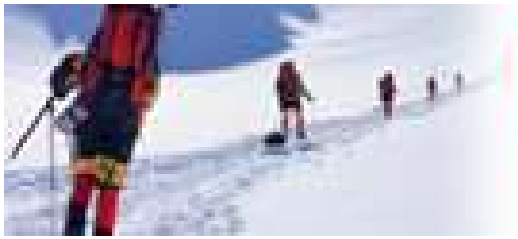


Data Communications and Networking Fourth Edition

Forouzan

Chapter 7

Transmission Media

Figure 7.1 *Transmission medium and physical layer*

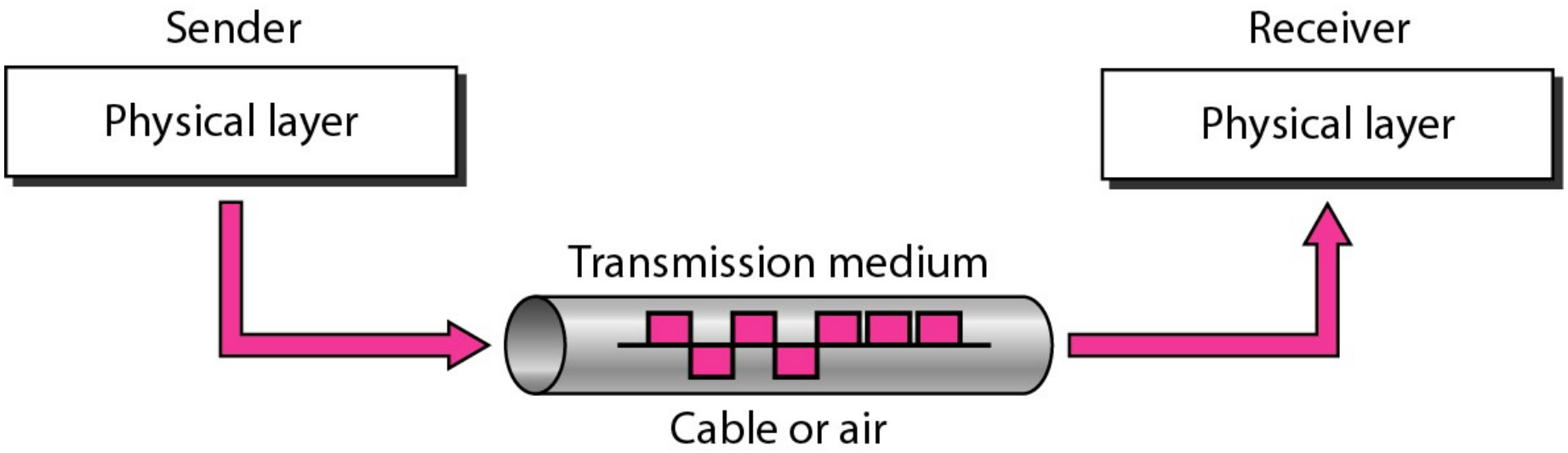
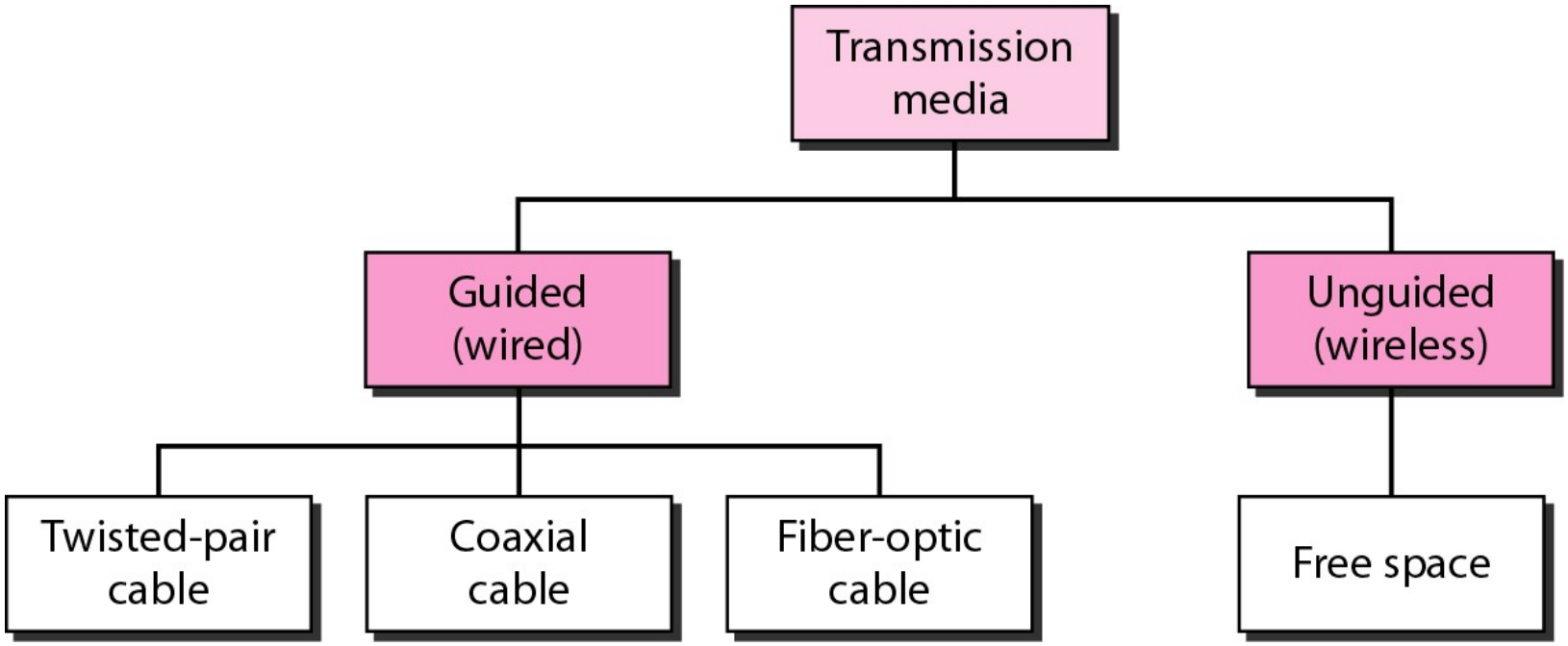


