Multiband Monopole Antenna with Sector-Nested Fractal

Prof. A. A. Trikolikar[1], Rohit Kotkar[2], Akshay Patil[3], Mahesh Wankhede[4]
[1, 2, 3, 4] Department of Electronics and Telecommunication
[1, 2, 3, 4] Savitribai Phule, Pune University

Abstract- *In this paper we have design the multiband monopole antenna with sector nested fractal having operating range of 2.44Ghz/3.5Ghz/5.2Ghz and 508Ghz.Also the calculate following parameter like Gain, VSWR, Directivity, Reflection coefficient. In design of antenna cpw(coplanar wave guide)feed is used antenna with trapezoidal shape. The pattern and impedance measurement of antenna show a good performance over the WLAN/WIMAX band. The proposed antennas have a promising application in other fields like computer graphics and for used broadcasting.*

Keywords- sector nested, fractal antenna, trapeziform ground plane, multi-frequency

I. INTRODUCTION

Development of high data rates wireless communication system and the increase of the communication frequency bands put forward the demand for multi-band antennas. In a fixed space, there usually exist many different communication systems, such as wireless local area network System mobile communication system, etc. This wireless systems need the antennas which could work on different frequencies and modes. For example the working

Frequencies for the wireless local area network (WLAN) are 2.4 GHz and 5.2 GHz, and those for the GSM wireless mobile terminal are 900 MHz and 1800 MHZ. So we really need an antenna, it can meet the requirements of different applications for the band and also can guarantee the gain of antenna. Antenna can work on different frequency bands and the corresponding radiation characteristics within each frequency band can be guaranteed. Fractals have self similar shapes and can be subdivided in parts such that each part is a reduced size copy of the whole. The self-similarity of fractals is the cause of multi-band property and their complicated shapes contribute to the design of antennas with smaller size. Fractals have convoluted and jagged shapes and these discontinuities will increase bandwidth and weaken the effective radiation of antennas. The space filling Property of fractal makes curves which have long electrical length be fitted into a compact physical volume.

The typical fractal antennas in recent years include Sierpinski fractal antenna, Koch fractal antenna and Minkowski antenna novel sector-nested fractal antenna is studied, which a single-plane printed monopole antenna having feeding as a trapeziform ground plane with CPW. The antenna can synchronously operate in three frequencies, covering the working frequency bands of WLAN/WIMAX (2.44 GHz/3.5 GHz/5.2 GHz - 5.8 GHz).

II. THEORETICAL ANALYSIS OF ANTENNA

ANTENNA DEFINATION:-

Antenna is an electrical device which converts electrical power into radio wave, and vice versa .It is usually use with a radio transmitter or radio receiver. Antennas are essential components of all equipment that uses radio. Typically an antenna consists of an arrangement of metallic conductance electrically connected to the receiver or transmitter. An oscillating current of electrons force through an antenna that transmitter will create an oscillating magnetic field around the antenna elements. In computer and Internet wireless applications, the most common type of antenna is the dish antenna, used for communications. Dish antennas are generally practical only at microwave frequencies (above approximately 3 GHz). The dish consists of a paraboloidal or spherical reflector with an active element at its focus. When used for receiving, the dish collects RF from a distant source and focuses it at the active element. When used for transmitting, the active element radiates RF that is collimated by the reflector for delivery in a specific direction At frequencies below 3 GHz, many different types of antennas are used. The simplest is a length of wire, connected at one end to a transmitter or receiver. More often, the radiating/receiving element is placed at a distance from the transmitter or receiver, and AC is delivered to or from the antenna by means of an RF transmission line, also called a feed linear feeder. Every structure carrying RF current generates an electromagnetic field and can radiate RF power to some extent. A transmitting antenna transforms the Radio Frequency (RF) energy produced by a radio transmitter into an electromagnetic field that is radiated through space. A receiving antenna it transforms the electromagnetic field into RF energy that is delivered to a radio receiver. Monopole

antenna above a PEC (a), and the equivalent source in free space (b)

Parabolic Reflector Antenna: The parabolic reflector antenna or dish antenna is widely used in many areas where high gain and narrow beam width are required. The parabolic reflector antenna or dish antenna has been used far more widely in recent years with advent of satellite television. However the dish antenna field uses in many radio and wireless applications at frequencies usually above about 1 GHz where very high levels of RF antenna gain are required along with narrow beam widths. Fig 2.

Fig 2. Parabolic reflector antenna

III. DESIGN OF ANTENNA

The sector-nested fractal antenna is evolved from multiplexing fractal antenna and the evolution process is presented in Figure. Antenna radiator is nested by multiple sector loops and the novel sector-nested antenna can be obtained. The two antennas in Figure 4 can be considered that the sector or circle metal-patches are covered out and orderly nested from larger to smaller. The dark part is metal and the white part is the substrate. The number of nested fan is set to n =4, and at the same time the segment heights are h1, h2, h3, h4. The vertex angles for the antenna are θ1, θ2, θ3, θ4 and metal thickness is 2 mm. As we can see, the antenna has two main parts metal radiator and trapeziform ground plane. Here the trapeziform ground plane has three functions: the first is acting as a ground plane for the monopole and the CPW, the second is acting as a radiating element.

