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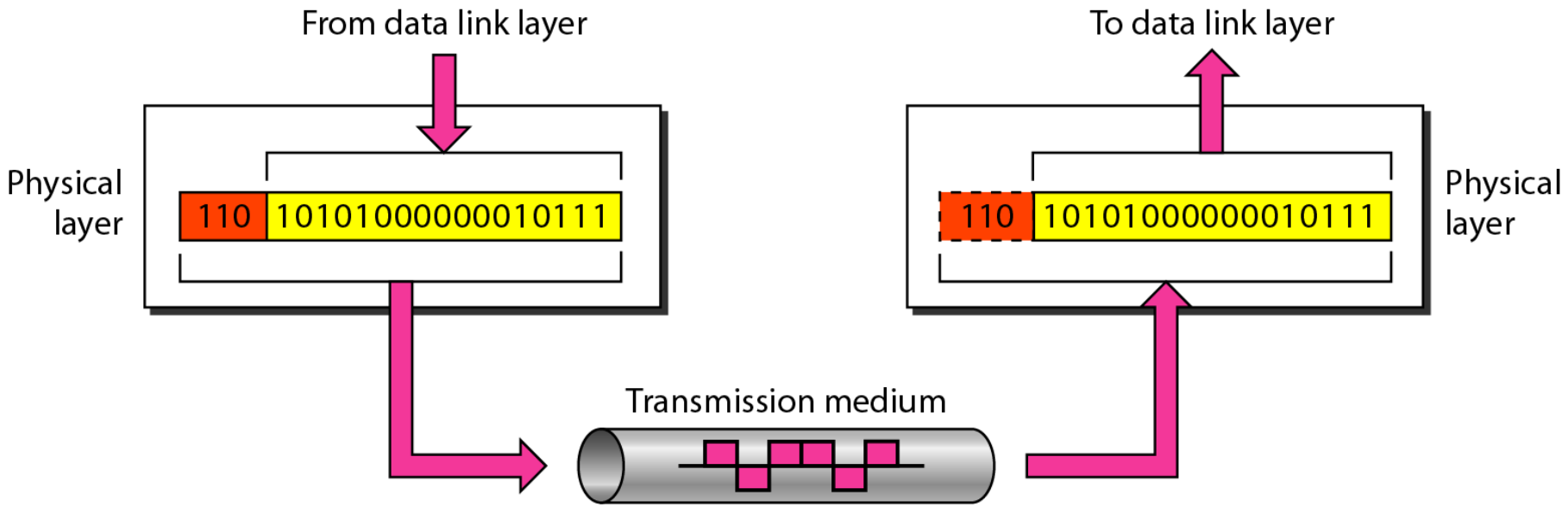
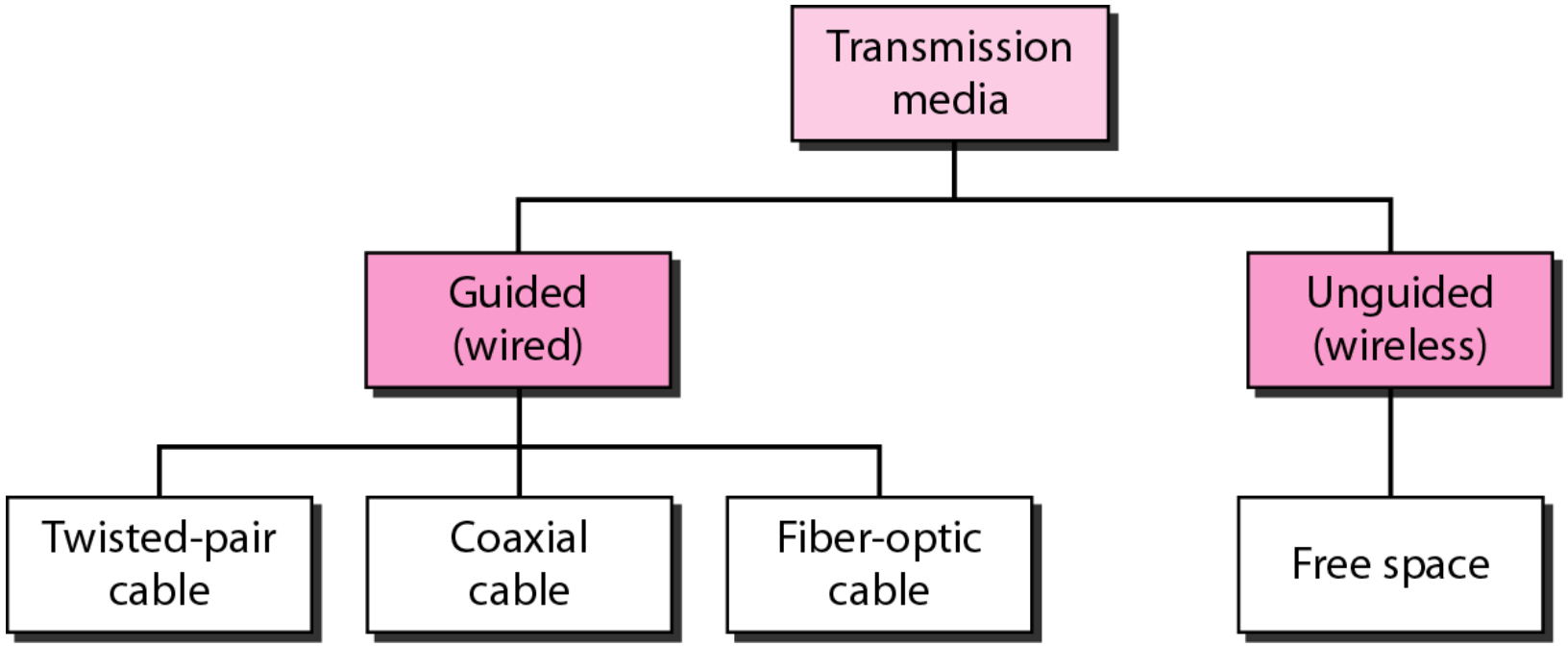
Physical Layer-Part-2

