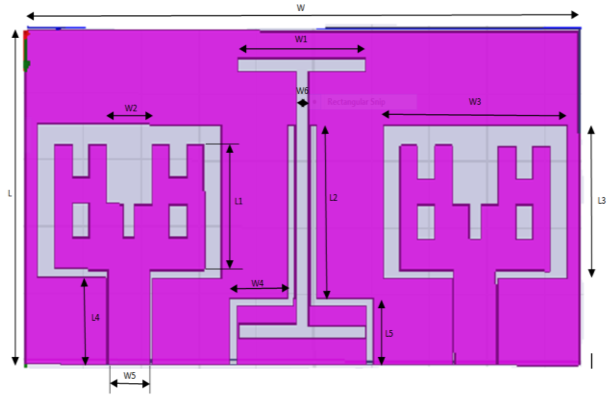


Fig.3 Design of the Antenna with Dimensions

The table below gives the dimensions of the antenna.

LENGTH L = 25mm	WIDTH W = 48mm
L1 = 9.4mm	W1 = 11mm
L2 = 13mm	W2 = 4mm
L3 = 11.5mm	W3 = 16mm
L4 = 6.5mm	W4 = 5.5mm
L5 = 5mm	W5 = 3.6mm
	W6 = 1mm

III. NUMERICAL RESULTS

(a) RETURN LOSS:

Return loss is a measure of how well the devices or lines are matched.The return loss curve of the proposed array of monopole fractal antenna is shown in the fig.4 below.

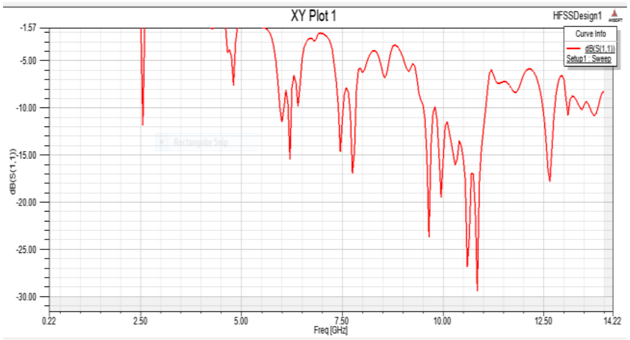


Fig.4 Return loss of proposed fractal antenna.

From fig.4 the proposed diversity fractal antenna with multiple slots operates at frequencies required for wireless applications,satellite applications and also operates in all the frequencies ranging from 9.6GHz to 10.8GHz.

(b) VSWR:

Most of wireless system operates at 50 ohms impedence. A VSWR(Voltage to Standing Wave Ratio) of 1 indicates an antenna impedence of exactly 50 ohms. The VSWR curve of the proposed antenna is shown in the fig.5 below.

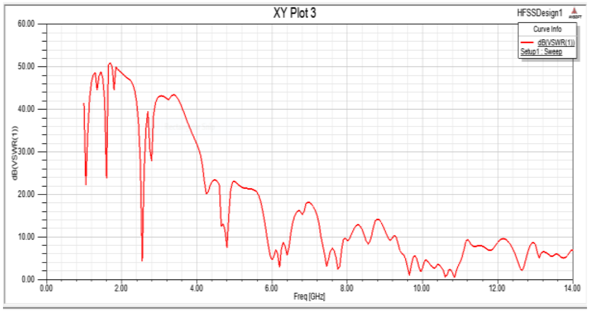


Fig.5 Voltage to standing wave ratio of the proposed antenna.

(d) GAIN:

The gain of an antenna is essentially a measure of the antenna's overall efficiency. A gain of 4.6 db is obtained for the antenna proposed here.

