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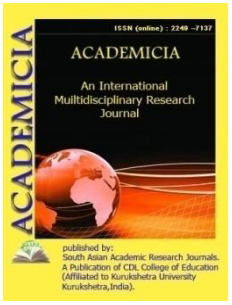

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A REVIEW ON TYPES OF ANTENNA

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ABSTRACT

In a wireless communication system, the antenna is the most essential component. Electrical signals are converted into radio waves via antennas, and vice versa. Antennas come in a variety of shapes and sizes, each with its own set of characteristics based on the signal transmission and reception requirements. In this article, we compare and contrast different kinds of antennas based on their forms, materials utilized, signal bandwidth, transmission range, and other factors. Our primary goal is to sort these antennas into categories based on their intended use. Antennas are the fundamental requirements for wireless communications in the contemporary age, since they are needed for quick and efficient transmission. This document will assist the design architect in selecting the best antenna for the job.

KEYWORDS: *Applications, Antenna, Dipole, Communications, Signal Transmission.*

1. INTRODUCTION

Antennas are one of the most basic components of any electric system. It connects the open space with the transmitter or the free space with the receiver. Antennas are devices that convert RF or electrical signals. It is also used to convert a signal into an electromagnetic or wave signal. Receiving an electromagnetic pulse and converting it to an electrical signal. Antennas are the devices that are used to transmit data. Information in the form of a signal emitted by an electromagnetic wave converse in an unguided or wireless manner. In a radiating antenna. If it

had a high radiating resistance, it would impair its efficiency. The antenna's efficiency will be high due to its resistance. Antennas are a helpful method of communication in a variety of situations. Antennas are utilized to transmit in the form of sound, graphicalvideo as a result of their significance in communication Antennas are developed on a regular basis to meet the needs of the market. Antennas are designed for a variety of applications. For improved communication, materials and structures are required. They really are. Radio, television, satellite, broadcasting, and design communications, cellular system, etc. It also took into account necessary for determining the characteristics of a system[1].There are antennas in operation.

Different systems have several types of. They have antennas attached to them. Directionality is used in certain systems. The operating characteristics of the antennas are developed around them. The antennas, on the other hand, are just the system's features. Used to transfer omnidirectional electromagnetic energy. It may be utilized in certain other systems or in other systems for point-to-point communication where the gain and range are increased. Wave impedance must be reduced. As far as antennas and their applications are concerned, is very low, thus this analysis is critical for identifying. Antennas of various types and their uses in diverse systems[2]. This article provides a comprehensive overview of different antenna types. It evolved to fulfill an important communication job in A variety of communication network fields are discussed. An antenna or aerial, used with a transmitter or receiver, is the contact between radio waves traveling across space and electric currents flowing through metal conductors. When transmitting, a radio transmitter sends an electric current to the antenna's terminals, which the antenna then emits as electromagnetic waves. An antenna receives part of the strength of a radio wave and converts it to an electric current at its terminals, which is then transferred to a receiver to be amplified[3]. Antennas are an important part of any radio system[4]. An antenna is a collection of conductors (elements) that are electrically linked to the receiver or transmitter. Antennas may be constructed to transmit and receive radio waves in all horizontal directions equally (omnidirectional antennas) or to broadcast and receive radio waves preferentially in one direction (directional, high-gain, or "beam" antennas). An antenna may include non-transmitter components such as parabolic reflectors, horns, or parasitic devices that guide radio waves into a beam or other desired radiation pattern. Heinrich Hertz, a German scientist, constructed the first antennas in 1888 as part of his pioneering experiments to establish the reality of waves anticipated by James Clerk Maxwell's electromagnetic theory. For both transmitting and receiving, Hertz used dipole antennas at the focal point of parabolic reflectors[5]. Guglielmo Marconi, who won the Nobel Prize for his work on antennas for long-distance wireless telegraphy, started developing them in 1895[6].

1.1 Types of Antenna:

- *Biconical Dipole Antenna*: An infinite constant-impedance transmission line has no limit on data transfer capacity, but any realistic implementation of the biconical dipole has limited extension appendages that create an open-circuit stub in the same way that a resonant dipole does. In the case of transmission, the loss caused by radiation from the biconical transmission line reduces the wave reflected by the open circuit end, and if the conical surface was long enough, the far end would be rendered electrically "invisible" at the terminals. At higher frequencies, its behavior resembles that of a true biconical transmission line, with the maximum limit determined mostly by the precision with which the 'near-coincident apices'

can be implemented. Between these two extremes, a worthwhile return loss may be achieved across an octave or more, depending on what defines "sufficient" for the anticipated use, such as 10dB. Despite these limitations, this is nevertheless one of the most basic genuinely[7].