Transmission Media

Physical layer



Classes of transmission media



GUIDED MEDIA: WIRED

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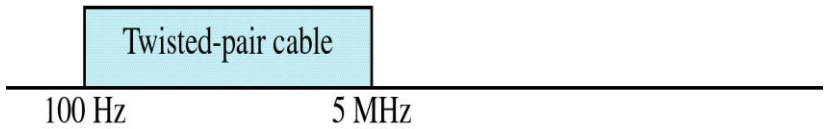
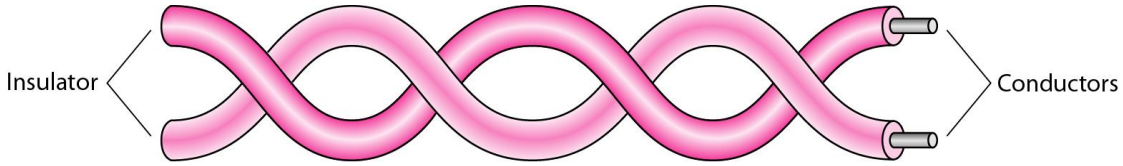
- All communication wires/cables are guided media
- In this media, the sender and receiver are directly connected and the information is send *guided* through it.

Twisted Pair cables

- Consists of 4 pairs (8 wires) of insulated copper wires typically about 1 mm thick.
- The wires are twisted together in a helical form.
- Twisting reduces the interference between pairs of wires.
- Flexible and cheap cable.
- CAT 3, CAT 4, CAT 5, Enhanced CAT 5 and now CAT 6.





