International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

A CRITICAL STUDY ABOUT THE MICROSTRIP & MICROSTRIP PATCH ANTENNA

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ABSTRACT
The purpose of this study is to understand how contemporary wireless communication necessitates original research advancements in the area of wireless transmission, which call for a fundamental understanding of the components of electromagnetic radiation, antennas, and related propagation phenomena. Antennas are a fundamental part of any electric system that connects the transmitter to the universe and the receiver to the universe. In order to determine the characteristics of the system to which antennas are applied, antenna plays a crucial function. An antenna can thus send and receive signals at high frequencies. Simply said, an antenna is a piece of electrical equipment that transforms electrical impulses into radio waves and the other way around.
Keywords: - Communication, Function, Electrical, Equipment, Antenna.

I. INTRODUCTION

Our electronic eyes and ears on the world are antennas. They serve as our connections to the universe. They play a crucial role in our civilisation. Antennas have existed for a very long time, but during the last century they have taken on a new importance as the conduit that connects a radio system to the outside world. The objective of the ongoing research in wireless communication technology is to raise the bar for the different antenna device standards that are based on the transmission of lines. Wideband and multiple-band operations are crucial for future wireless systems, and they call for a small antenna. The antenna has simple construction, small size, broad functioning, and the ability to be integrated into RF circuits with ease.

Thus, the benefits of monopole antennas for meeting the needs of wireless communication technology are cheap cost, low weight, and broad bandwidth. Although the research calls for enhancing the bandwidth of multiband antennas, which are favoured in contemporary communication systems, the bandwidth of the sub-bands in the design of multiband antenna is not sufficiently large.

Wireless communication systems call for a variety of voice, video, and data services that work together when applied to mobile devices. There is a desire for internal antennas that are integrated into mobile devices that are lightweight and can fit into small spaces without compromising antenna performance. These wideband and multiband antennas have lately drawn interest from manufacturers of various application devices, including mobile phones, laptop computers, and USB dongles.

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Anywhere an unforeseen wire system is laid down, an antenna fulfills the function of sending or receiving electromagnetic waves for the purpose of communication. One of an antenna's functions is power radiation. An antenna uses a transmission line, which relies on the transmission line's radiation mechanism, to connect to the circuitry at the location.

II. OUTLINE OF WIRELESS COMMUNICATION

One of the fastest-growing segments of the communication industry is wireless communication. The spotlight of the press and the general public is now on it. Over the last decade, sales of mobile cellular (Cell) phones have skyrocketed, and there are now more than a billion Cell phones in use across the globe. Indeed, mobile phones have become an essential business tool and part of daily life in every country, rapidly replacing older wired systems. Wireless local area networks (WLANs) are also being utilized to supplement or replace wired networks in a number of workplaces and campuses today. Most emerging applications are transitioning from theory to practice, including wireless sensor networks, computerized roadways, computerized industries, smart homes, appliances, and remote telemedicine. The rapid expansion of wirelessly enabled computers augurs well for the future of wireless networking, both in terms of standalone systems and larger communications networks. There are still a lot of technological hurdles to get over before robust wireless networks can be designed. These are sharing out the power that will be required to run interesting programs.

The size of an antenna is proportional to the wavelength at which it operates. According to this relationship, an antenna's radiation resistance, bandwidth, and gain will all suffer if its dimensions are less than one by one-fourth of a wave's length. As a result, antennas come in a wide range of sizes, typically λ/4 and λ/2.

III. MICROSTRIP ANTENNAS

In 1953[4], physicist Deschamp presented the idea that would later become the microstrip patch antenna. Howell and Munson created the first workable Microstrip antenna (MSA) in 1970 [5]. This specialized antenna has a small footprint. The three components of a microstrip antenna are a patch, a substrate, and a ground. An attachment patch for a microstrip line feed. This kind of microstrip antenna is also known as a patch antenna that uses electromagnetic coupling [6, 7].

1. Methods for analysis

Microstrip antenna research has been broken down into two categories. The first strategy uses a dispersion of magnetic equivalent currents. The transmission line model, the cavity model, and the MNM are just a few.

