वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900

Antenna –The Evolution in the field of Communication

Lawkesh Tripathi
Asst. Professor
Department of Electronics and Communication Engg.
Shri Krishna University, Chhatarpur (M.P.)

ABSTRACT

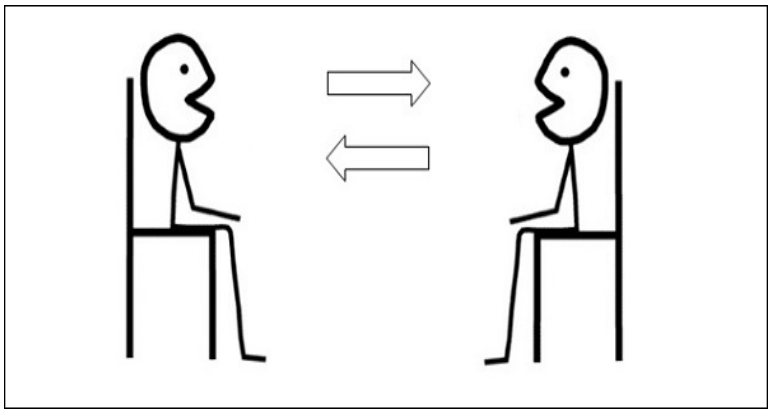
To fully comprehend radio communications, radar, cell phones, and other electronic communication technologies, one must study antennas and electromagnetic wave propagation. The fundamentals of wave propagation and antennas are covered in this course. Antennas come in many different varieties. It's like 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 Propogation 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.



वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900

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.

The images below provide examples of several antenna types.

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.

वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900

The antenna in the image above aid in establishing connectivity throughout the region, even the valleys and mountains. Clearly, this would be a simpler process than installing an electrical system throughout the space.

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.

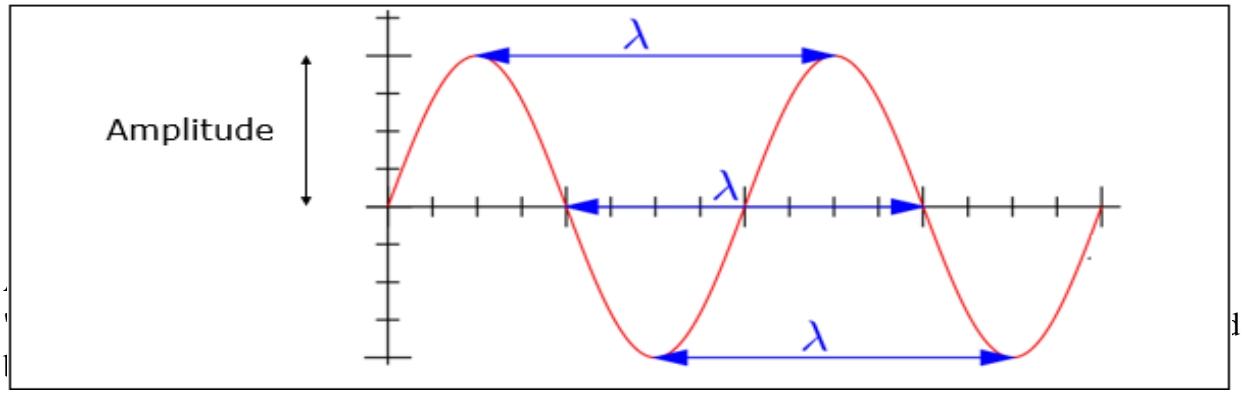
A transmission line must be treated as a waveguide in order for it to emit power.

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 (λ) are indicated. The wavelength will decrease with increasing frequency and vice versa.

वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900



its input with the fewest possible losses. An antenna's efficiency indicates how well it can deliver its output with the fewest losses possible in the transmission line.
This is also known as the antenna's radiation efficiency factor.

EXPRESSION IN MATHEMATICS

for antenna efficiency -

ηe=Prad/Pinput

where, The power emitted is called **Prad**.
The antenna's input power is known as **Pinput**.

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.

REFERENCES

1) William Hart Hayt and John A Buck. Engineering electromagnetics, volume 7. McGraw-Hill New York, 2001
2) Warren L Stutzman and Gary A Thiele. Antenna theory and design. John Wiley & Sons, 2012
3) "***Antenna And Wave Propagation***" by K.D. Prasad,2003
4) Antenna Theory: Analysis and Design, Pearson Publication Third Edition, G.S.N Raju,2009
5) Antenna and Wave Propagation by R.L Yadava,2011