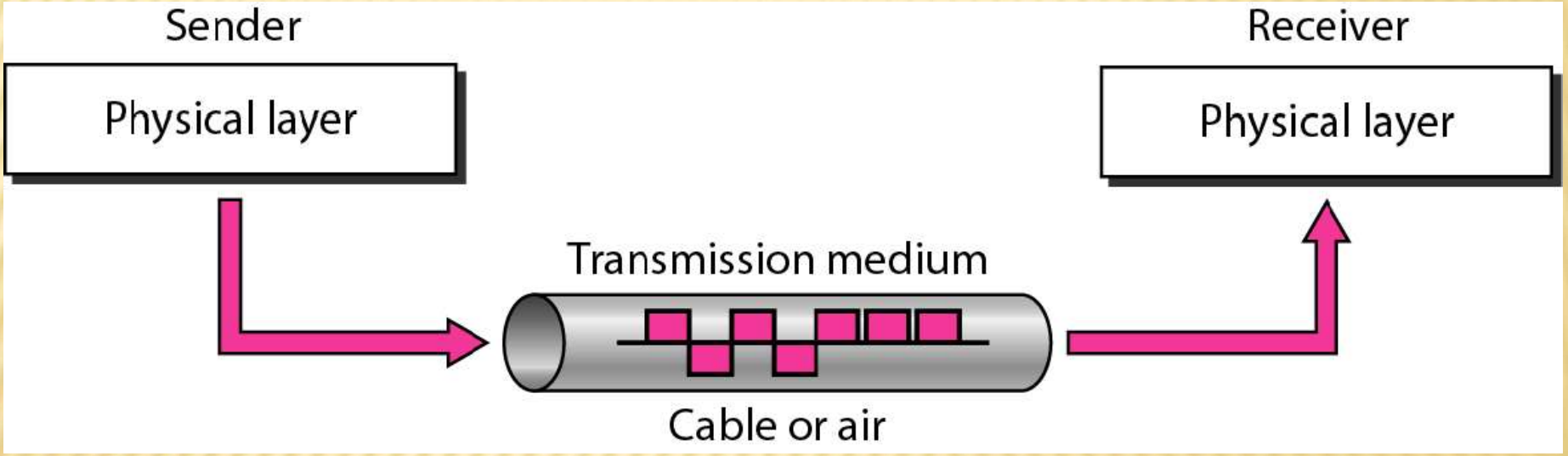
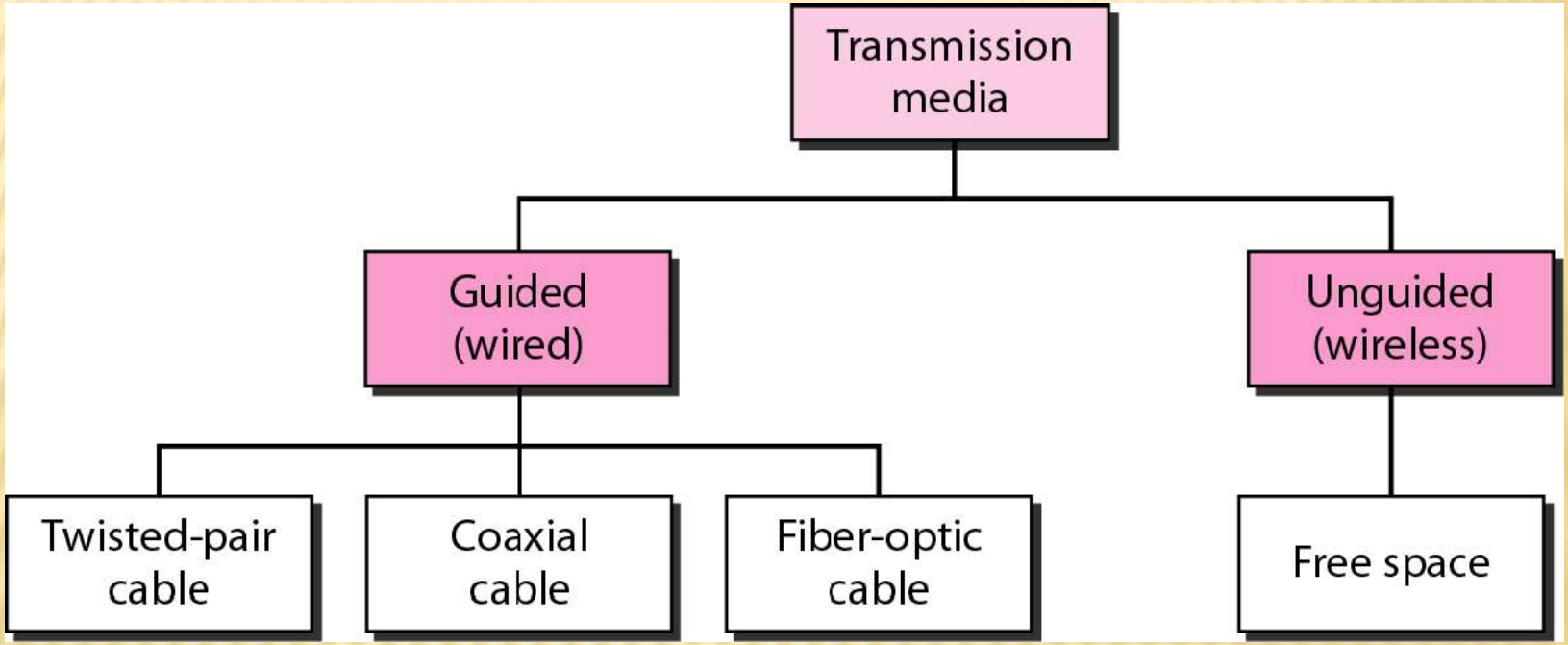
Transmission medium and physical layer



