



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME :19IT401 COMPUTER NETWORKS

II YEAR /IV SEMESTER

Unit 1- INTRODUCTION AND PHYSICAL LAYER

Topic 6:Transmission media



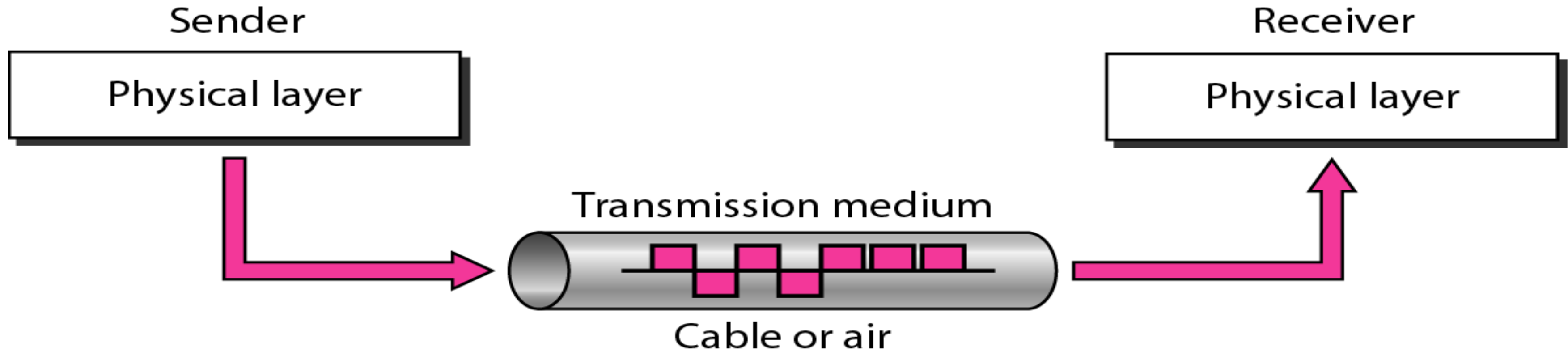
Physical layer-Transmission media



- ✓ Transmission media are actually located below the physical layer and are directly controlled by the physical layer.
- ✓ A transmission medium can be broadly defined as anything that can carry information from a source to a destination
- ✓ The transmission medium is usually free space, metallic cable, or fiber-optic cable.

