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DESIGN AND SIMULATION OF MULTIBAND MICROSTRIP ANTENNA

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Abstract - *The use of fractal geometries has significantly impacted many areas of science and engineering; one of which is antennas. Antennas using some of these geometries for various telecommunications applications are already available commercially. The use of fractal geometries has been shown to improve several antenna features to varying extents.*

Wide band fractal antennas geometry has been proposed in this thesis. Fractal shapes and their properties are discussed. The proposed antennas are micro-strip line fed and their structure is based on fractal geometry where the resonance frequency of the antenna is lowered by applying iteration techniques. The bandwidth was optimized by combining different geometries resulting in a hybrid Fractal Antenna. Analysis of fractal antenna was done by using the Software named CST Microwave Studio Suite 12 .This antenna has a low profile, lightweight and easy to be fabricated and has successfully demonstrated wideband characteristics. Here we use 3-4 different feeding techniques to design the antenna and figure out the best way to optimize the parameters to get maximum efficiency and bandwidth. And we build antennas in different fractal geometries and then compare the return losses, VSWR, directivity, power, reflection coefficient surface current, radiation pattern.

This project mainly focuses to enhance the bandwidth of the existing antennas so that it can be used for multi-purpose applications in the field of Mobile communication, Radar, Military and defence etc.

This project surveys about the existing methods and techniques for designing antennas and focuses on MB technology to design antenna of bandwidth 3-10 GHz.

***Key Words*:**

1. INTRODUCTION

Modern telecommunication systems require antennas with wider bandwidths and smaller dimensions than conventionally available antennas. This has initiated antenna research in various directions, one of which is by using fractal shaped antenna elements. In recent years several fractal geometries have been introduced for antenna applications and have been very successful in improving the characteristics. Some of these geometries have been effectively useful in reducing the size of the antenna, while other designs aim at incorporating multi-band characteristics. There have been many antenna configuration put forth in recent years, based on this fractal geometry. These antennas are mainly used because of its multiple frequency bands which allow us to use it for several functions. These have a moderate gain and are also known as low-profile antennas. The important features of fractal geometry are that it has a complexity in its structure and has self-similarities. As mentioned above, these patterns that are existing in the nature around us, have self-similarity and space filling properties which is exploited in designing fractal antennas, hence help us achieve designing wide band and multiband antennas.

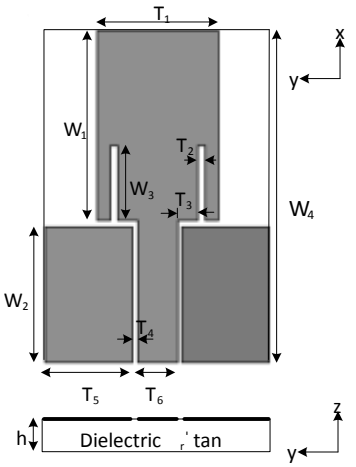

Fig-1: Structure of the antenna 1 without slots.

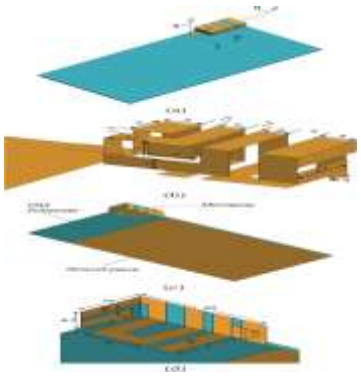

Fig-2: Sketch of the antenna showing: (a) top view of the antenna and the PCB board, (b) detailed dimensions of the monopole in millimeter, (c) bottom view of the antenna and PCB board showing the ground plane, and (d) further details of the antenna structure and the optimization parameters used to tune the antenna performance.

2. BACKGROUND/DOCUMENTARY RESEARCH

[1] In this paper Several complex antennas designs have been attempted to cover the entire LTE band [3,4] were multiple antennas are used for multiple band. They proposed the same solution using micro strip line-fed wide slot antenna concept. In order to improve the coupling between the slot and the feed line and also widen the impedance bandwidth dual stubs were introduced in the feed line on two corners of the ground plane. This antenna will also provide polarization diversity which is the key of LTE antennas. The stimulated design of a multi-slot antenna fed by feed line using two tunable stubs which is presented in this paper. The antenna impedance bandwidth is approximately 0.85 to 3 GHz covering most of the LTE band.

[2] In this paper a printed elliptical antenna is presented.it displays a various multiband frequency response and it is used in variety of applications such as radio frequency, wireless sensors networks basically it helps in single antenna which can be operated at different frequencies. The overall dimensions of these antenna is 41mm× 44mm.Generally it is useful for multiband operation by creating nuts in the conventional ellipse patch antenna and multiple ellipses are added for multiband operation. The antenna operates at multiple

Frequency bands of GSM900, GSM1800, and Bluetooth/Wi-Fi (2.4 GHz) suitable to be used for ambient RF energy harvesting systems.

[3] In this paper a frequency - tunable multi-ring multi strip antenna (MR-MSA) fed by an L-probe with varactor diode. In order to realize a frequency tunable multi band micro strip antenna, multiple-ring patches are arranged concentrically and two varactor diodes are mounted on each ring patch resonant frequencies of the proposed antenna can be controlled by the DC biased voltage applied to the varactor diode. The antenna configuration can be easily extended to multi band operation more than dual-band by arranging more ring patches.

[4] In this paper He proposed UWB antenna with dual band notched characteristics. The first band notched characteristics for first notch WLAN (5.1GHz-5.9GHz) and for second notch WiMAX application from 3.3GHz to 3.8GHz. This antenna has good impedance working from 2.5 GHz-12 GHz except the two notched frequencies. The dual frequency band is achieved by using a defected micro strip structure (DMS) band stop filter and meandered with the WiMAX and WLAN bands.