2. Dielectric Substrate

When creating a microstrip antenna, the substrate material is crucial. Microstrip antenna dimensions and characteristics are affected by substrate characteristics. Thickness, dielectric constant, and loss tangent are substrate-related characteristics.

3. Fractal Antennas

Combining electromagnetic theory with the fractal idea of patch geometry is discussed. Current progress in the field of fractal antennas is summarized. The primary study categories for fractal antennas are as follows: The focus is first on the construction and study of fractal types, and then on the use of fractal geometry into the design of antenna arrays.

4. MSA advantages and disadvantages

The benefits of microstrip patch antennas are portability, compact size, and a flat, unobtrusive design. Using printed circuit board technology, it is possible to produce components that are perfectly shaped to fit the host surface. As a result, the cost to make this is rather low. These antennas may be used with either linear or circular polarization and can be combined with other MMICs on the same substrate with relative ease. They function on many frequencies, and may be used for on-the-go chats.

There are drawbacks to using a microstrip antenna instead of a more traditional microwave antenna. They have a limited impedance bandwidth, generate little gain, are prone to radiating additional energy at their feeds and connection points, can only manage a modest amount of power, are inefficient, and create poor polarization purity.

IV. MICROSTRIP PATCH ANTENNA

Several scholarly journal publications and current reviews that are pertinent to the topic of microstrip patch antennas are cited and given here. Microstrip antennas are a very new concept, as Pozar D.M. mentioned [30]. They are finding use in a variety of novel microwave components. Pattern equalization of circular patch antennas was achieved by Saeed I. Latif et al. [31] utilizing a variety of substrate permittivities and ground plane diameters. Enhanced gain and reduced cross polarization characterize the wideband stacked offset microstrip antenna [32] that V.P.Sarin summarizes. Broadband microstrip antennas for use in wireless communication were the subject of research by M.A.Matin et al. [33]. Broadband microstrip stacked antennas were demonstrated by Tingqiang Wu et al. [34]. With a measured gain of 3 dB, Babani Suleiman et al. [35] demonstrated a small microstrip patch antenna suitable for wireless systems.

1. Rectangular patches

The following is a synopsis of the research done on rectangular patches. The following journal articles have been chosen as relevant literatures and will serve as the basis for this study.

2. Circular patches

The following articles provide a literature review and then suggest solutions for implementing the principles in circular antennas for wireless applications. For wireless mobile applications, Chan Hwang See et al. presented a multi-band crescent-shaped planar monopole patch that was fed by a microstrip line and included a defective ground.

3. Patches using slits and slots

Multiband antenna patches with slits and slots have been suggested based on a review of the relevant literature. Double L-slit antenna for two frequencies was introduced by Tae-Hyun Kim et al. It operates at both 2.4 and 5 GHz [44]. Rectangular patch antennas with slots and meandering slits were presented by A.Kaya [45] to reduce the patch size.

4. **Meandered antennas**

This article provides a summary of the works written on meandered antennas. The impact of meandering on dipole antennas was studied by OLaode et al. [60]. When it comes to microstrip patch antennas, Mohamad Zoinol Abidin Abd Aziz et al. [61] looked at the effect of meander slots.

V. CONCLUSION

The papere summarizes the development of Microstrip patch antennas in the shapes of a monopole, a dipole, and a U for use in a wireless sensor network. Using the Numerical Electromagnetics Code (4nec2), a monopole antenna's physical layout was planned. Using Ansoft's High Frequency Structure Simulator (HFSS), we were able to plan out the blueprints for a half-wavelength dipole antenna and a U-shaped microstrip patch antenna. Key design considerations for antennas include radiation pattern, return loss, directional selectivity, gain, VSWR, reflection coefficient, and impedance.

The first layout shows that the electric field lobe of the antenna is flat, and it is utilized to improve the radiation pattern of monopole antenna for multiband applications. This means the suggested antenna design is effective in a wide arc of radiation. Monopole antennas may function at frequencies up to 300MHz. The monopole antenna has a 1 m wavelength. Gain is 2.27 dBi, bandwidth is 1 GHz, and 945 MHz is the suggested midband frequency for the monopole antenna. There was a -2dBi boost to the monopole antenna's overall gain.

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