Classes of transmission media



GUIDED MEDIA

Guided media, which are those that provide a conduit from one device to another, include twisted-pair cable, coaxial cable, and fiber-optic cable.

Types Of Guided Media

- **Twisted-Pair Cable**
- **Coaxial Cable**
- **Fiber-Optic Cable**

Twisted Pair

The wires in Twisted Pair cabling are twisted together in pairs. Each pair would consist of a wire used for the +ve data signal and a wire used for the -ve data signal. Any noise that appears on 1 wire of the pair would occur on the other wire. Twisted Pair cables are most effectively used in systems that use a balanced line method of transmission.

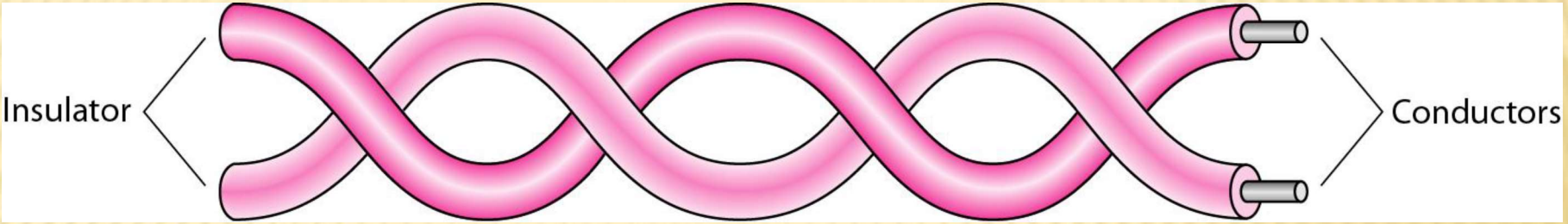
UTP

UTP or Unshielded Twisted Pair cable is used on Ethernet 10BaseT and can also be used with Token Ring. It uses the RJ line of connectors (RJ45, RJ11, etc..)

