DESIGN AND IMPLEMENTATION OF PATCH ANTENNA USING ADS FOR TELEMEDICAL APPLICATIONS

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ABSTRACT

The project's goal is to construct and simulate a low-profile antenna called a microstrip patch antenna utilising the FR4 substrate. The slot antenna was made with wireless applications in mind. There are multiple bands in the frequency band. This project produced a well-designed aerial with great radiation efficiency and power. Measurements were made of the antenna's characteristics, including return loss, voltage standing wave ratio, radiation pattern, gain, directivity, and power.

Keywords: Microstrip Patch Antenna, Efficiency, Power Radiation, Voltage

I INTRODUCTION

Antennas serve as converters between electromagnetic waves that are travelling freely in space and transmitted waves (see Figure 1). The term "antennae" in zoology refers to the projecting, sensitive feelers that many insects have.

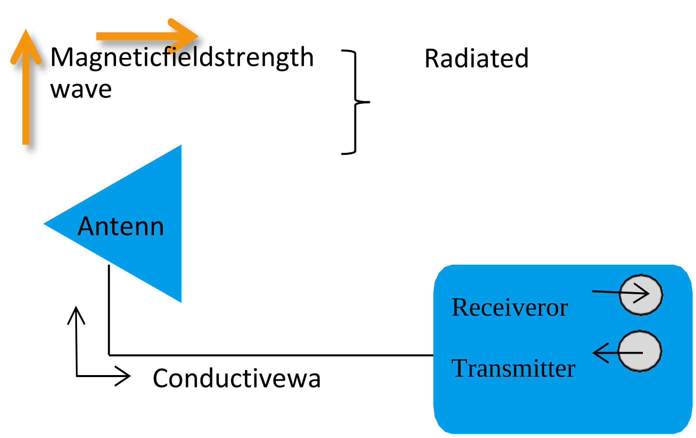

Fig.1.Basic antennafunctionality.

The oldest antennas that are still in use today, such as those Heinrich Hertz created in his early tests to show that electromagnetic waves exist in 1888, are theoretically and practically not all that different from an RF generator [8].

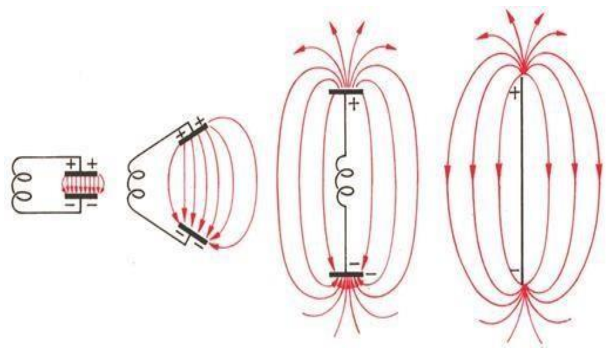

Fig.2. HeinrichHertz's antennamodel.

An antenna can be created by adding an inductor and capacitor to a parallel circuit.

As seen in the top right corner of Figure 2, a dipole antenna is created by opening the capacitor's plates and lowering the inductance to that of the wire itself [13].

Resonant circuits are actually still frequently used to illustrate the many properties of antennas today. Antennas were classified as separate sections of radio systems when transmitting and receiving stations first began to be built, about 1900 or even later. At first glance, modern antennas may resemble the traditional kind pretty closely. Yet, they are currently highly tuned for the intended usage. With the least amount of loss feasible, communications aerial technology aims to convert one wave type into another. When it comes to test antennas, which are designed to precisely measure the field strength at the installation site and

relay that information to a connected test receiver, this requirement is less significant. Instead, it's critical to fully comprehend the physical characteristics of these gadgets. Although while the following chapters may only briefly focus on a small number of the numerous types of antenna that are currently in use, the description of the physical factors by which the behaviour of each antenna may be both characterised and appraised is probably of greater general use.

II LITERATURE SURVEY:

2.1 Design of G- Shape Patch Antenna in HFSS

A circularly proposed dual band single layer G-shaped patch antenna with HFSS was proposed by K. Sankar et al. He created a G-shaped patch antenna by employing four slots. Due to resonance behaviour, micro strip antenna has a restricted bandwidth. By adding slots to the patch, the form can be altered to boost radiation and bandwidth. The primary goal is to offer two resonance frequencies [13]. They are 3 GHz and 3.8 GHz in frequency. At frequencies of 3 GHz and 3.8 GHz, respectively, gains and return losses are achieved of 7.5 dB and -17 dB and 2.4 dB and -15 dB.

2.2 Geometry of the Proposed Planar Mono pole Antenna'

A novel modified ultra-wide band (UWB) planar monopole aerial with changeable frequency band-notch function was proposed by Reza Zaker et al. By adding two slots to the ground plane on either side of the micro strip feed line, bandwidth can be magnified in this configuration [10]. The FR4 substrate, which has a 1.0 mm thickness and a 4.4 dielectric constant, is used to build this antenna. Cutting slots can create an additional current path and alter the input impedance's inductance and conductance, which alters the bandwidth. A modified H-shaped conductor-backed plane with adjustable dimensions is used to generate the frequency band-stop performance and manage its attributes, including the band-notch frequency and bandwidth. By changing the slot's size and shape, it is possible to modify the resonance frequency of the structure transmission[10]. The constructed antenna operates between 3.1 and 13.9 GHz, has a small VSWR of 2222mm2, and is effective.