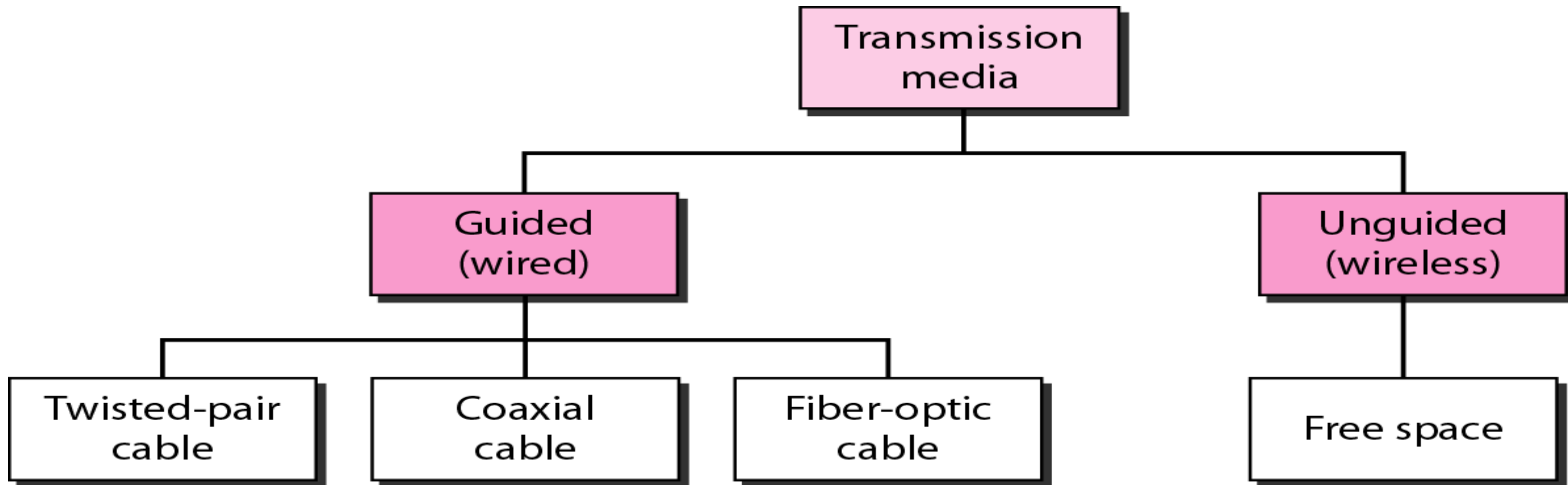


Transmission medium and physical layer



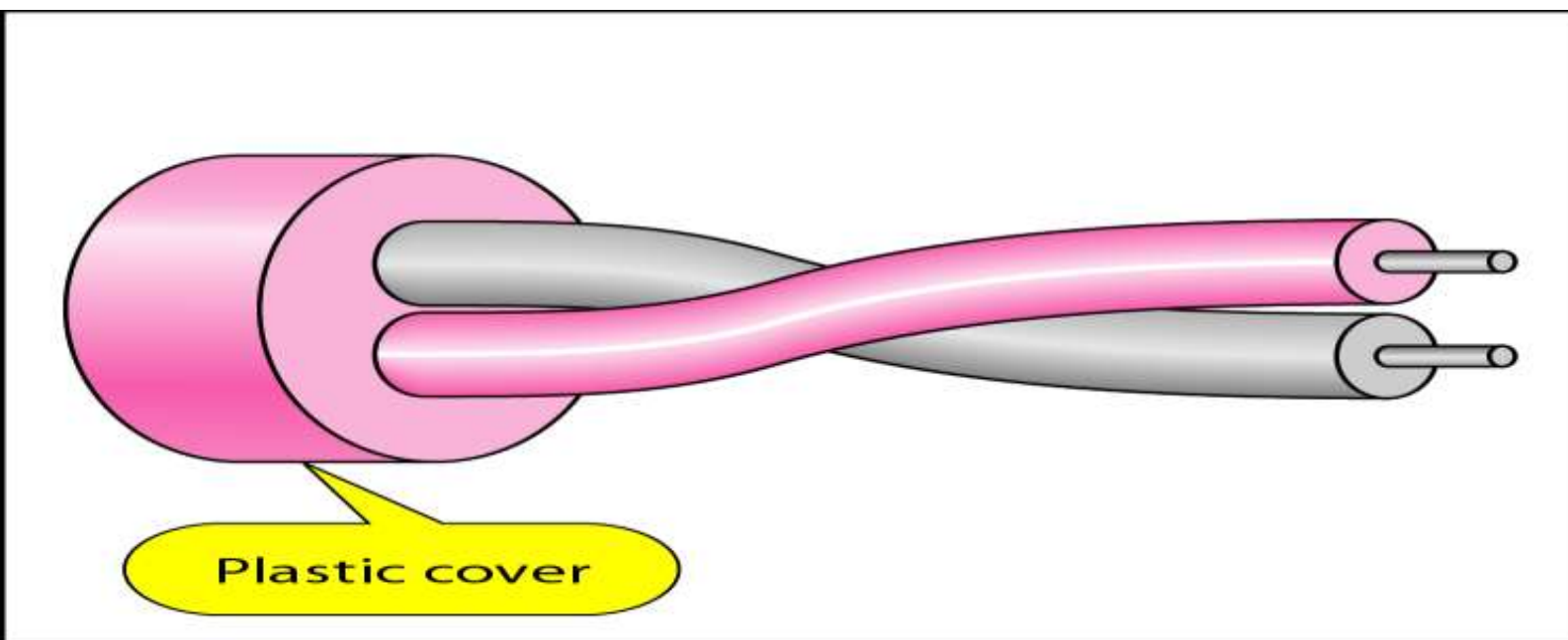
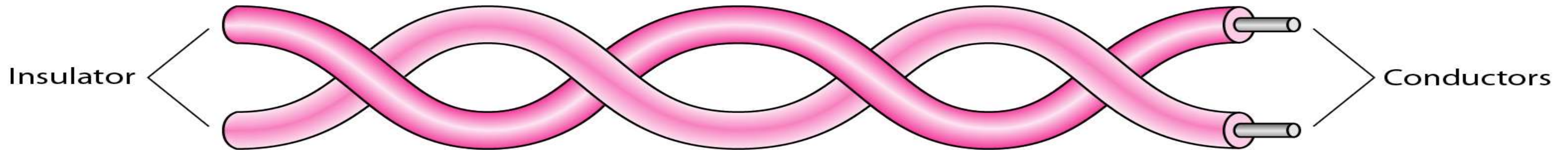