- *Antenna with a Left-Handed Dipole*: Left handed dipole antennas are a novel kind of antenna that gets its name from the fact that its transmission is left-handed. Shunt inductors and capacitors are used in the antenna design. The capacitor is placed on one side of the line, causing currents of varying amplitude on both sides. Because the eliminate currents are of varying adequacy, they do not completely cross out in the far field, and so it transmits. With a shorter wavelength, the frequency of the left-handed transmission line decreased. In free space, the 0.18 wavelength receiving antenna has a gain of 3.9 dB and a transmission capacity of 1.7 percent .
- *Antenna with a Folded Dipole*: Folded dipole antennas are simple, low-cost, have a smaller footprint, are cheap to manufacture, and are simple to install. The folded dipole antenna is made up of two folded wires with the folded ends of the dipole antenna left open. The folded dipole antennas have a broad loop configuration. In Xin, there is more flexibility in adjusting the impedance design, which is critical. The impedance is determined by the geometric parameters rather than the strip thickness. The radiation patterns are identical to those of a dipole antenna.
- *Dipole Antenna*: When a dipole antenna has half wave length at output, it is called a half-wave dipole antenna. The resonant frequency of a half-wave dipole antenna causes size fluctuation. The suggested antenna operates at a full frequency of 1.995 GHz, making it suitable for GSM technology. The frequency range of a half-wave dipole antenna is 1.877 GHz to 2.1199 GHz. The proposed dipole antenna is a radio antenna that is constructed using wire and a center-fed portion. Two wires are placed in line in a half-wave dipole antenna, with a tiny gap between them. The center of both wires is connected to the voltage[8]. If a half wave dipole occurs, the length of the dipole should be half the wavelength, however in practice it is computed as 0.45 wavelength time. Current flows between the two poles of a half-wave dipole antenna. The radio signal is emitted by the passage of current and voltages in the suggested antenna.
- *L-loop Antenna*: L-loop antennas take the least amount of effort, are geometrically smaller, and have a radio effective structure, which is needed in ultra-wideband applications (UWB). It's a unique printed loop antenna since the arms include an L-shaped section. Antennas in UWB systems offer excellent performance for lower band frequencies ranging from 3.1 GHz to 5.1 GHz. The antenna has a 10dB return misfortune transmission speed throughout the whole frequency range. The L part of the loop antenna selects the lower frequency band, while the decrease transmission line determines the upper frequency limit [5]. The shape of the antenna is dependent on FR4 substrate and FED with 50 ohms linked reduced transmission line. The construction of an L-loop antenna[5]. The entire length of the square loop's outer boundary The construction of the L-Loop antenna. The whole length of the square circle antenna's exterior breaking point should be one wavelength, with the aim of having direct focused radiation. A helical antenna is a kind of antenna that has a helical shape. The helical antenna was invented by John Kraus in 1964. These antennas have been around for a long time. All things considered, unifilarhelix antennas are made up of a single

wire or restricted tape wrapped like a right or left hand screw, self-supporting or spun on a dielectric cylinder . Such antennas have been widely used for many years because to their practical emission and ease of usage. Furthermore, owing to their remarkable and exceptional characteristics, these antennas are frequently employed to get microwaves from VHF[9].Because high gain is needed in satellite communication, helical antennas are employed. Because a greater gain is required in a parabolic dish, a helical antenna was built for this purpose. The proposed antenna has a very broad bandwidth. The helical antenna. The geometry of this kind of antenna model design was fed via a 50 Ohm coaxial connection. It is made up of a single empty dielectric chamber with a relative permittivity of 2.1 and a cross-sectional area of 61.33mm. The antenna was aided by the generator located at the base, between the antenna and the ground plane. The feed is at the bottom of this section[10].