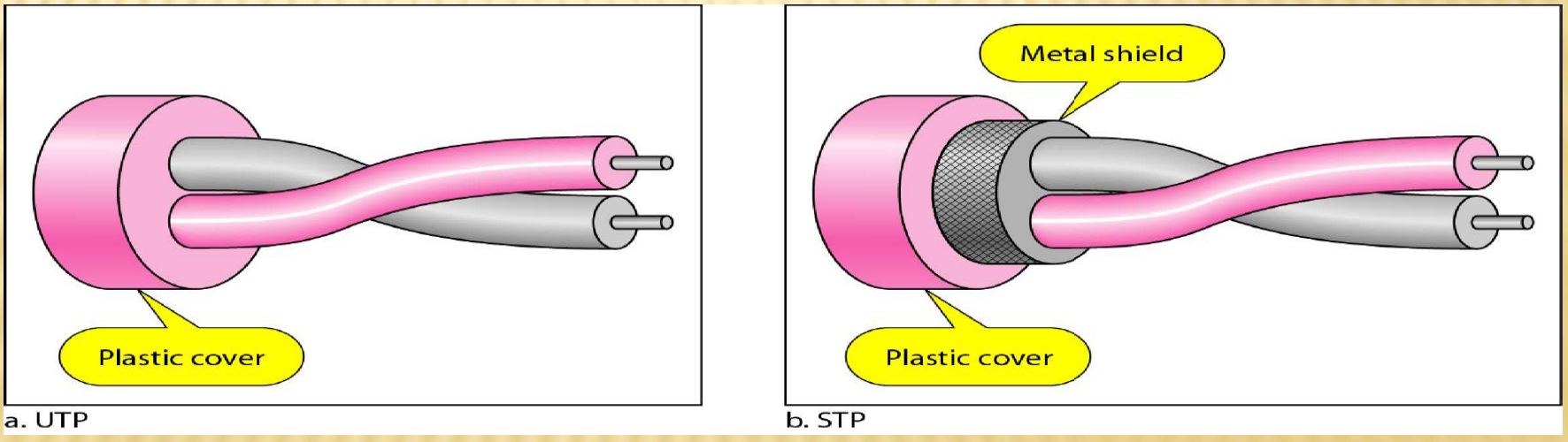
STP

STP or Shielded Twisted Pair is used with the traditional Token Ring cabling or ICS - IBM Cabling System. It requires a custom connector. IBM STP (Shielded Twisted Pair) has a characteristic impedance of 150 ohms.

