

**Antenna –The Evolution in the field of Communication****Dr. Lalwani Sinha****Asst. Professor****ABSTRACT**

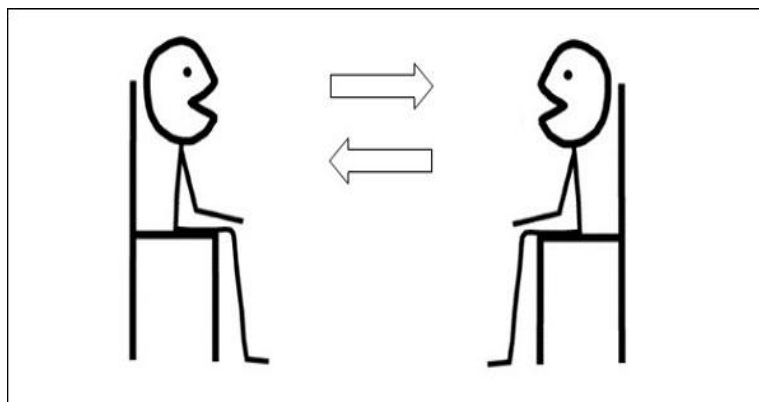
To fully comprehend radio communications, radar, cell phones, and other electronic communication technologies, one must study antennas and electromagnetic wave propagation. The fundamentals of wave propagation and antennas are covered in this course. Antennas come in many different varieties. It's like trying to lay up a fourth pyramid with a fine paintbrush to study every detail about various types of antennas in books that are overflowing with theoretical concepts. In this book, I focus mostly on the engineering elements and use very little mathematics. Thankfully, antennas may be broadly categorized into seven kinds based on their structure: wire antennas, micro-strip antennas, traveling-wave antennas, reflector antennas, lens antennas, and smart antennas.

**KEY WORDS**

Antenna, Wave Propagation Communication, Power, Electromagnetic wave.

**INTRODUCTION**

A person can use voice communication to express a thinking, an idea, or a doubt. The illustration that follows shows two people conversing with one another. Here, sound waves are used for communication. Nevertheless, we must convert these sound waves into electromagnetic waves if two people who are farther apart wish to converse. Antenna is the equipment that transforms the necessary information signal into electromagnetic waves.

**ANTENNA : WHAT IS IT?**

Transducers, such as antennas, change electrical power into electromagnetic waves and the other way around. Antennas are useful for both receiving and sending signals. An antenna that radiates electromagnetic waves after being converted from electrical impulses is called a transmitting antenna. An antenna that transforms electromagnetic waves from the received beam into electrical impulses is called a receiving antenna.

The same antenna can be used for both transmission and reception in two-way communication. An aerial is another word for an antenna. Antennae or antennas are the plural form of it. In terms of size and shape, antennas have changed significantly in recent years. Antennas come in a wide range of types based on their many applications.

### **ANTENNA REQUIREMENT**

An antenna is always required in the field of communication systems when wireless communication is required. When installing a wire system is not an option, an antenna can send and receive electromagnetic waves for communication purposes.

### **SITUATION**

The wiring must be installed all the way to the remote place, through valleys, mountains, tiresome pathways, tunnels, etc., in order to establish communication with it. The development of wireless technology has simplified the entire procedure. The essential component of this wireless technology is the antenna.

### **MECHANISM OF RADIATION**

An antenna's ability to emit or receive power is its only purpose. Antenna can be connected via a transmission line to the station's electronics, regardless of whether it transmits, receives, or does both. An antenna's ability to work is dependent on a transmission line's radiation mechanism. A transmission line is a conductor that is intended to transport current across long distances with little loss. As an illustration, consider a wire that is attached to an antenna. A transmission line that is straight and has an infinite length, conducting current at a constant speed, radiates no power.

A transmission line must be treated as a waveguide in order for it to emit power.

1. The transmission line or wire should be bent, shortened, or terminated if power needs to be dispersed even while the current is flowing at a constant speed.
2. Despite being straight, this transmission line radiates electricity if it has current that accelerates or decelerates with a time-varying constant.
3. A device or tube is referred to as a waveguide if it is bent or terminated to radiate energy. These are specifically utilized for transmitting and receiving microwaves.

**WAVELENGTH**

The usual definition states that the wavelength is "the distance between two consecutive maximum points (crests) or between two consecutive minimum points (troughs)." The length of that wave is all that separates two immediate positive peaks or two immediate negative peaks. It's known as the Wavelength. An illustration of a periodic waveform is provided below. In the figure, the amplitude and wavelength ( $\lambda$ ) are indicated. The wavelength will decrease with increasing frequency and vice versa.

**EXPRESSION IN MATHEMATICS**

for antenna efficiency -

$$\eta_e = \text{Prad} / \text{Pin}_{\text{input}}$$

where, The power emitted is called **Prad**.

The antenna's input power is known as **Pin<sub>input</sub>**.

**CONCLUSION**

The creation and production of antennas for the reception and transmission of electromagnetic waves is the focus of antenna technology. Conductive waves are transformed into free space waves by transmitting antennas, and then back into conducted waves by receiving antennas. The length of the waves determines an antenna's dimensions. Therefore, antenna diameters ranging from a few millimeters (in the high-frequency region above 50 GHz) to several hundred meters (in the long-wave range below 10 kHz) are achievable in antenna technology.

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