Figure 7.2 *Classes of transmission media*



7-1 GUIDED MEDIA

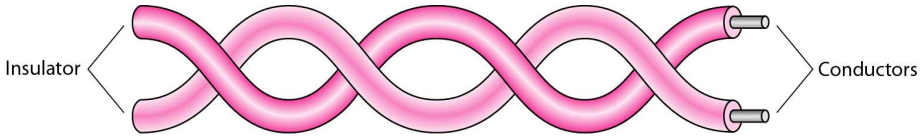
Guided media, which are those that provide a conduit from one device to another, include twisted-pair cable, coaxial cable, and fibre-optic cable.

Topics discussed in this section:

Twisted-Pair Cable
Coaxial Cable
Fiber-Optic Cable

Figure 7.3 *Twisted-pair cable*

- ***Twisted pair cable is a type of electrical cable consisting of pairs of insulated wires twisted together.***
- ***It is commonly used in telecommunications and networking to transmit analog and digital signals.***



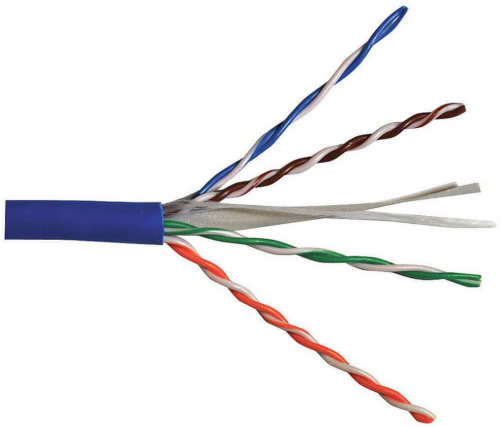
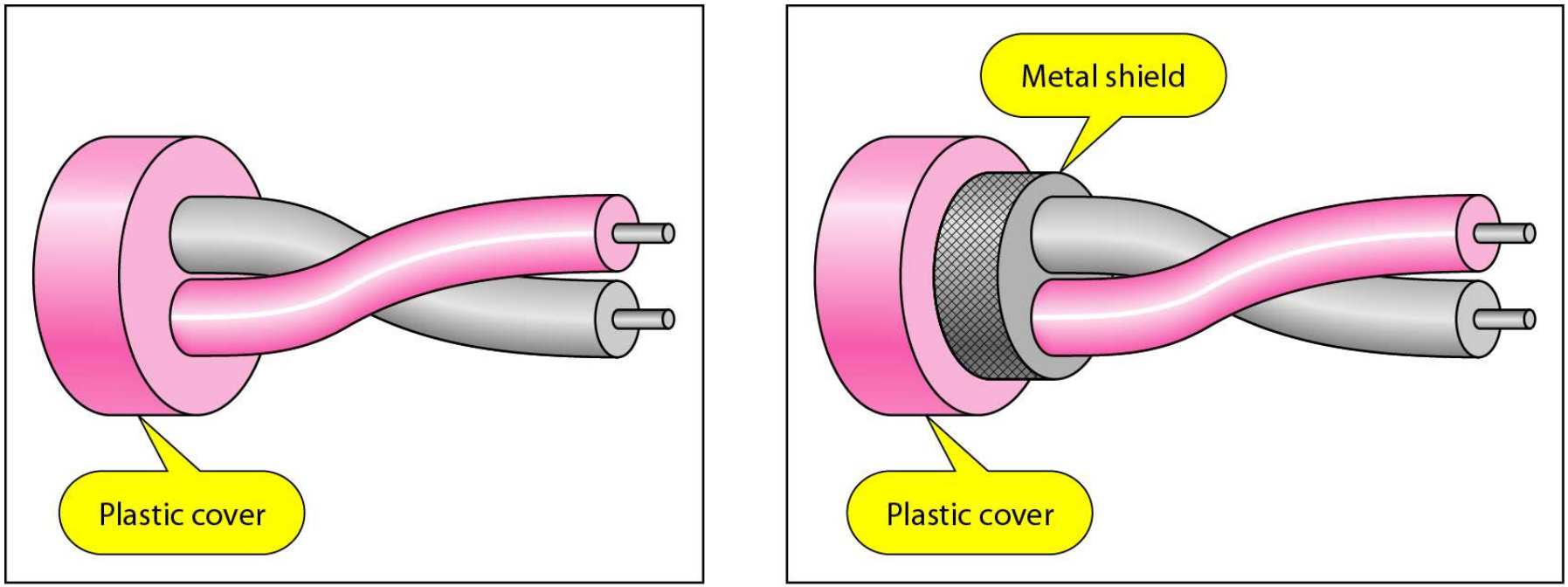