Twisted-pair cable



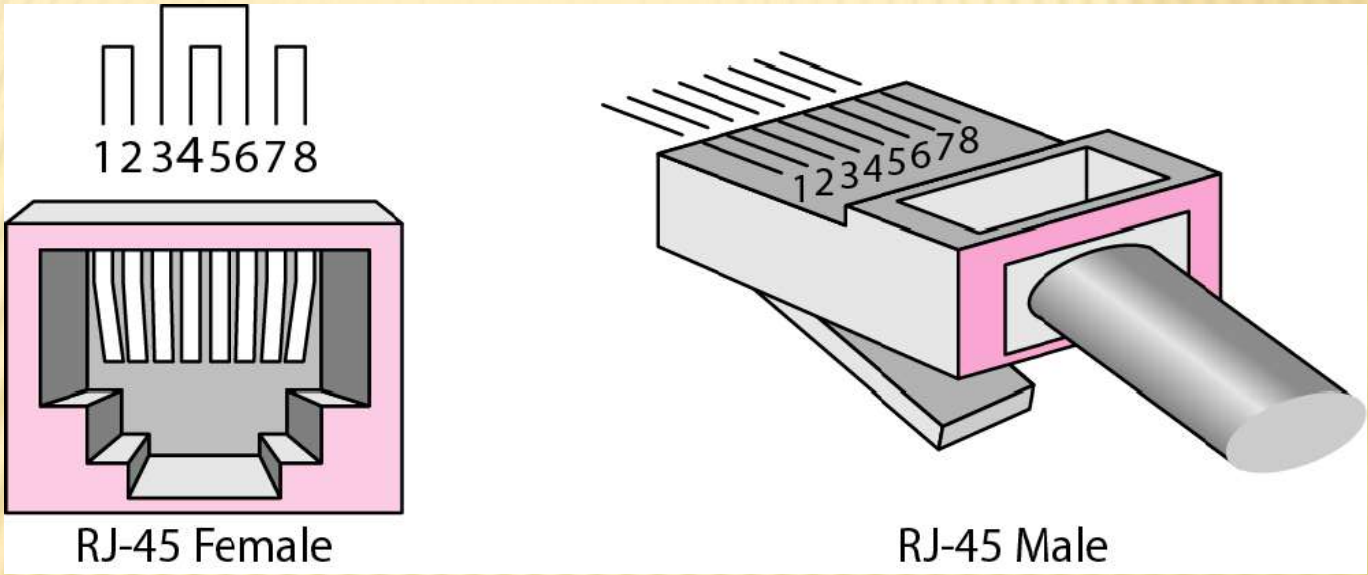
UTP and STP cables



a. UTP

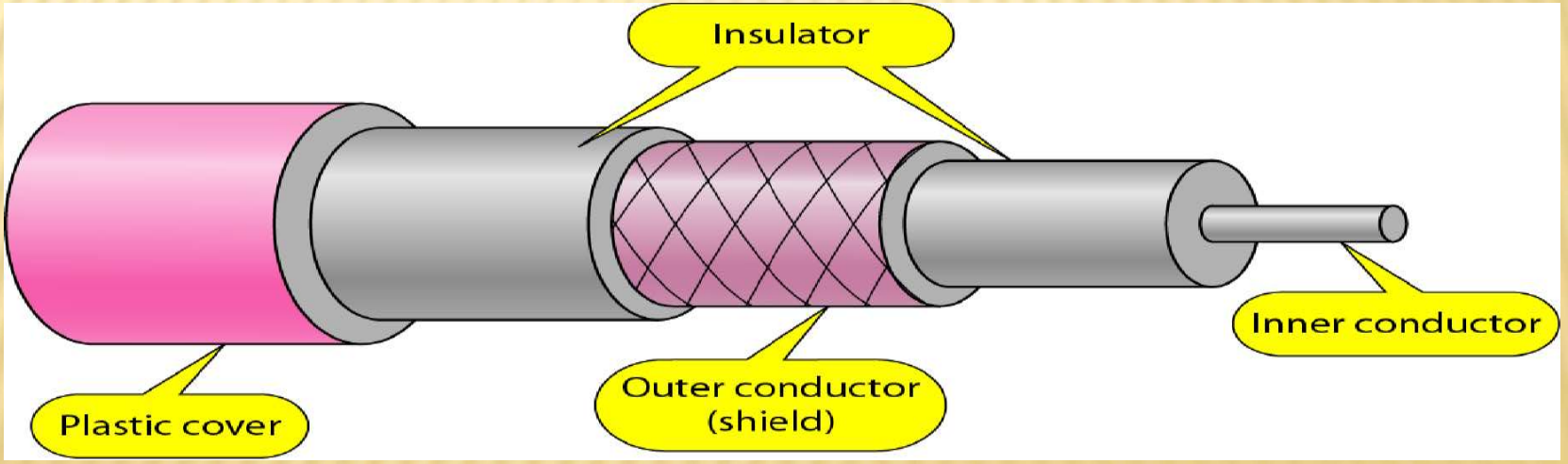
b. STP

UTP connector



Coaxial cable

Coaxial Cable consists of 2 conductors. The inner conductor is held inside an insulator with the other conductor woven around it providing a shield. An insulating protective coating called a jacket covers the outer conductor. The outer shield protects the inner conductor from outside electrical signals. The distance between the outer conductor (shield) and inner conductor plus the type of material used for insulating the inner conductor determine the cable properties or impedance. Typical impedances for coaxial cables are 75 ohms for Cable TV, 50 ohms for Ethernet Thinnet and Thicknet. The excellent control of the impedance characteristics of the cable allow higher data rates to be transferred than Twisted Pair cable.