- *Yagi-uda Antennas*: The suggested antenna is referred to as a yagi antenna or simply a yagi. The yagi antenna is a guided path with a dipole and additional strongly linked parasitic components, such as reflectors and directors. Reflectors, a dipole, and directors make up the yagi antenna's construction. UHF/VHF radars, phased Doppler radars, and wind profiler systems all utilize these antennas. The performance of the reflector dipole or feeder, as well as the director, is determined by these components. The construction of the yagi-uda antenna.
- *Spiral Antenna*: High bandwidth is required in wireless communication systems, necessitating the use of wideband antennas. In comparison to other antenna, the proposed antenna has a better spectral competency. Spiral antennas have the advantages of being easy to manufacture, low cost, extended life, and better emission performance. Ultra-wideband radio (UWB) operates in the frequency range of 3.1 to 10.6 GHz. In comparison to other planer antennas, the spiral has a high spectrum efficiency, which means a fast transmission rate. It is based on Archimedes' spiral guideline and comes in a variety of forms based on outlining goals. Theoretically, a spiral antenna apparatus with an infinite number of turns and perfect arm splitting possesses indefinite spectral proficiency and transfer speed.For all intents and purposes, we must cope with the fact that the unfathomable vastness is impractical, and the addition turns cannot be too close to one another without dread.
- *Antenna for Beverage*: Antennas for beverages are widely utilized in a variety of applications. It can receive signals in the frequency range of 2 MHz to 30 MHz and utilize them for direction finding. On a low height, these antennas have a high directivity. Beverage antennas are low-cost and have a straightforward design. A high frequency signal is received by the current detecting terminal, which modulates a laser diode. The high-frequency signal is then demodulated after passing via optical fiber to the receiver. The demodulated signal was measured using a Hewlett-Packard 8753B network. In a high-frequency antenna system, the laser output remained constant to prevent heat-dependent fluctuation, and optical-fiber offered significant benefits over co-axial cable. The construction of the beverage antenna.
- *Reflector with a Parabolic Shape*: There are two types of antennas in this category. One is a right cylinder, whereas the other is a paraboloid. To feed a cylinder type linear dipole, a linear array, a slotted waveguide, and so on are utilized. On the other hand, with a paraboloid, feeding is done in a conical or pyramidal shape. The suggested antenna's radiation field pattern is based on the feed component's radiation pattern, as well as the reflector material and measurements. It's found on parabolic reflectors, which collect and

focus parallel incoming radio wave beams, focusing them into the real antenna at its focal point on focus. The construction of the parabolic reflector.

- *Antenna with a Corner Reflector*: These antennas are easy to use, efficient, and effective. The suggested antenna consists of a dipole element, and it should be a low-cost, small-size, and reliable wireless system. The planer inverted-f antenna has a low profile, is small in size, has a wide bandwidth, and has a high gain. It covers the DCS-1800 and PCS1900 frequency bands. A square planer element suspends the dielectric FR4. The substrate's plane is at the ground's base. The dimensions of the proposed antenna. Planer inverted-f antennas are used in smartphones because of their features. The planer inverted-f antenna is a low-profile, high-efficiency antenna used in portable devices. Because of their properties, they are utilized in a variety of technologies. The device's operating qualities are better if it's simple to make, the signal emission is high, the covered area is small, and the impedance matching is low. The planer inverted-f-antenna (PIFA) is formed as a parallel portion from a wire to a plate with the inverted-f adjusted to it. These antennas reverberate construction with completely resistive burden impedance at the frequency of operation. The antenna's electrical execution is affected by the radiator's height, feed separation and area, and length variation, among other factors.

The construction of the planer inverted-fantenna.

- *Antennas with a Bow Tie*: Dense, effective, and low-cost devices have become more important in communication network systems. The similar feature is needed in multi-band applications. The current communication network necessitated antennas that were light in weight, cheap in cost, dense, mobile, and simple to operate. Two mirrors are needed in the manufacture of the proposed antenna and are positioned on a rectangular patch. Lumped port is utilized for Coplanar Wave Guide (CPW). The proposed antenna's output is limited by its location, distance, and alignment. Mobile communication networks and wireless systems are effective uses of these antennas.

- *Periodic Log Antenna*: In telecommunication, a log periodic antenna is a broadband, multi-component, tight pillar, directional antenna with radiations and impedance characteristics that repeat periodically as a logarithmic function of the frequency excitation. A logarithmic rise in element length and space occurs from one terminal to the other in a log periodic antenna. This kind of antenna, with its directionality and modest gain, is ideal for an area that needs a wider frequency range. These antennas were created with a broad bandwidth in mind for a particular application. The antenna is made up of a series of dipoles that are alternately connected by a balanced transmission line known as a feeder. To induce end-case radiation to go in a shorter direction, these closely spaced elements are linked oppositely form element and cancel the broadside radiation. A short coaxial cable was utilized. The antenna's own balun is created by connecting the feeder to the conductor of the coaxial wire.