2.3 Electromagnetic Waves under Sea: Bow-Tie Antenna Design for Wi-Fi Underwater Communications

This paper analyses the propagation of electromagnetic waves in a medium with non-zero conductivity and investigates the dielectric properties of sea water in order to precisely characterise a wireless communication channel. Mathematical models for the sea water dielectric constant, wavelength, propagation speed, and route loss are presented [11] as an electromagnetic wave at 2.4GHz travels through sea water. A Bow-Tie microstrip antenna is investigated in order to meet the high path loss and bandwidth requirements in sea water.

III RESLUT & DISCUSSION

3.1 ANTENNA LAYOUT:

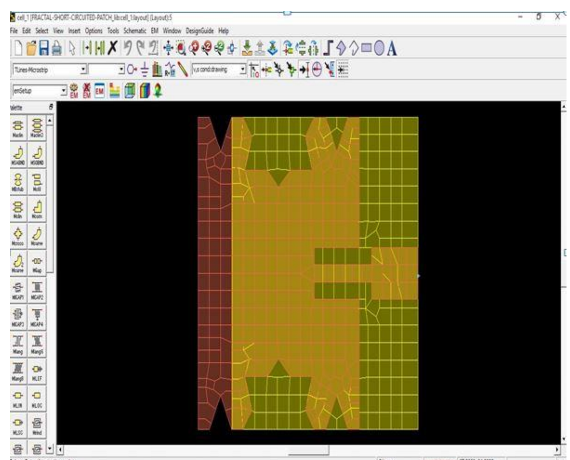

Fig.3 Layout of Design using ADS Tool

According to the desired frequency sweep of 900 MHz to 2.4 GHz, the design arrangement of the factral form antenna is depicted in the above image. The frequency sweep-specific patch antenna will have dimensions of 520 mm in length and 410 mm in breadth.

3.2 RETURN LOSS:

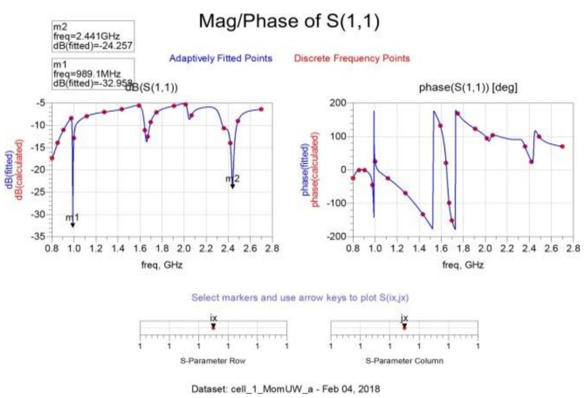

Fig.4.Magnitudeand phaseplot forfractal shapeMSA

employing ADS simulation software, FR4 substrate factral create patch antenna return loss. The graph above displays the return loss and phase shift plot for various 900 MHz and 2.4 GHz suggested frequencies. According to the fundamental principle of return loss, any designed antenna with a return loss of less than -10 dB is recognised as a worthy antenna. The (S1) parameters are always used to determine an antenna's return loss. The first graph shows the return loss for the frequency band of 989.1 MHz, giving a return loss of -32.958 dB, and similarly for the frequency band of 2.441 GHz, giving a return loss of -24.257 dB. This shows that the designed antenna is an appropriate antenna for both transmission and reception of the two frequency bands.

3.3 THE RADIATING FRACTAL PATCH OF THE ANTENNA:

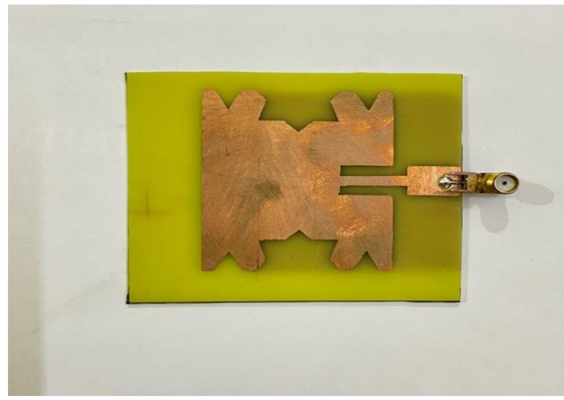

Fig.5 Home fabricated fractal patch antenna.

The manufactured patch antenna was created at home, and its dimensions were precisely measured using the ADS software's design. The manufacturing of the antenna is often done using one of two tone transfer methods, namely the

- heat tone transfer method.
- Tone transfer using acetone.

Imprint tone transfer is the technique I used to create the patch antenna, in which the antenna's design is cut out and prepared like a stencil.

The stencil is then adhered on the FR4 substrate, and the copper cladding board is painted with spray paint before being allowed to cure.

The copper is next eroded and the substrate is revealed by dipping the board into the ferric chloride solution.

IV CONCLUSION:

For both WiFi and mobile applications, a small multiband antenna has been created. The Advanced Design Systems (ADS) programme was used to build and construct this aerial, and it also included simulation and analysis of the antenna's properties, including gain, directivity, and radiation pattern. The identical antenna will be constructed in the future, and the performance of S-parameter and VSWR will be assessed using a vector network analyzer.

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