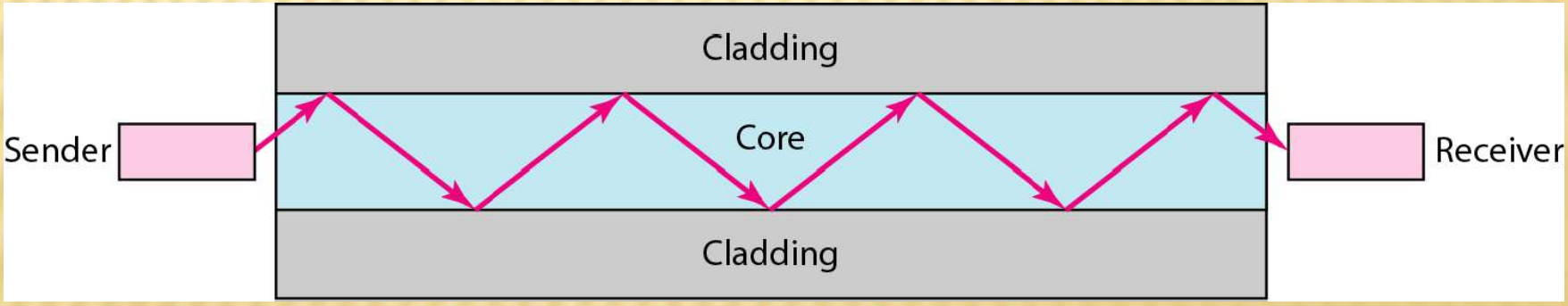


Categories of coaxial cables

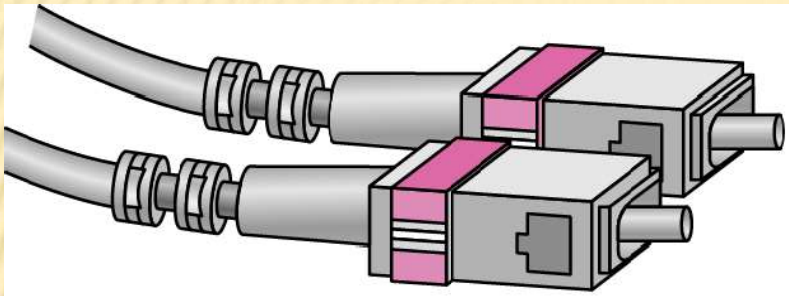
Category	*Impedance*	*Use*
RG-59	75 Ω	Cable TV
RG-58	50 Ω	Thin Ethernet
RG-11	50 Ω	Thick Ethernet

Optical Fibre

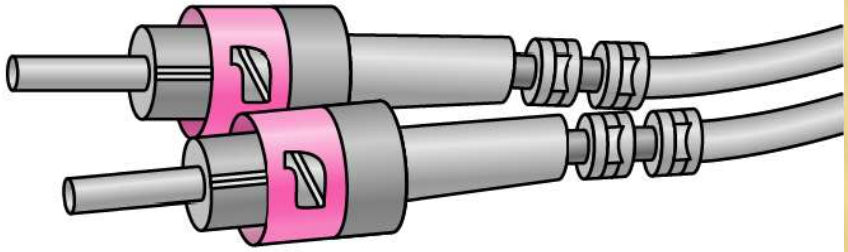
Optical Fibre consists of thin glass fibres that can carry information at frequencies in the visible light spectrum and beyond. The typical optical fibre consists of a very narrow strand of glass called the Core. Around the Core is a concentric layer of glass called the Cladding