Classes of transmission media

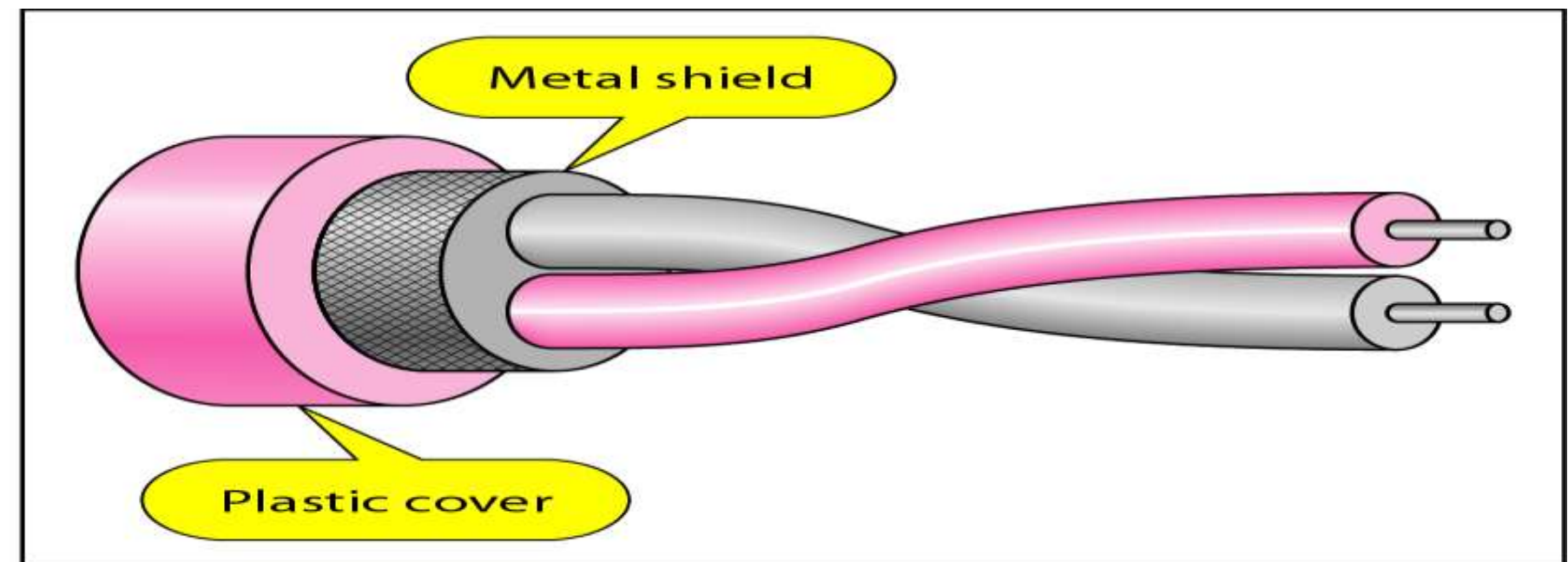


Twisted-pair cable

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

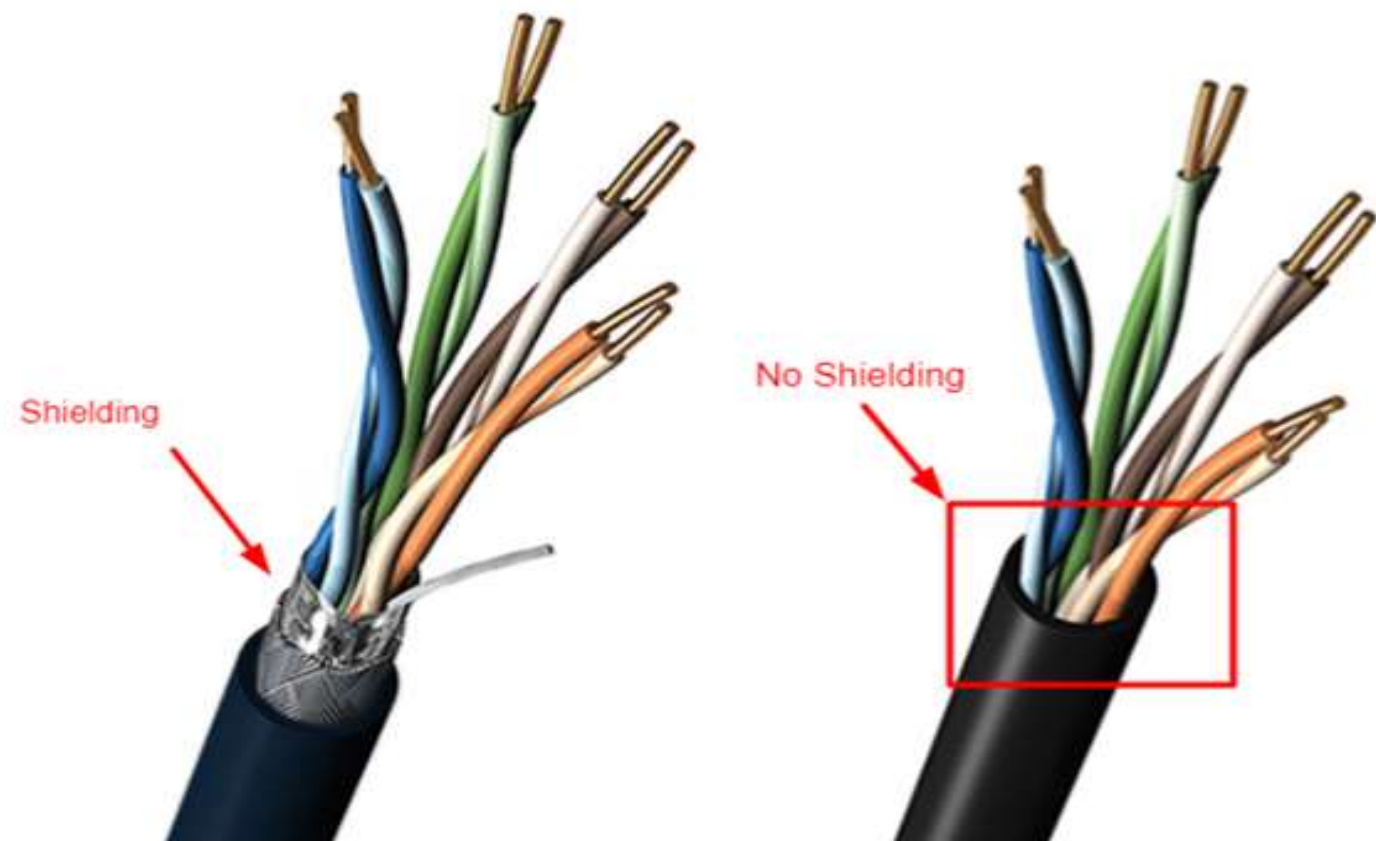


a. UTP



b. STP

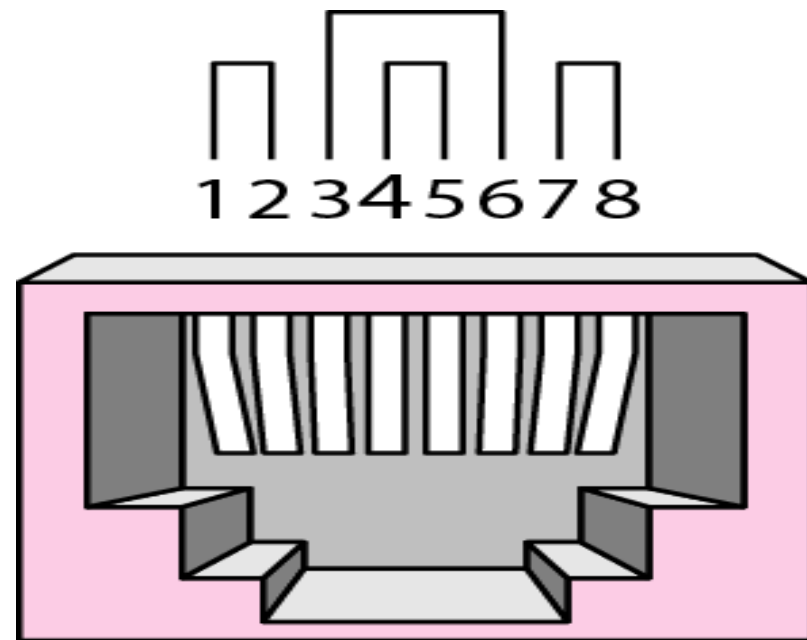
- ✓ In a **shielded twisted pair (STP)**, the wires are enclosed in a shield that functions as a **grounding** mechanism. This is done to provide greater protection from electromagnetic interference and radio frequency interference; however, STP cable is more expensive and difficult to install, compared with UTP.
- ✓ **Unshielded twisted pair (UTP)** is a type of copper cabling used in telephone wiring and local area networks (**LANs**). There are 8 types of UTP cables -- identified with the prefix CAT, as in *category* -- each supporting a different amount of bandwidth.