[5] From this paper we learn that the compact size EGB structure improves the beam width, return loss and radiation pattern over antenna without EBG structure. The results show that antenna with

EBG structure can effectively cover three separated impedance bandwidths of 28.72 MHz (1.48548 - 1.5142 GHz), 17.39 MHz (1.79134 - 1.80873 GHz) and 163.84 MHz (4.53034 - 4.69418 GHz), resonant at 1.49997 GHz, 1.80003 GHz and 4.60004 GHz with return loss of -20.4248 dB, - 14.7067 dB and -20.42458 dB respectively.

[6] This paper presents us the analysis of half U-slot and rectangular-slot cut dual and triple band rectangular microstrip antenna.By studying the surface current distributions in antennas ,the resonant length at the individual frequency is proposed.Dual band rectangular microstrip antenna is realised by cutting U-slot or rectangular-slot at appropriate position, but this introduces a mode near the fundamental mode resonance frequency and yields dual band characteristics.Similarly the triple band antenna is realised by cutting an additional slot inside the slot cut patch ,this yields the triple band response. The frequencies calculated using the equation proposed agrees closely with the simulated ones with less than 5% error over the slot range.

[7] In this paper a novel and compact printed monopole antenna is presented, which has a simple but effective radiating patch for multiband wireless communication systems and mobile devices. The antenna has dimensions 20×20×1 mm^3 , which is smaller than previously proposed monopole Structures. The design concept was validated by fabricating the antenna prototype and measuring its characteristics. Monopole planar antennas are considered to be the best choice for multiband applications due to their specific properties, such as low cost, light weight, simple fabrication, compatibility with integrated circuits, compact size, for impedance bandwidth.

[8] This paper presents us with the concept of a multi band dual polarized transceiver micro strip slot antenna with dual feed designed to operate for mobile phone base station. The antenna is composed from a single substrate layer. The overall dimension is 285*140*1.645mm .In order to achieve dual polarization, a single feed layer of two orthogonal micro strip feed line working like the U shaped are placed underneath the substrate material on the opposite side of the ground plane. This antenna supports GSM, DCS, PCS, UMTS, LTE, ISM2450 bands. The simulated isolation layers from 29-40dB.

[9] In this paper, a single-element micro strip patch antenna with four edge-slots and shorting pins is proposed. The proposed antenna is said to cover 2.4 GHz, 5.2 GHz and 5.8 GHz band with multi band. The general Taconic TLC is used as the substrate. The design of a reconfigurable micro strip antenna with edge slots and shorting pins operating in triple band have good results and it can be researched further so that it can operate in the near RF network using cognitive technique.

[10] This paper presents us the concept of a novel low profile integrated monopole slots antenna for

Multi band multi polarization applications. It operates at both GPS and Iridium frequencies of 1.575GHz and

1.62GHz with circular polarization and GSM850/GSM900/DCS/PCS bands with vertical polarizations. The antenna is designed to have an L-shaped monopole slot with a C-shaped feed to generate wide band circular polarization. The concept and design methodology shows us that this is a low profile, low cost, integrated multiband multi polarization monopole slot antenna.

[11]In this paper the design of a planar monopole multi band antenna with U-shaped and L-shaped slots has been prevented. It is a novel planar monopole antenna for multi band operation. It covers the PCS(1850-1990-MHz), Bluetooth/WLAN(2400-2480MHz), WiMAX(2500-2690MHz) and an additional band of (5000-5200MHz). It consists of an E-shaped patch fed through a coplanar waveguide transmission line. The substrate used here is the FR-4 which is low of cost

[12] In this paper represents the square ring micro strip antenna is a compact variation and it is realized by cutting the slot in the center of the patch. The multi-port network model (MNM) is an efficient and simpler tool to analyze MSA on substrates having thickness less than < 0.04*0Mainly it helps in analyzing the mode distributions at various frequencies the stud offers capacitive or inductive impedance around the resonance frequency of the patch and realizes the dual frequencies.

[13] This paper mainly presenting the design and detailed of novel antenna for multitasking mobile handsets based on the monopole element and it is most effective through the experimental prototyping and various simulation its total volume is only 1.6 cm^3 because of this it shows good return loss, radiation patterns and efficiency performance. These days they are mainly manufactured for the development of handheld mobile devices which consists of smaller, similar and lighter. Mainly the antenna works at different frequency bands and design is a hexa band antenna that covers most of the frequency bands of interest in the 800 MHZ to 2.5GHZ range. The main antenna characteristics is return loss efficiency and radiation patterns mainly for a frequency sweep the return loss of the antenna is 700 MHZ to 2.5 GHZ because of this it shows an excellent agreement between the measurements and simulations. The main role of the antenna shows the radiation patterns which work at a higher frequency of 1800 and 2400 MHZ. Due to the 3-D folding of the antenna design it does not show the linear polarization.

[14] In this paper the micro strip patch antenna involves the many tiny subdomain function resulting in a very large number of unknowns. Basically the radiation parameters of the antenna can be numerally computed using integral equation method of moments. Basically this paper will tackle the optimization of the method of moment solution taking advantage of the geometrical properties of the iterated function system that generates the antenna geometry. This paper will present results only for the MLMDA structures generated by an IFS necessarily have many equal subdomains at different levels.

4. CONCLUSION

This antennas has an improvement in bandwidth over regular antennas. By varying several parameters of these designs, we can increase the bandwidth further and thereby reach our goal of designing an multi-band antenna.

5. FUTURE SCOPE

Our Primary goal of this project is to increase the bandwidth of the existing fractal antenna so that a single antenna with larger bandwidth can be used for several applications.

With further research and innovation this project can be implemented with more optimisations in the parameter design and the bandwidth and can be used for multi-purpose applications.

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