- *Log Periodic Dipole Antenna*:If there are any wideband applications, the suggested antenna will come in useful. The VHF frequency range for the log periodic array antenna is 30 MHz to 300 MHz. Independent antennas with a bandwidth larger than 10:1 are classified as log periodic antennas. Raymond Duhamel was the first to come up with the idea of a log periodic array structure. Is bell invented the log periodic dipole array in the 1960s. The input

impedance, gain, radiation, and other characteristics of the proposed antenna change periodically in the logarithm of the frequency space. A log periodic array is what this is called. The construction of the log periodic dipole array antenna.

- *Log Periodic Fractal Koch Antenna*: The suggested antenna, the log periodic fractal koch antenna (LPFKA), is used in devices that operate in the ultra-high frequency (UHF) band. The fractal Koch method may reduce the antenna size by up to 27% without affecting the antenna radiation or reception performance. Antennas are now created in tiny sizes with less covered area and greater bandwidth, thus they are manufactured in a variety of directions and shapes. Koch bend is a good example of a self-comparable space-filling fractal that may be used to make a wideband, multiband, or scaled-down antenna. The antenna aids in breaking free from imprisonment. The log periodic fractal koch antenna.
- *Horn Antenna*: Jagadis Chandra Bose invented the proposed antenna in 1897, which was a pyramidal horn antenna . The characteristics of a horn antenna are straightforward: it can be stimulated by wavelength. The suggested antenna is known as a principle feed reflector antenna. Because these losses are so small, we estimate the suggested antenna's gain to be the same as its directivity. The horn antenna served as both an antenna and a reflector. They aren't waveguide-matched properly. When compared to waveguide and high directivity, the horn antenna radiates a constant phase font and sends a larger aperture. Horn radiation gain is related to the square of the wavelength and the area A of the flared open flang. Horn radiation is the impedance transition between free space and waveguide impedance provided by a tapered termination with a length equal to a waveguide. Horn radiators serve as both reflector antennas illuminators and antennas in and of themselves. These antennas aren't the greatest fit for the waveguide, but they can still achieve standing wave proportions of 1.5:1 or less. The flared open rib area corresponds to the rise of a horn radiator, and the square of the wavelength corresponds to the decrease. The construction of the horn antenna.
- *Wearable Antenna*: Wearable is the term given to the planned wearable antenna since it may be worn on the human body. These antennas are embedded in clothing and provide functions such as tracking and navigation, remote computing, and human safety.In wireless communication, body-centric communication has become more important. Smaller, lighter, less costly, long-lasting, and easy-to-install antennas are in more demand these days.The antennas suggested are utilized in medical emergencies, firefighting, and military applications. They may be used to keep track of athletes. The antenna radiator of a wearable antenna is rectangular, with a width of W and a length of L. The patch radiator has a minor impact on the radiation pattern but a large effect on the input impedance and operating band. The radiation powers, as well as the bandwidth and antenna performance, rise as the radiator width grows.

2. DISCUSSION

Antennas are found in a wide range of wireless systems, from IoT devices to microwave and millimeter-wave imaging systems like radio telescopes. Antennas are the essential component of a wireless system because they transform electron flow into electromagnetic radiation in a symmetric and well-designed way. An antenna's precise behavior is determined by the geometry of the conductors and dielectrics in its construction, and there are many different antennas to

meet different application needs. Radiation parameters and network parameters are the two major types of antenna behavior. Typically, these characteristics are only provided for the frequencies that fall inside an antenna's bandwidth. An antenna's bandwidth is simply the frequency range that the manufacturer has specified. Broadband behavior is common in antennas, and it may extend beyond the antenna's bandwidth. Radiation parameters explain how the antenna works when it transfers electromagnetic energy to electronics and back. The behavior of an antennae interconnects and ports, which link it to transmitters, receivers, interconnect, and measurement equipment, is described by network parameters.

3. CONCLUSION

The study's conclusion provides a wealth of information on various antenna types. With the assistance of this study paper, we can choose the optimal antenna to meet the requirements for the needed wireless communication system. The applications and functions of antennas are examined in this article based on their groupings. One of the most important and least understood aspects of any radio communication platform is the antenna system. The antenna system serves as a link between the radio system and the outside world. Antennas at the transmitter and receiver are required for wireless communication systems to function correctly. Antenna design and placement may make or break a wireless system, and many poor-performing systems can be traced back to antennas that were incorrectly installed or positioned. A single antenna at the base station and one at the mobile station may make up the antenna system. The antenna is primarily used by the base station and the mobile phone to establish and maintain communication links. Antennas come in a variety of shapes and sizes, each of which serves a particular purpose depending on the application. The antenna that a system operator uses.

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