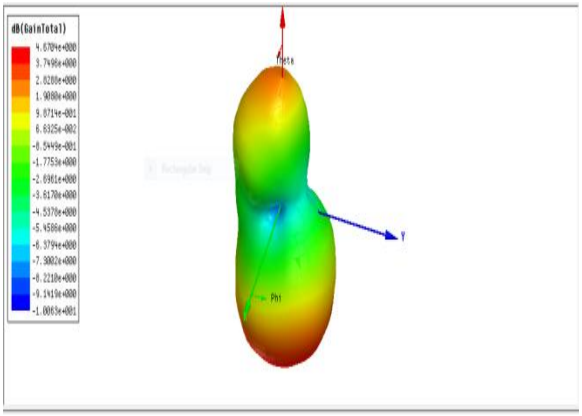
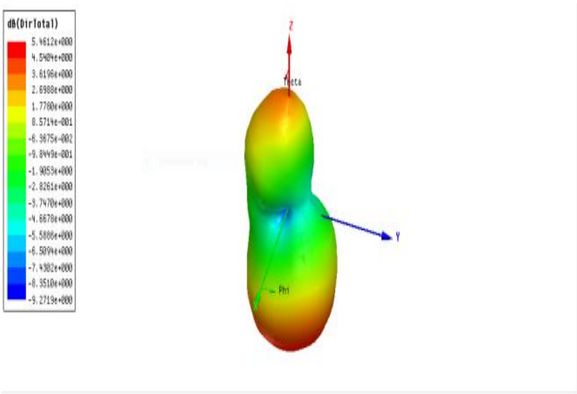


Fig.6 Gain of the proposed antenna.

(e) DIRECTIVITY:



Any antenna is said to have 100% efficiency if the obtained gain and directivity are equal. The gain and directivity of the proposed antenna are nearly equal.

(f) RADIATION PATTERN:

The radiation pattern of the proposed antenna is shown in the fig.7 below.

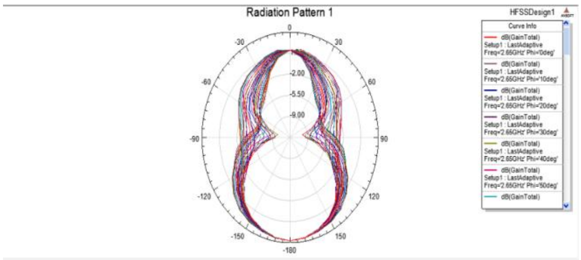


Fig.7 Radiation pattern of the proposed array of fractal antenna.

IV. CONCLUSION

In this work an array of monopole fractal antenna is proposed and discussed. Two identical U-shaped fractal antennas are taken and multiple slots are embedded on the patch which is present on the substrate. The simulation and numerical results show that the proposed antenna can well meet the requirement of wireless communication and satellite communication applications.

REFERENCES

[1] Y. S. Li, X. D. Yang, C.Y. Liu, and T. Jiang, Miniaturization cantor set fractal UWB antenna with a notch band characteristic, Microwave and Optical Technology Letters, vol.54, no.5, pp.1227-1230, 2011.

[2] Y. Li, W. Li, Q. Ye, Compact reconfigurable UWB antenna integrated with SIRs and switches for multi-mode wireless communications, IEICE Electronics Express, vol.9, no.7, pp.629-635, 2012.

[3] M. Al-Husseini, A. Ramadan, K. Y. Kabalan, A. El-Hajj, and C. G. Christodoulou, A novel printed diversity antenna for WiMAX applications, IEEE International Symposium on Antennas and Propagation (APSURSI), pp. 2212-2214, 2011.

[4] K. Chung and J. H. Yoon, Integrated MIMO antenna with high isolation characteristic, Electronics letters, Vol.43, No. 4, pp.199-201,2007.

[5] M. S. Sharawi, S. S. Iqbal, and Y. S. Faouri, An 800MHz 2□1 compact MIMO antenna system for LTE Handsets, IEEE Transactions on Anntennas and Propagation, vol.59, no.9, pp.3128-3131, 2011.

[6] S. Zhang, Z. N. Ying, J. Xiong, and S. L. He, Ultrawideband MIMO/diversity antennas with a tree-like structure to enhance wideband isolation, IEEE Antennas and Wireless Propagation Letters, vol.8, pp.1279-1282, 2009.

[7] H. T. Chattha, Y. Huang, X. Zhu and Y. LU, A dual feed PIFA diversity antenna for MIMO systems, 2010 International Workshop on Antenna Technology (iWAT), 2010.

[8] M. S. Han and J. Choi, Multiband MIMO antenna with a band stop filter for high isolation characteristics, IEEE International Symposium on Antennas and Propagation (APSURSI), 2009.