Twisted-pair cable

Types of Twisted Pair cables

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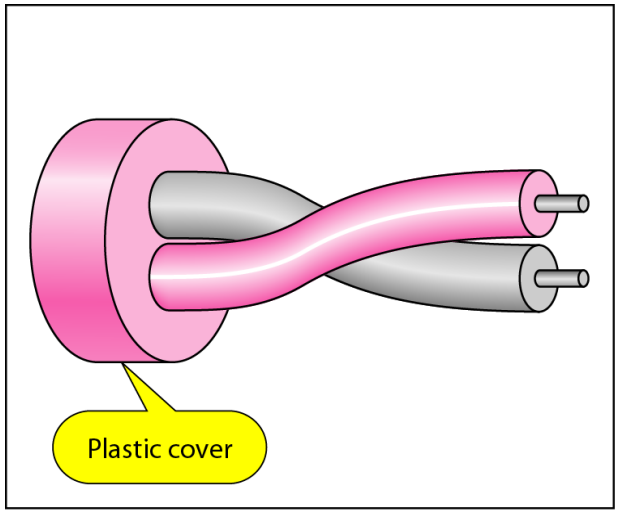
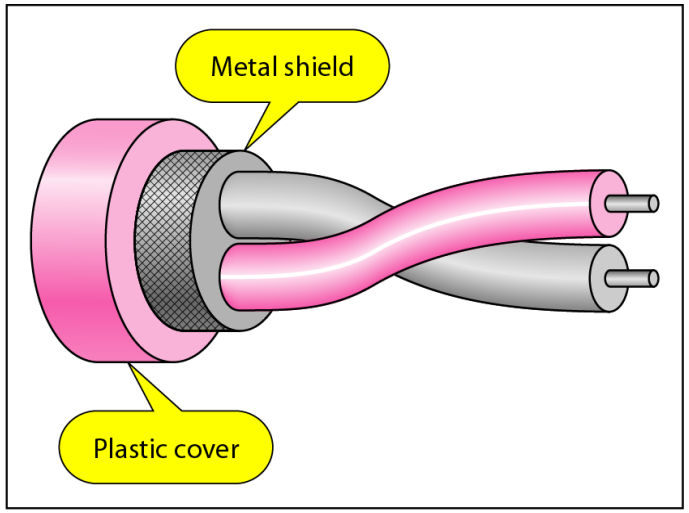
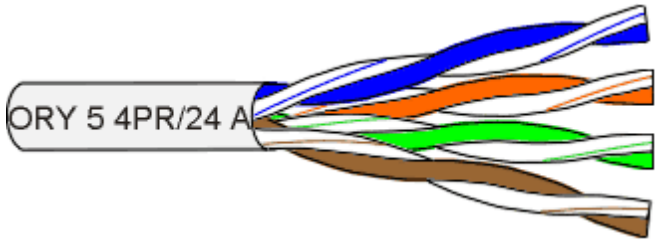
- UTP- Unshielded Twisted Pair
- STP- Shielded Twisted Pair



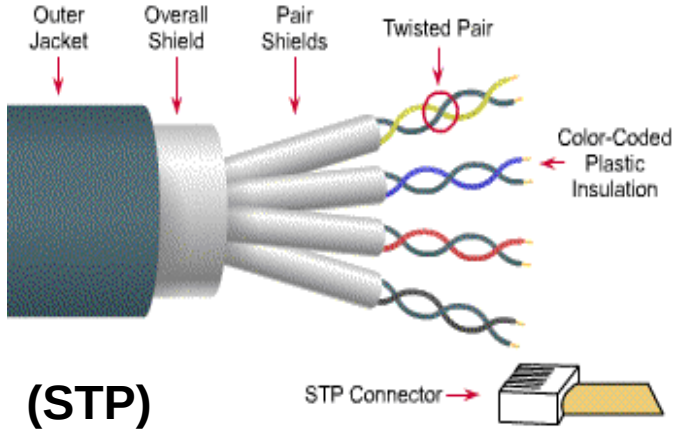
a. UTP



b. STP



(UTP)



(STP)