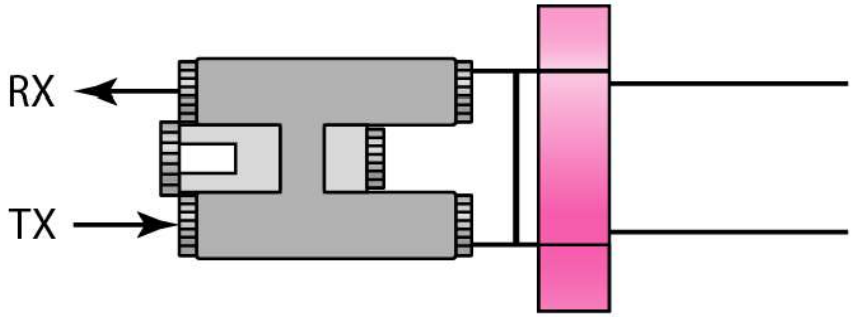
Fiber-optic cable connectors



SC connector



ST connector



MT-RJ connector

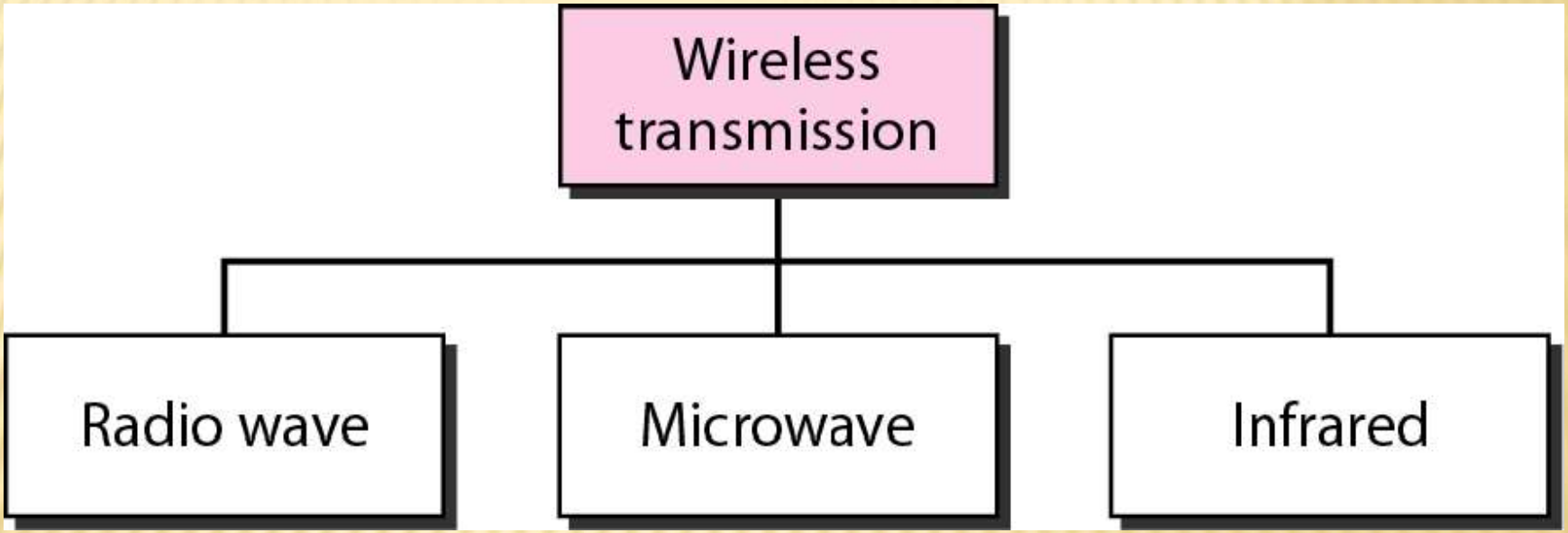
UNGUIDED MEDIA: WIRELESS

Unguided media transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication.

Types Of Unguided Media:

- **Radio Waves**
- **Microwaves**
- **Infrared**

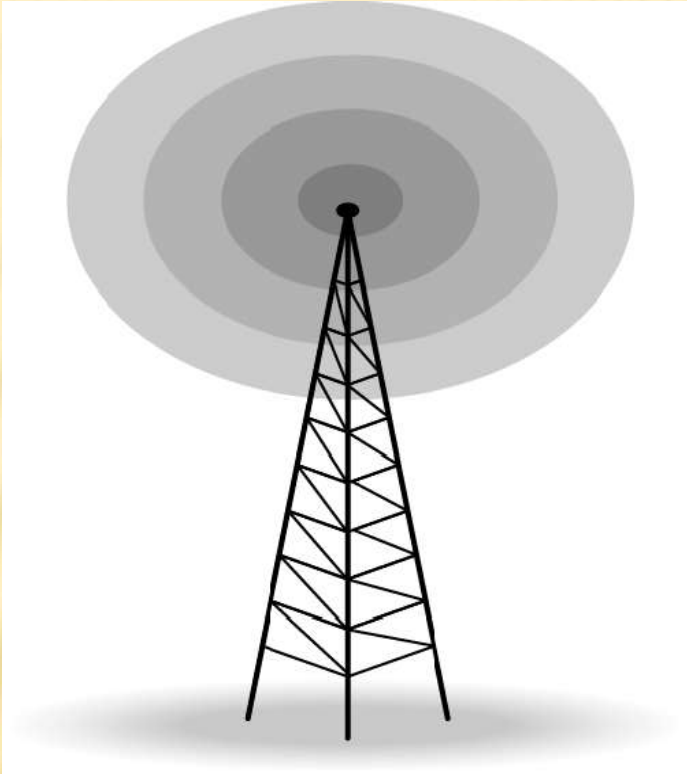
Wireless transmission waves



RADIO WAVES

Radio waves are used for multicast communications, such as radio and television, and paging systems. They can penetrate through walls.
Highly regulated. Use omni directional antennas