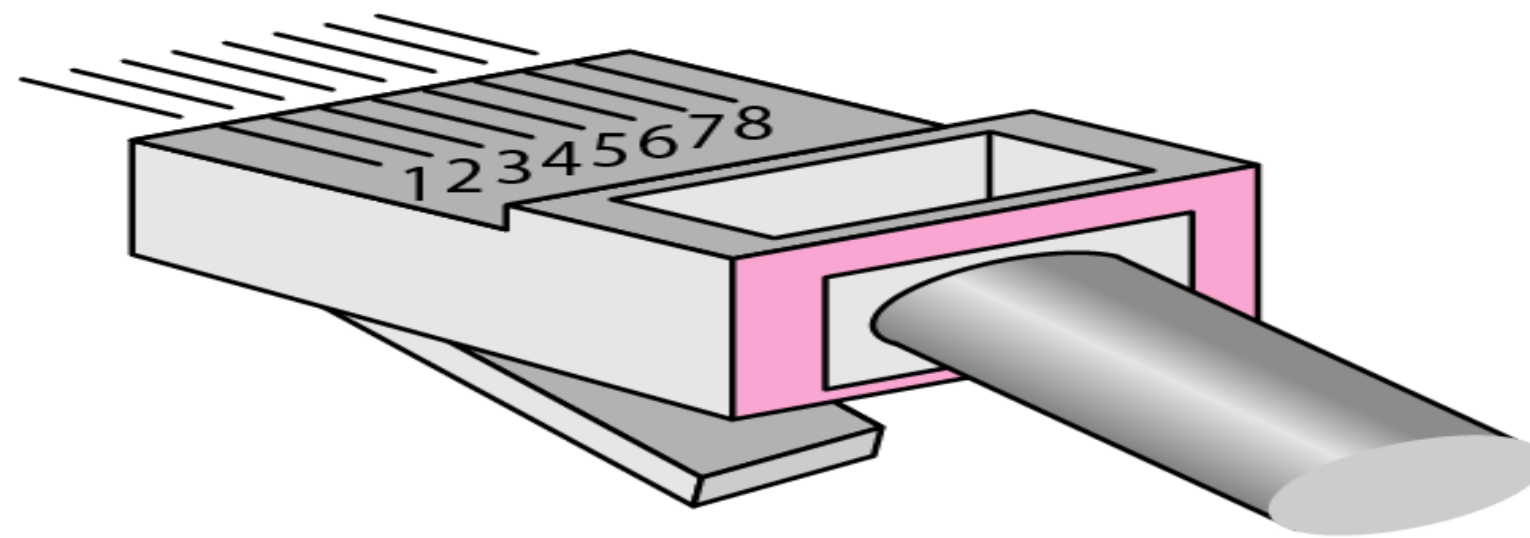


Attribute	Cat6 Cable	Cat7 Cable	Cat8 Cable
Frequency	250MHz	600MHz	2000MHz
Maximum Transmission Speed	1 Gbps/10 Gbps	10Gbps	25 Gbps/ 40 Gbps
Distance	100m with 1 Gbps/ 37-55m with 10 Gbps	100m	30m
Number of Connectors in Channel	4	4	2
Cable Construction	UTP or Shielded	Shielded	Shielded
Connector Type	RJ45	Non-RJ45	Class I: RJ45 Class II: Non-RJ45
Cost	Expensive than previous categories	Expensive than previous categories	High