Coaxial cable

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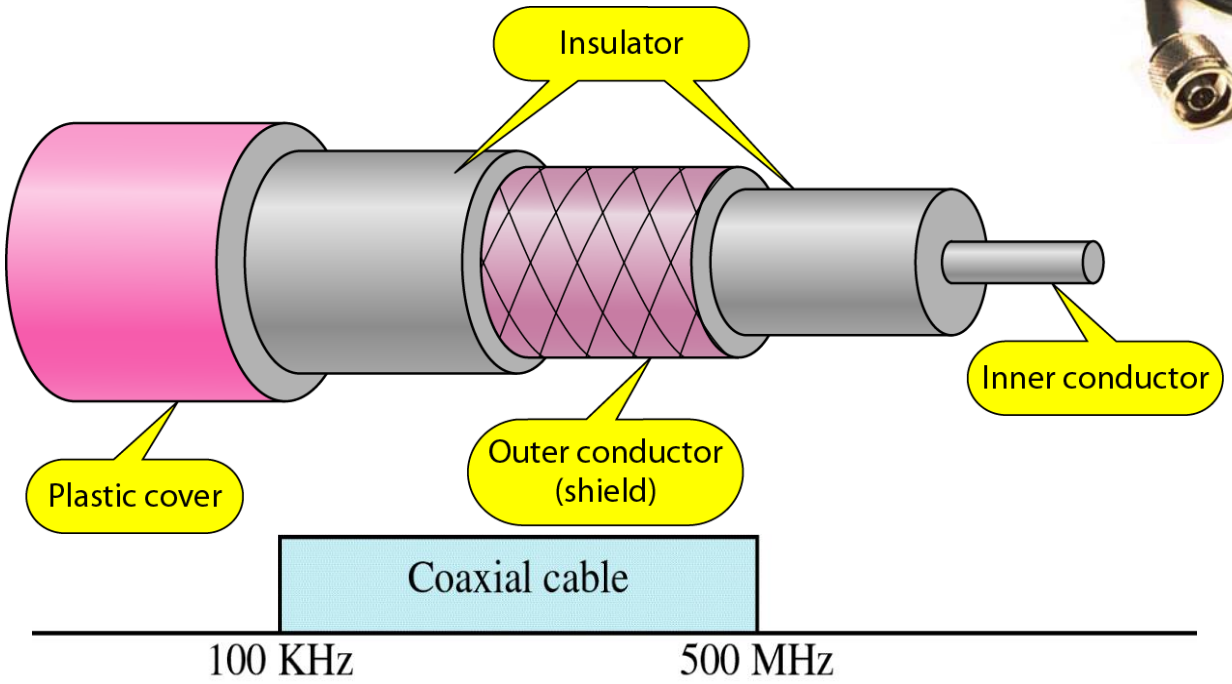
Coaxial cable is a type of copper **cable** specially built with a metal shield and other components engineered to block signal interference.



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

Coaxial cable

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Coaxial cable Connector Types

- F type- Used to connect a cable TV and FM antenna

- BNC (Bayonet Neill- Concelman)Type-

  Used to terminate a coaxial cable

  - T connectors
  - Barrel connectors

Fiber Optics Cables

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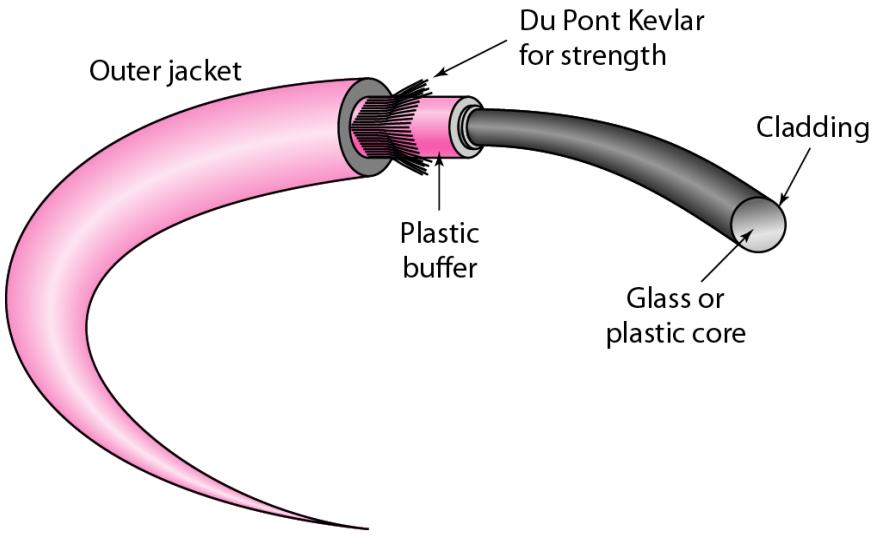
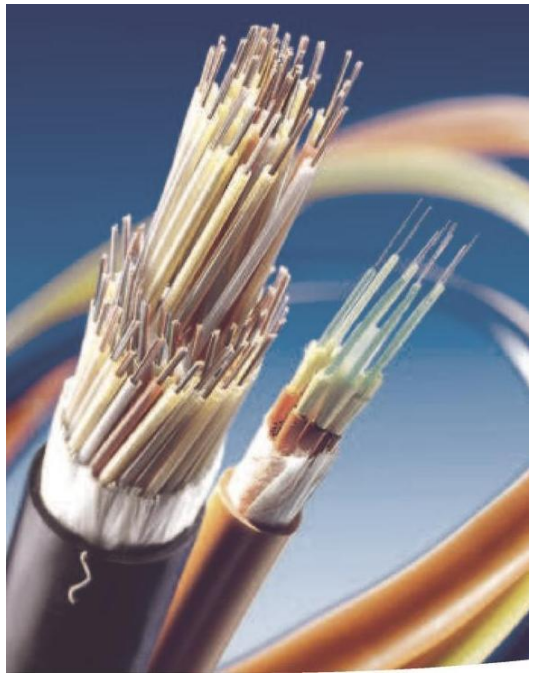
- A fiber optics cable is a type of cable that has a number of optical fibers bundled together, which are normally covered in their individual protective plastic covers.
- It is used to transfer digital data signals in the form of light up to distances of hundreds of miles.