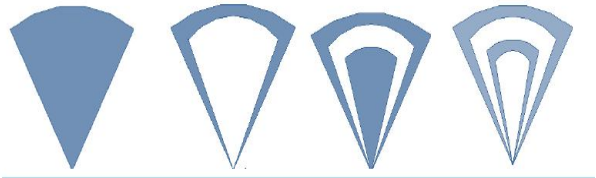

Fig.6.2.1 The process of sector nested fractal antenna

IV. RESULT AND ANALYSIS

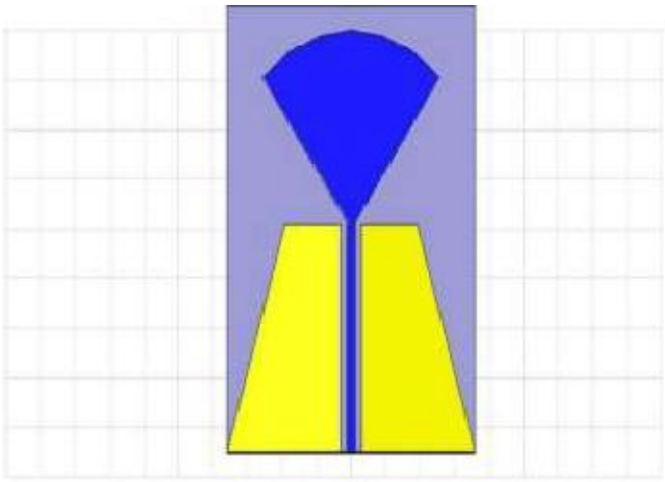

Fig . Top view of Antenna

RETURN LOSS VS FREQUENCY:-

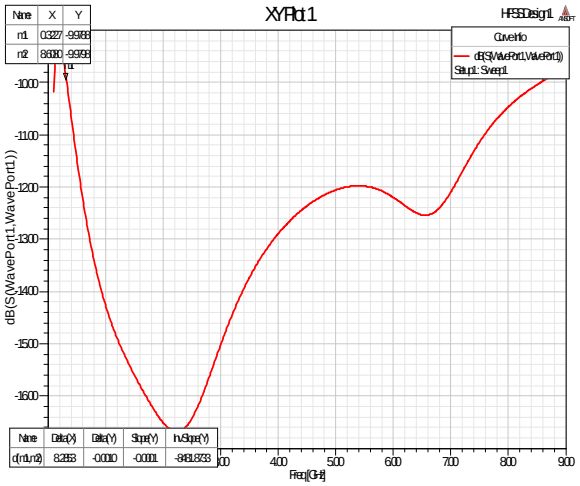

Fig.7.3 plot of Return loss vs Frequency

VSWR VS FREQUENCY:-

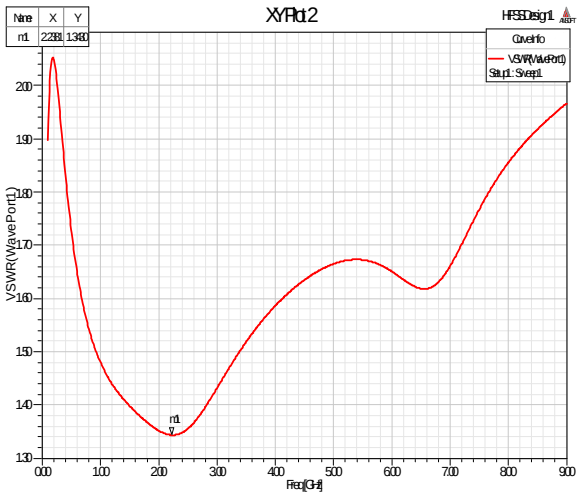

Fig.7.8.plot of VSWR vs Frequency

Gain:-

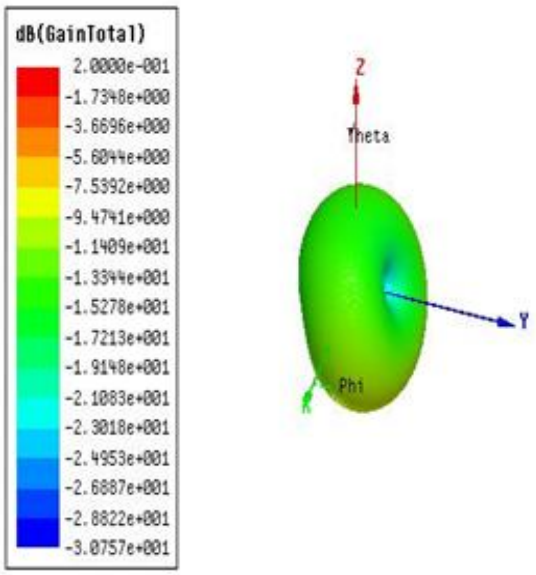

Fig. Polar plot of Gain

V. CONCLUSION

A novel sector-nested fractal antenna has been studied in this seminar. When we combine two techniques: the sector nested Fractal structure and the trapeziform ground plane, the monopole multiband antenna can operate to cover three bands at 2.44 GHz/3.5 GHz/5.2 GHz - 5.8 GHz, which are required by WLAN/WIMAX systems. It is observe from study that, the antenna has simple structure, thin profile, low cost and significant gain; therefore it can be applied for the electronic protection systems, etc., and will be an attractive candidate for various WLAN/WIMAX applications. In this seminar a antenna with trapezoidal shape & CPW feed can be designed & results are obtained in the form of various antenna performance parameter. The material used for said antenna is FR4, with thickness of 1.5mm. The antenna is Operating at a frequency of 1.34 GHz & having total value of gain is 0.2 dB. The gain of antenna may be increases when we use fractal shape antenna.

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