UTP connector



RJ-45 Female

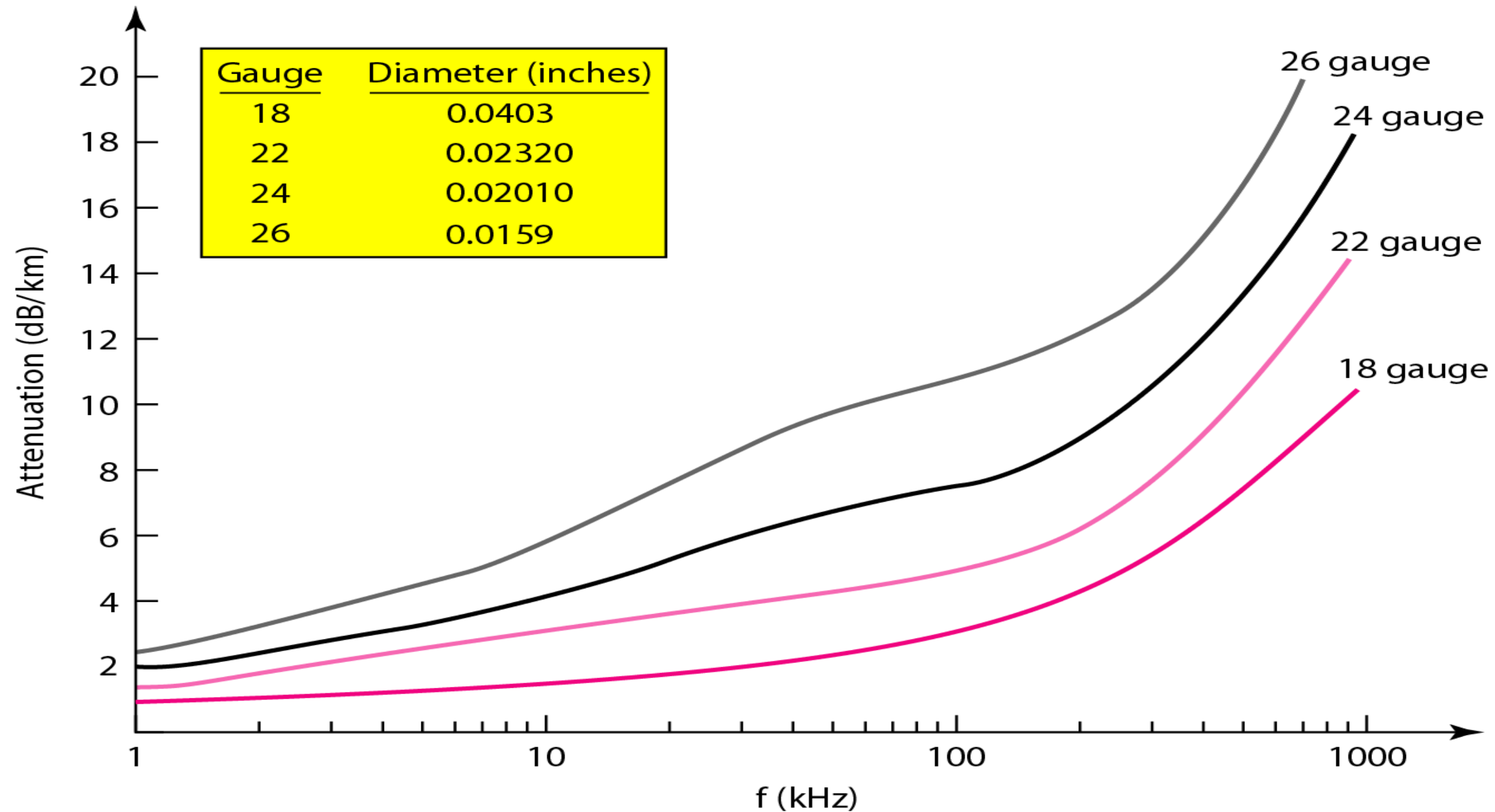


RJ-45 Male

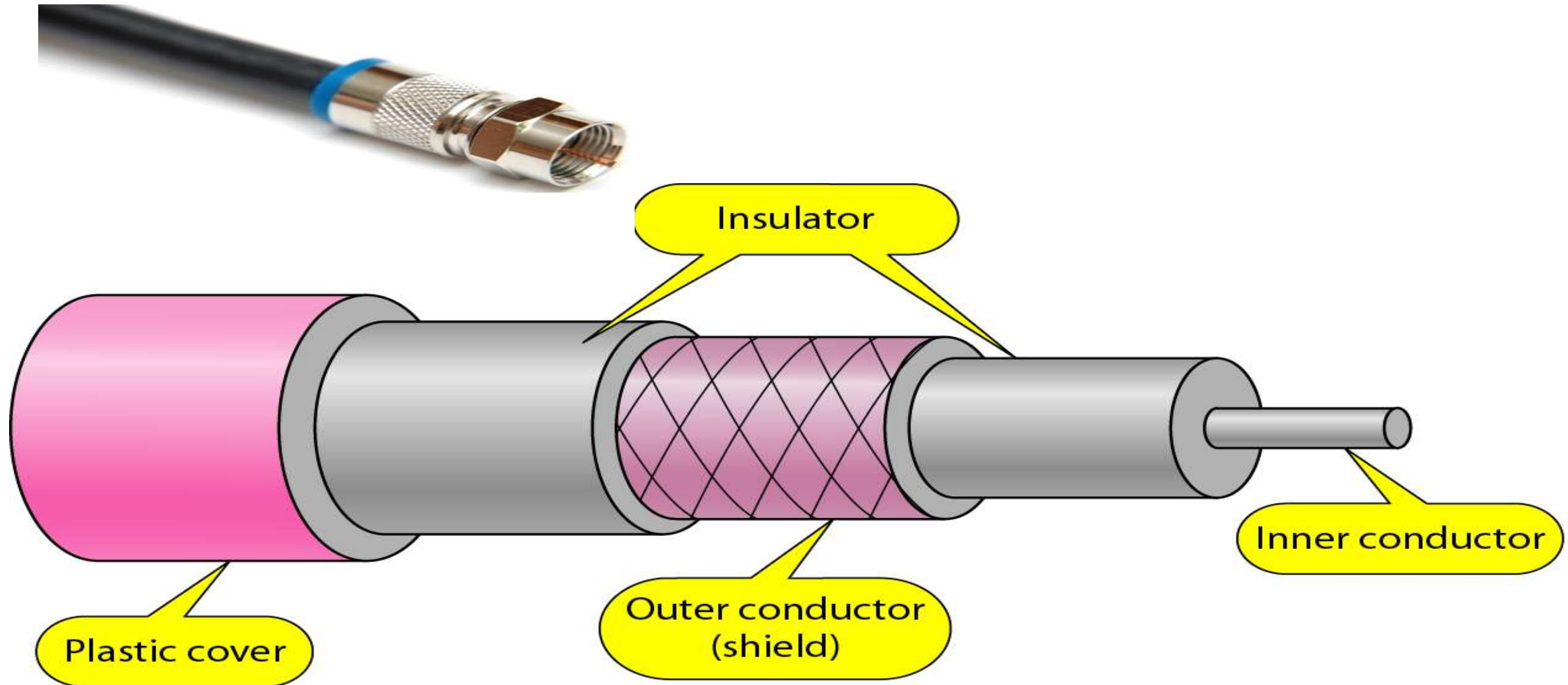




UTP performance

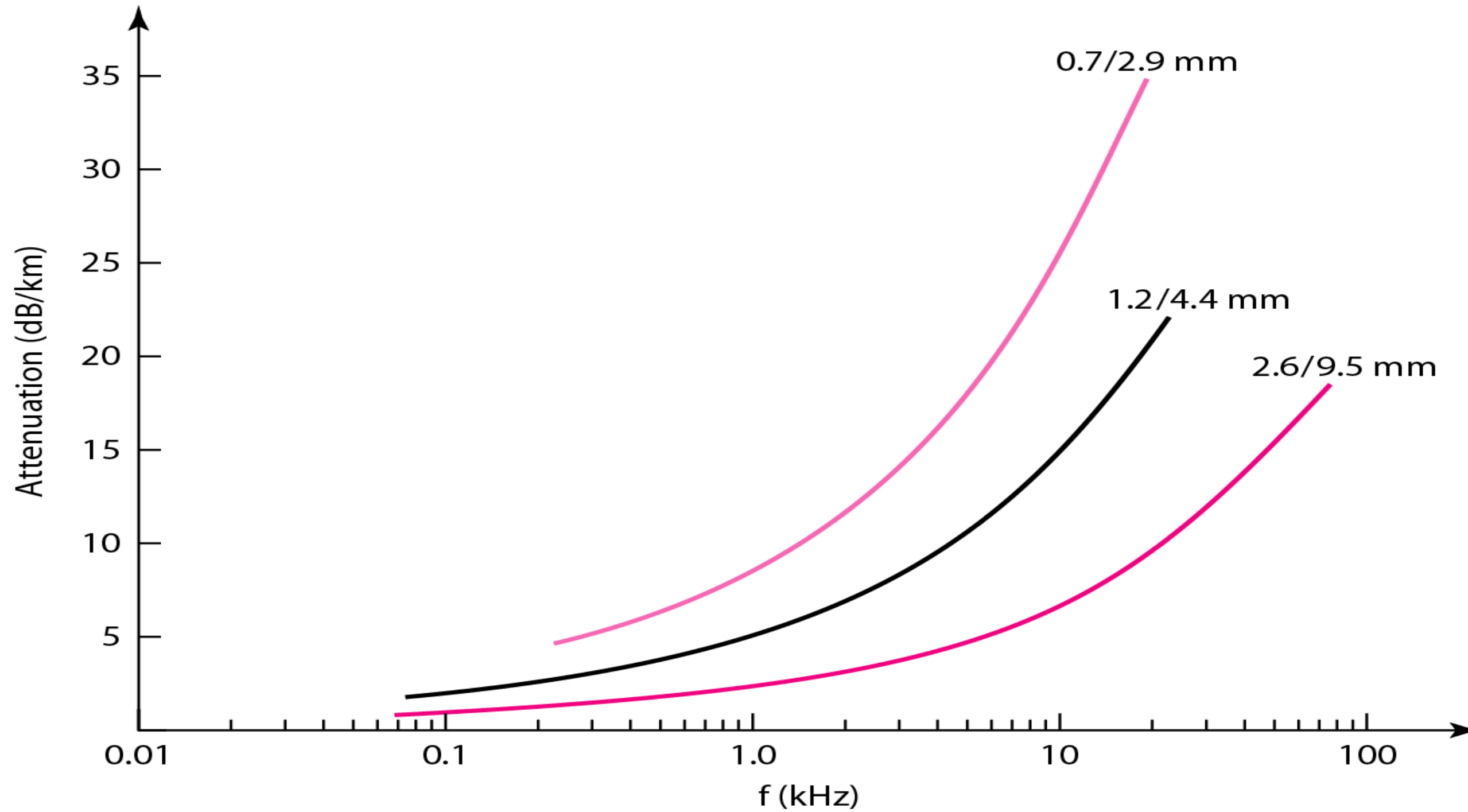


Coaxial cable



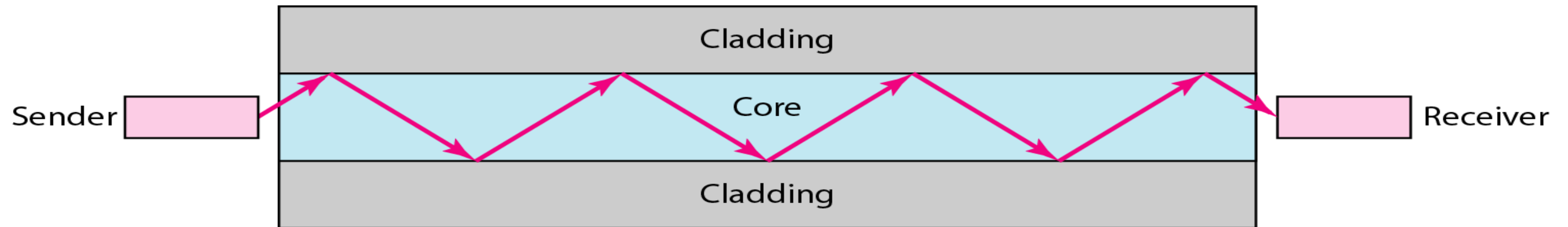


Coaxial cable performance

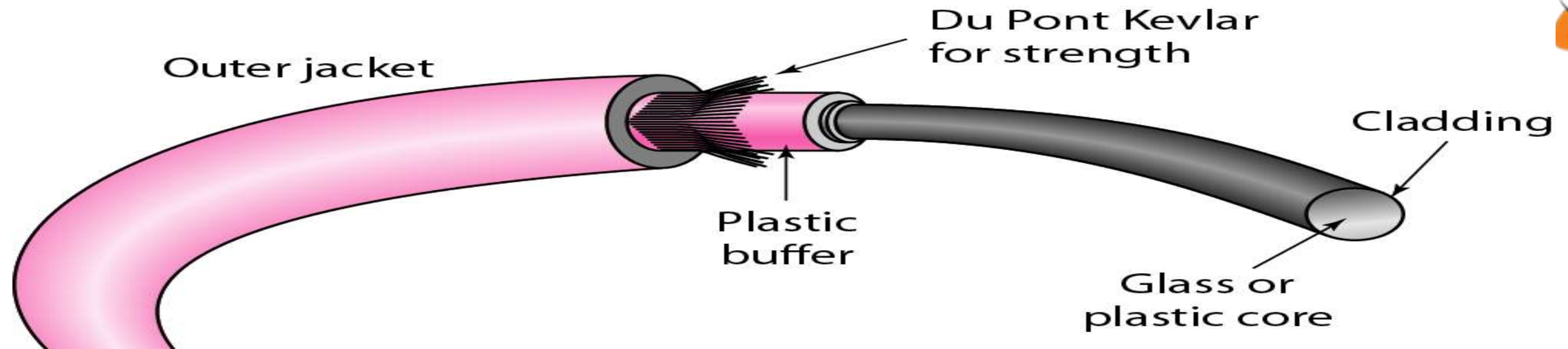




Optical fiber cable



Fiber construction





Twisted pair cable	Co-axial cable	Optical fiber
1. Transmission of signals takes place in the electrical form over the metallic conducting wires.	1. Transmission of signals takes place in the electrical form over the inner conductor of the cable.	1. Signal transmission takes place in an optical form over a glass fiber.
2. In this medium the noise immunity is low.	2. Coaxial having higher noise immunity than twisted pair cable.	2. Optical fiber has highest noise immunity as the light rays are unaffected by the electrical noise.
3. Twisted pair cable can be affected due to external magnetic field.	3. Coaxial cable is less affected due to external magnetic field.	3. Not affected by the external magnetic field.
4. Cheapest medium.	4. Moderate Expensive.	4. Expensive
5. Low Bandwidth.	5. Moderately high bandwidth.	5. Very high bandwidth
6. Attenuation is very high.	6. Attenuation is low.	6. Attenuation is very low.
7. Installation is easy.	7. Installation is fairly easy.	7. Installation is difficult.