Fibre Optic cable

Fiber optics: *Bending of light ray*

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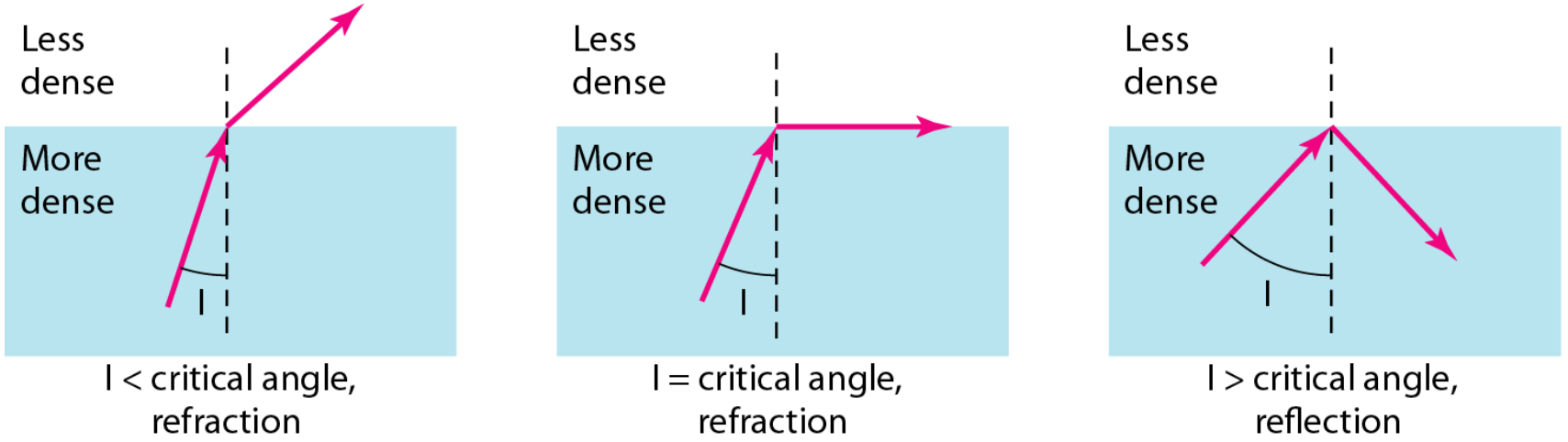

