

NIELIT GORAKHPUR

Course Name: O Level (2nd Sem)

Subject: Introduction to ICT Resources

Topic: Computer Network – Unguided Media(Part 1)

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Computer Network

Unguided Media

Media in which the signals are not guided through a solid medium are known as unguided media. Air is the media through which electromagnetic energy can flow easily. Therefore, there are several methods which are in use to send electromagnetic energy through air. These methods are:

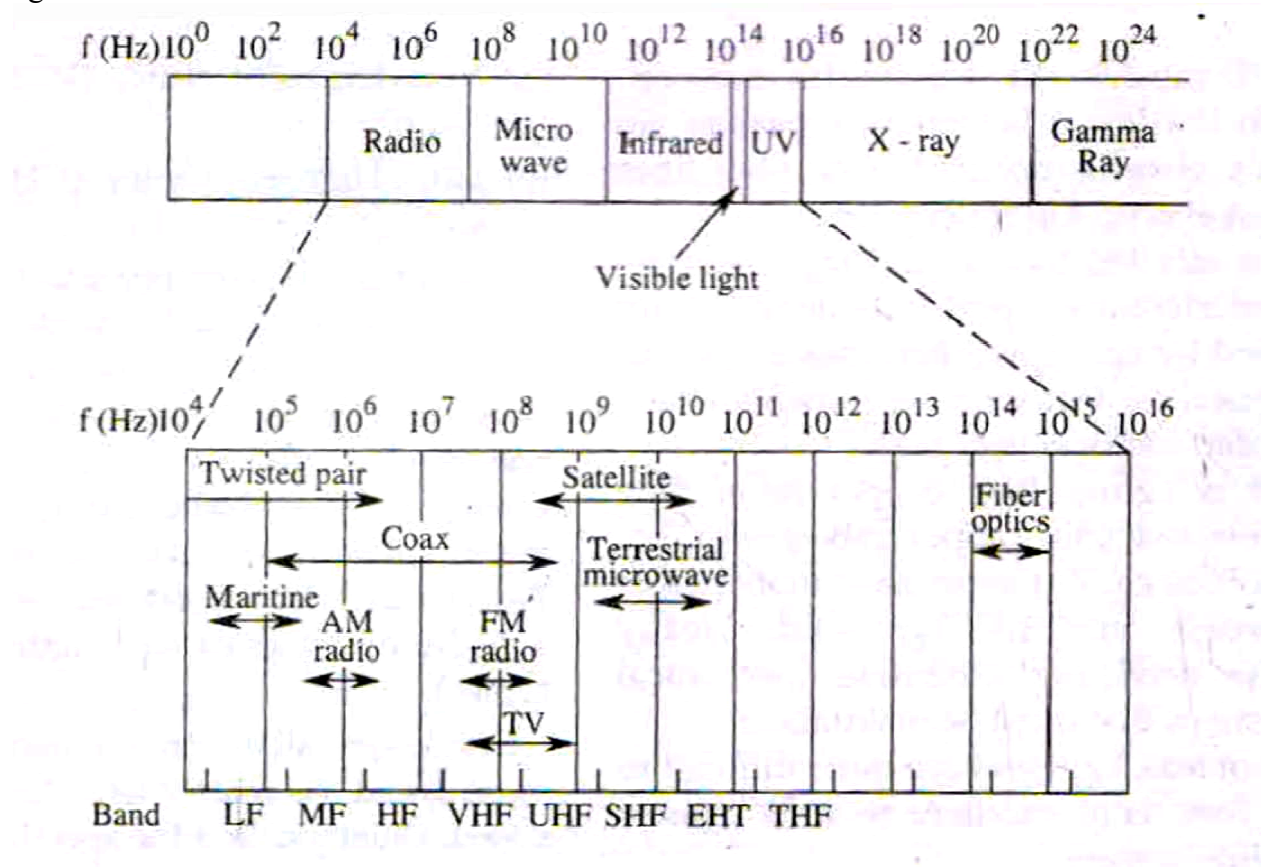
- (a) Radio wave communication including VHF and microwave links
- (b) Satellite links
- (c) VSATs (Very Small Aperture Terminals)
- (d) Infrared and Millimeter Waves

• Radio Waves

Radio waves have frequencies between 10 kilohertz (kHz) and 1 gigahertz (GHz). Radio waves include the following types:

- i. Short-wave
- ii. Very-High-Frequency (VHF) television and FM radio.
- iii. Ultra-High-Frequency (UHF) radio and television

The range of frequency and type of medium used for the transfer of radio waves is shown in figure bellow.



Radio waves can be broadcasted Omni-directionally or unidirectional. Various kinds of antennae can be used to broadcast radio signals. The power of the Radio Frequency (RF)

signal is determined by the antenna and trans-receiver (a device that transmits and receives a signal over a medium such as copper, radio waves or fiber-optic cables).

In vacuum, all electromagnetic waves travel at the same speed, no matter what their frequency is. This speed, usually called the speed of light, c , is approximately 3×10^8 meters per second or about 1 foot per nanosecond. In copper or fiber, the speed slows to about 2/3 of this value and becomes slightly frequency dependent.

Radio Transmission

Some of the characteristics of radio waves are as follows:

- (a) Radio waves are easy to generate.
- (b) They can travel long distances
- (c) They can penetrate buildings easily. Thus, they are widely used for communications both indoors and outdoors.
- (d) Radio waves are Omni-directional, meaning that they travel in all directions from the source, so that the transmitter and receiver do not have to be carefully aligned physically.

In Very Low Frequency (VLF), Low Frequency (LF) and Medium Frequency (MF) bands, radio waves follow the earth's surface. Amplitude modulated radio broadcasting uses the MF band. This band of frequencies cannot be used for data transfer because they offer relatively low bandwidth.

The amount of information that an electromagnetic wave can carry is related to its bandwidth. With current technology, it is possible to encode a few bits per Hertz at low frequencies, but often as many as 40 under certain conditions at high frequencies. So, a cable with a 500 MHz bandwidth can carry several gigabits/sec.

In the HF and VHF bands, the ground waves tend to be absorbed by the earth's surface. However, the waves that reach the ionosphere are refracted by it and sent back to earth. Ionosphere is a layer of charged particles circling the earth at a height of 100 to 500 km.

Exercise:

- 1: What is unguided media?**
- 2: Write the characteristics of radio waves.**
- 2: How many types of radio wave?**