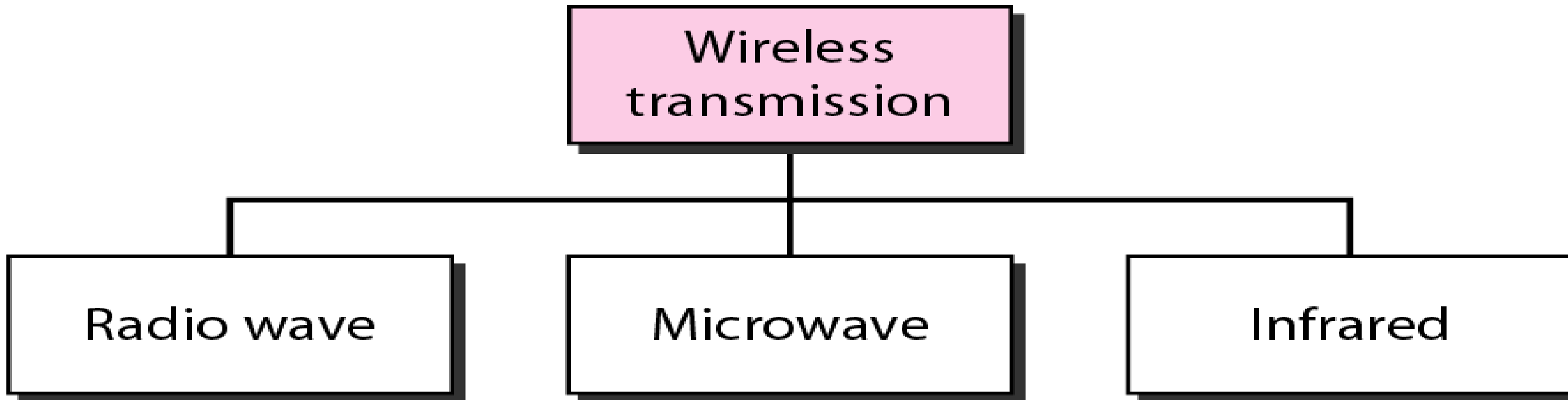
UNGUIDED MEDIA: WIRELESS



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



Wireless transmission waves





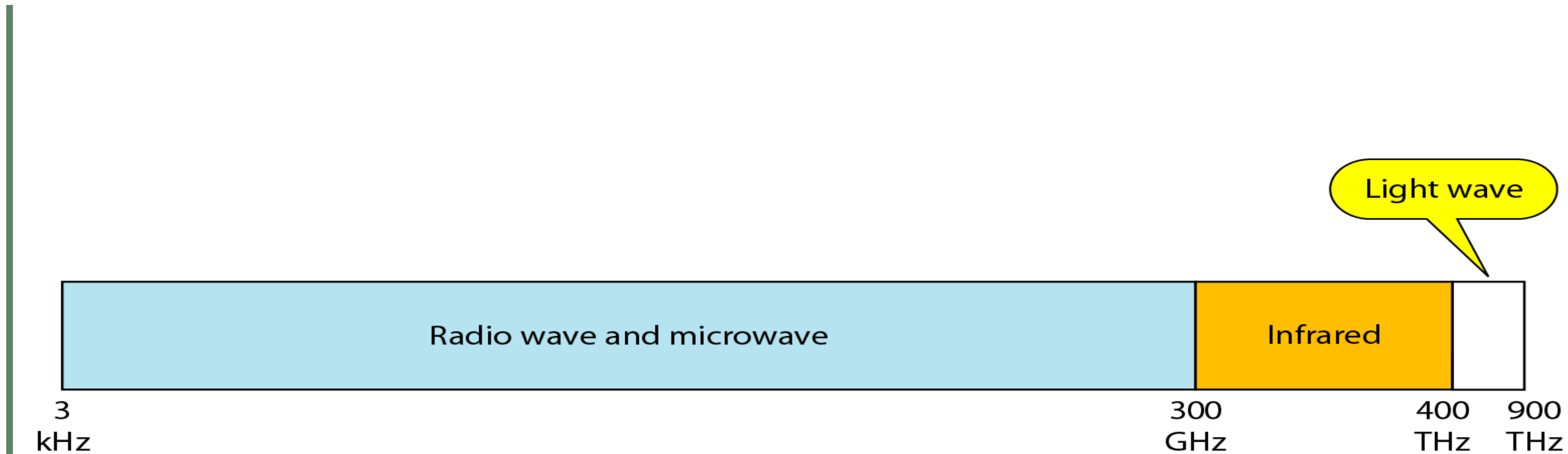
Radio waves are used for multicast communications, such as radio and television, and paging systems. They can penetrate through walls.
Highly regulated. Use omni directional antennas