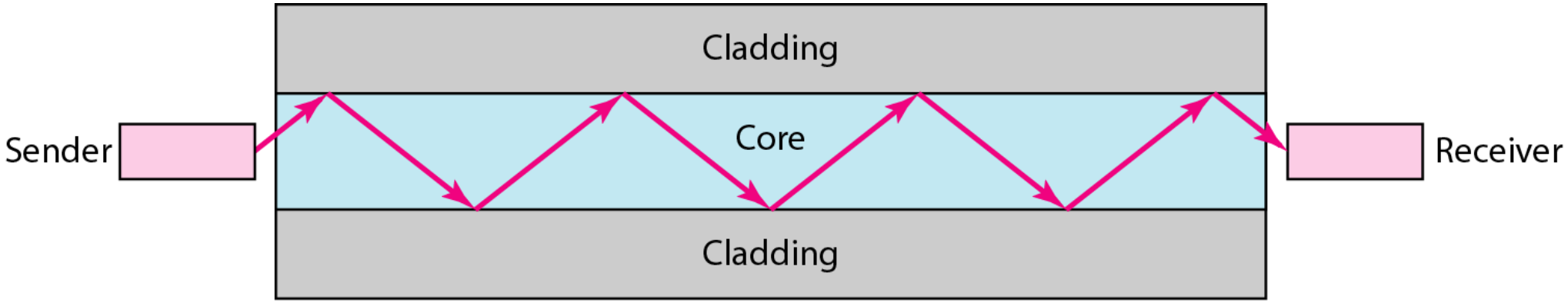

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Fiber Optics Connector Types

- ST- used to connect multi-mode fibers
- SC- used in single mode and multi-mode
- LC- used in single mode and multi-mode
- MT-RJ- used with multi-mode fibers

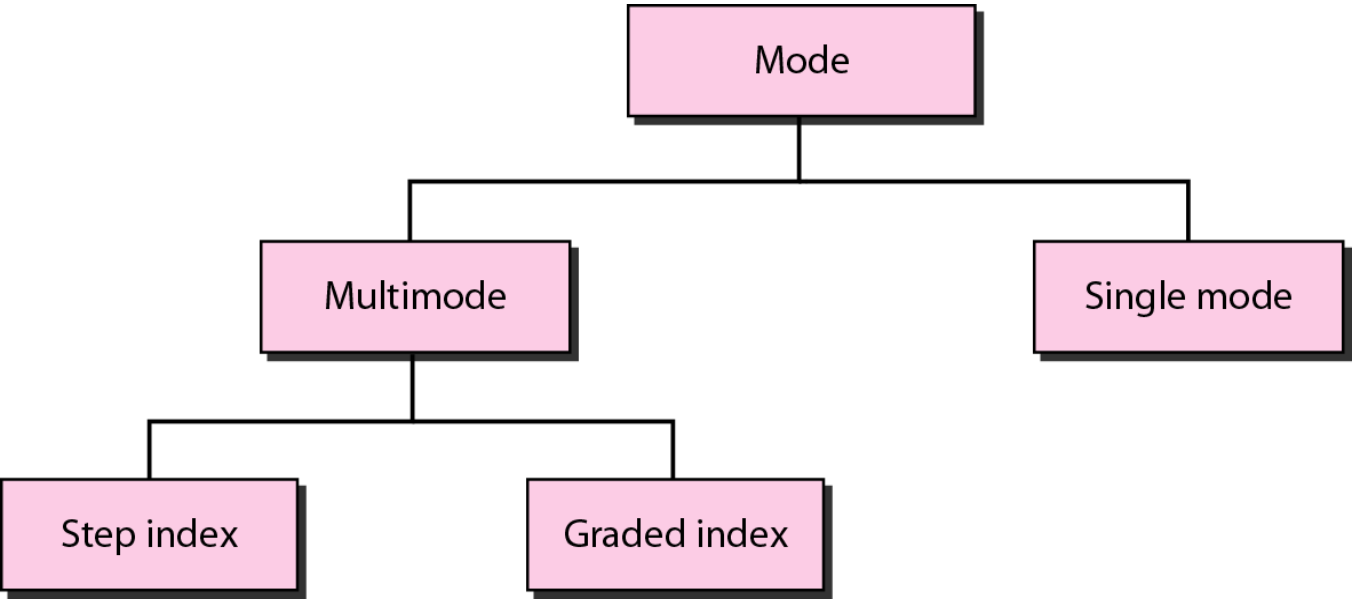
Straight Tip (ST)

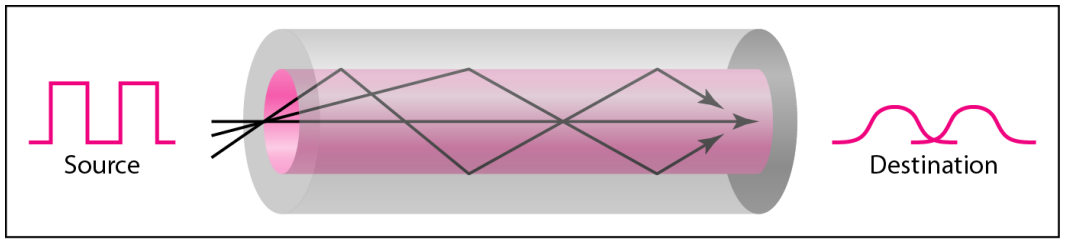
Standard Connector (SC)