Omnidirectional antenna



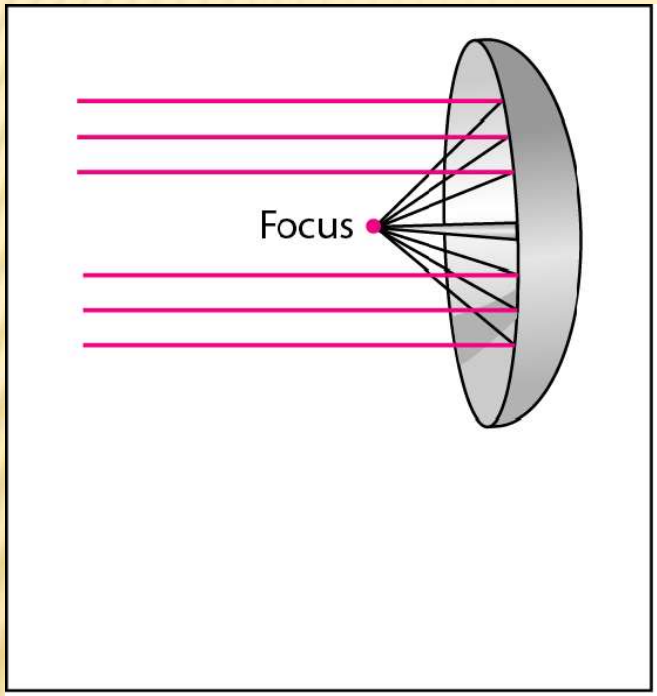
MICROWAVES

Microwaves are used for unicast communication such as cellular telephones, satellite networks, and wireless LANs.

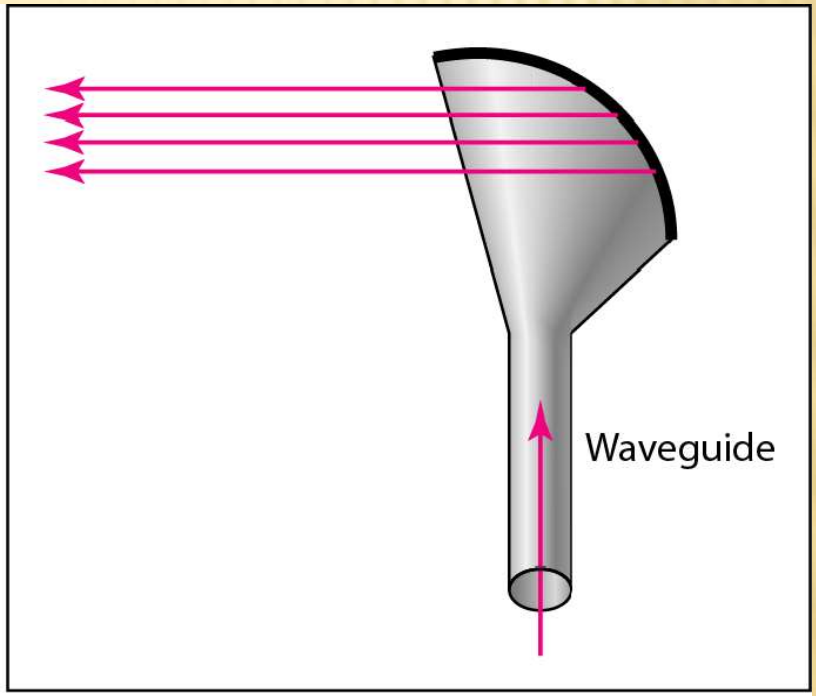
Higher frequency ranges cannot penetrate walls.

Use directional antennas - point to point line of sight communications.

Unidirectional antennas



a. Dish antenna



b. Horn antenna

INFRARED

Infrared signals can be used for short-range communication in a closed area using line-of-sight propagation.


Thank You!