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

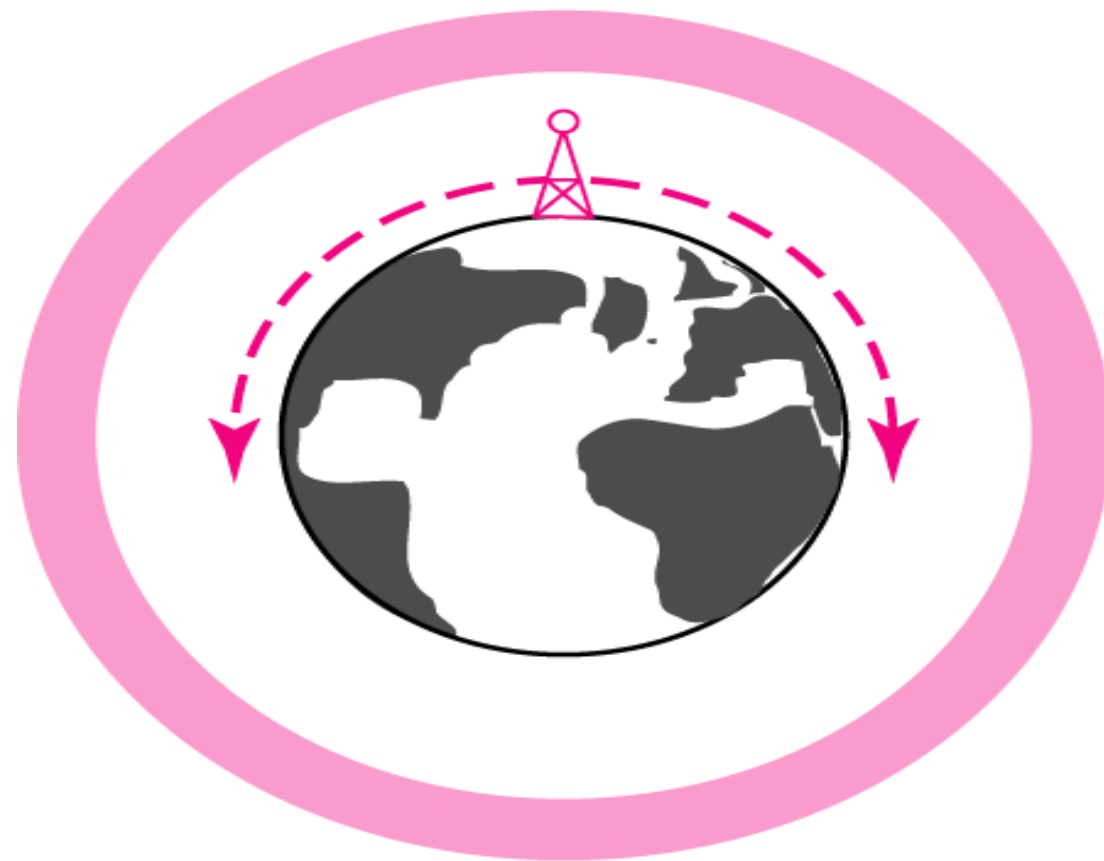


Electromagnetic spectrum for wireless communication



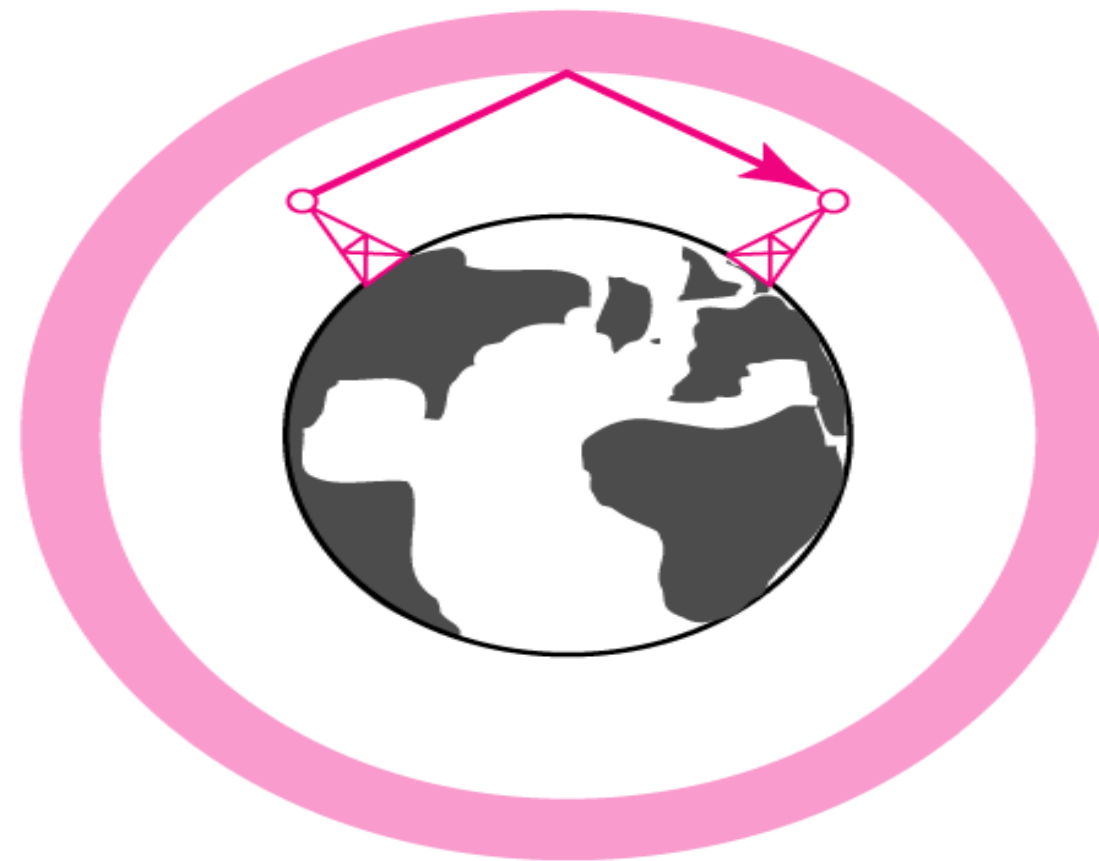
Propagation methods

Ionosphere



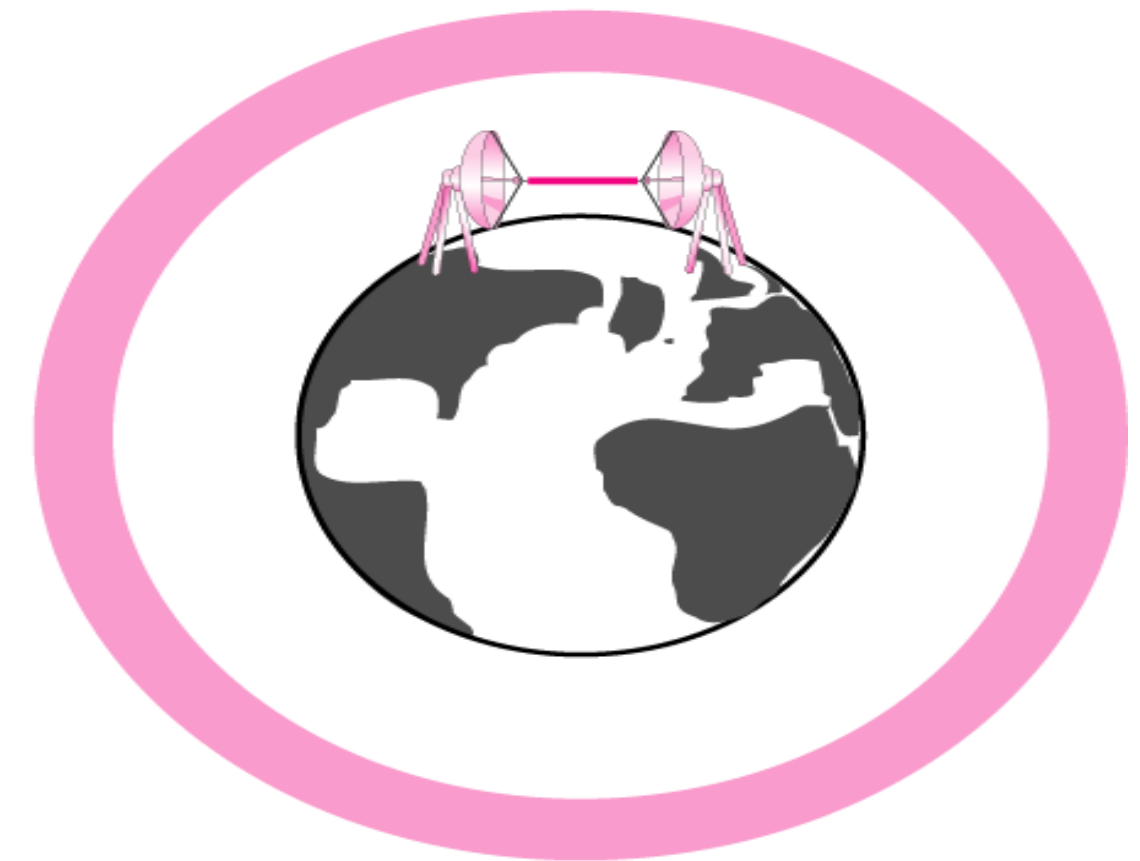
Ground propagation
(below 2 MHz)

Ionosphere



Sky propagation
(2–30 MHz)

Ionosphere



Line-of-sight propagation
(above 30 MHz)



Bands

<i>Band</i>	<i>Range</i>	<i>Propagation</i>	<i>Application</i>
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



Assessment



- a).What is Transmission media?
- b) What is guided and unguided mediam?
- c) List the propagation methods ?
- d) Compare twisted pair, coaxial and fiber optic cables





Reference



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Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

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