Local Connector (LC)

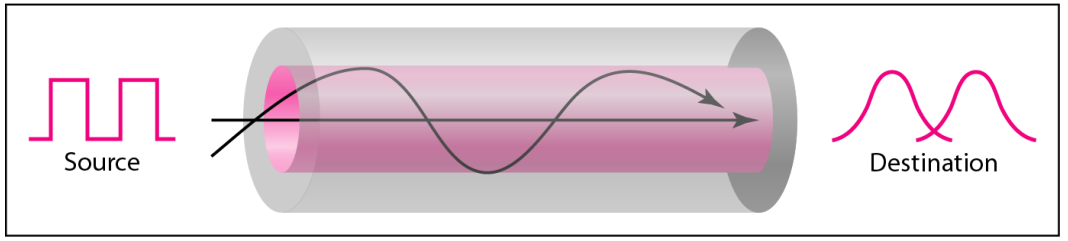
Mechanical Transfer Registered Jack (MT-RJ)

Propagation modes in Fibre Optics

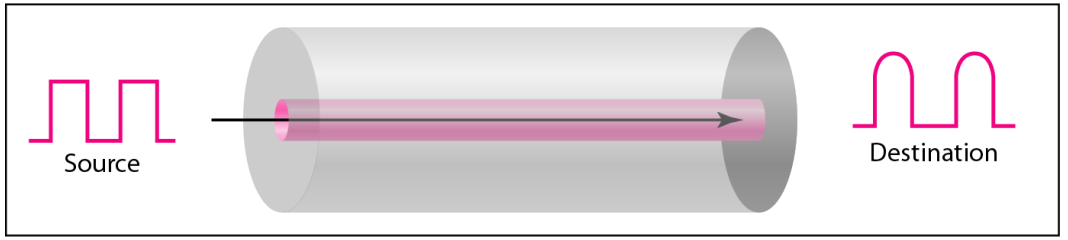




a. Multimode, step index



b. Multimode, graded index



c. Single mode

UNGUIDED MEDIA: WIRELESS

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

Electromagnetic spectrum for wireless communication

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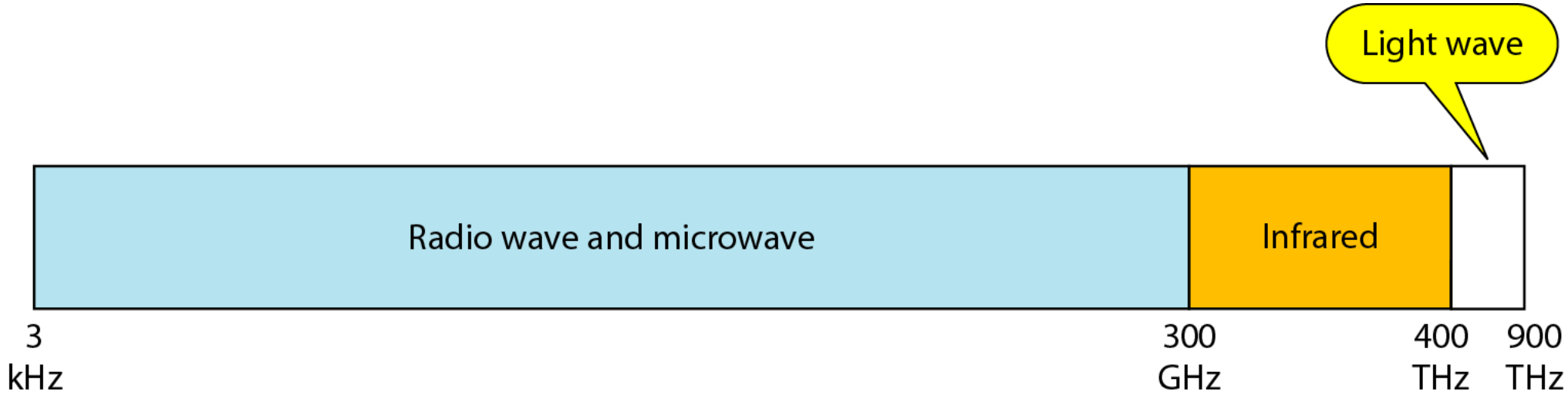
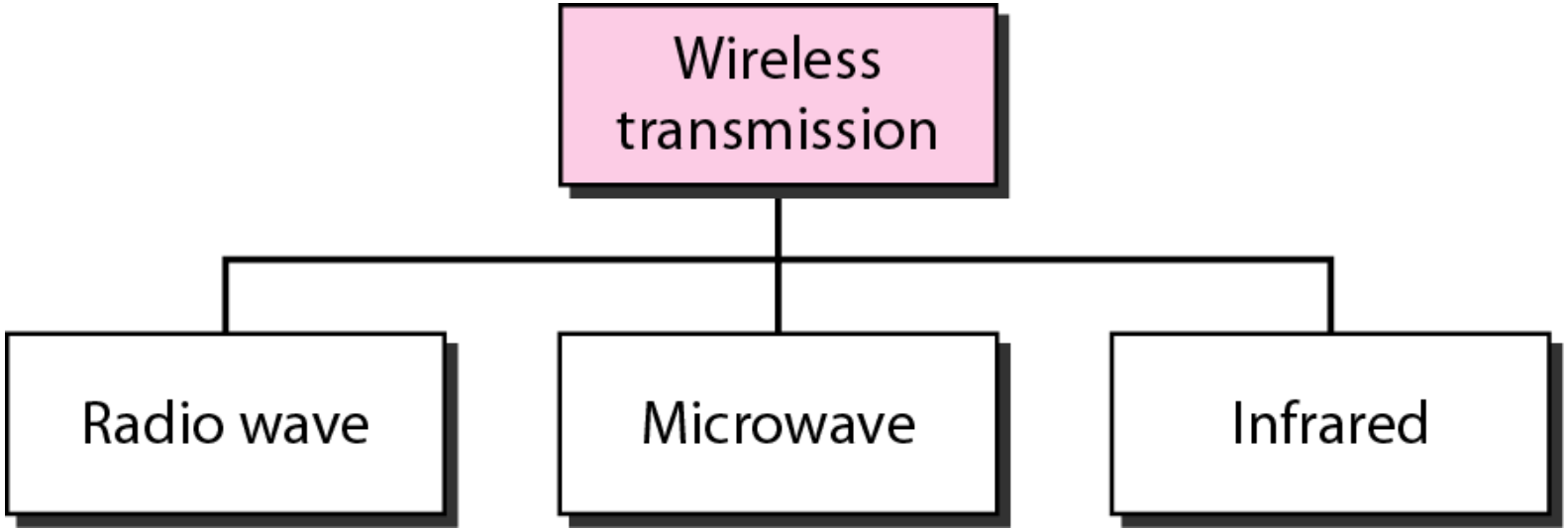


Bands and Applications

Band	*Range*	*Propagation*	*Application*
VLF (very low frequency)	3–30 kHz	Ground	Long-range radio navigation
LF (low frequency)	30–300 kHz	Ground	Radio beacons and navigational locators
MF (middle frequency)	300 kHz–3 MHz	Sky	AM radio
HF (high frequency)	3–30 MHz	Sky	Citizens band (CB), ship/aircraft communication
VHF (very high frequency)	30–300 MHz	Sky and line-of-sight	VHF TV, FM radio
UHF (ultrahigh frequency)	300 MHz–3 GHz	Line-of-sight	UHF TV, cellular phones, paging, satellite
SHF (superhigh frequency)	3–30 GHz	Line-of-sight	Satellite communication
EHF (extremely high frequency)	30–300 GHz	Line-of-sight	Radar, satellite

Wireless transmission waves



Wireless transmission waves

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Radio Waves

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

Microwaves Waves

- 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.

Infrared Waves

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

Wireless Channels

- Are subject to a lot more errors than guided media channels.
- Interference is one cause for errors, can be circumvented with high SNR.
- The higher the SNR the less capacity is available for transmission due to the broadcast nature of the channel.
- Channel also subject to fading and no coverage holes.

Question

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- Identify the type of network cabling shown in the graphic

Question

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Question

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- Identify the type of network cabling shown in the graphic