Figure 7.4 *UTP and STP cables*

UTP (Unshielded Twisted Pair) and STP (Shielded Twisted Pair) are two common types of twisted pair cables used in networking and telecommunications:



a. UTP

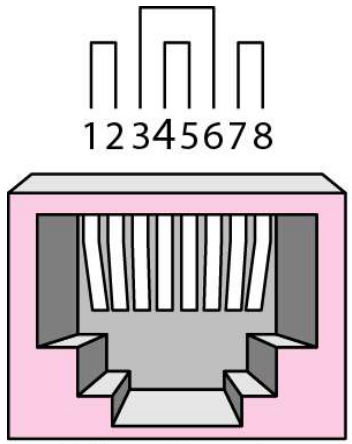
b. STP

Table 7.1 *Categories of unshielded twisted-pair cables*

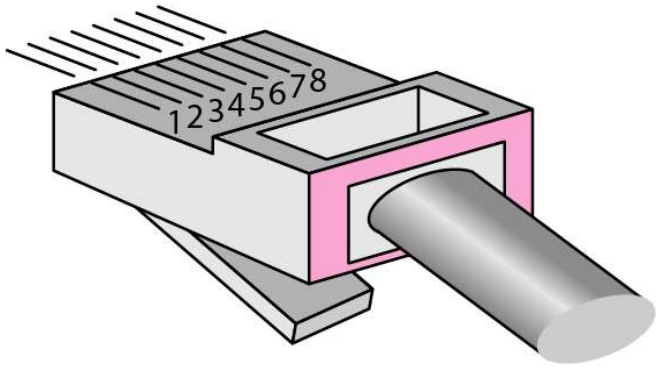
Category	*Specification*	*Data Rate (Mbps)*	*Use*
1	Unshielded twisted-pair used in telephone	< 0.1	Telephone
2	Unshielded twisted-pair originally used in T-lines	2	T-1 lines
3	Improved CAT 2 used in LANs	10	LANs
4	Improved CAT 3 used in Token Ring networks	20	LANs
5	Cable wire is normally 24 AWG with a jacket and outside sheath	100	LANs
5E	An extension to category 5 that includes extra features to minimize the crosstalk and electromagnetic interference	125	LANs
6	A new category with matched components coming from the same manufacturer. The cable must be tested at a 200-Mbps data rate.	200	LANs
7	Sometimes called SSTP (shielded screen twisted-pair). Each pair is individually wrapped in a helical metallic foil followed by a metallic foil shield in addition to the outside sheath. The shield decreases the effect of crosstalk and increases the data rate.	600	LANs

Figure 7.5 *UTP connector*

- ***A UTP (RJ-45 connector) connector refers to a type of connector commonly used with UTP cables, which are widely employed in Ethernet and other networking applications.***



RJ-45 Female



RJ-45 Male

Figure 7.6 *UTP performance*

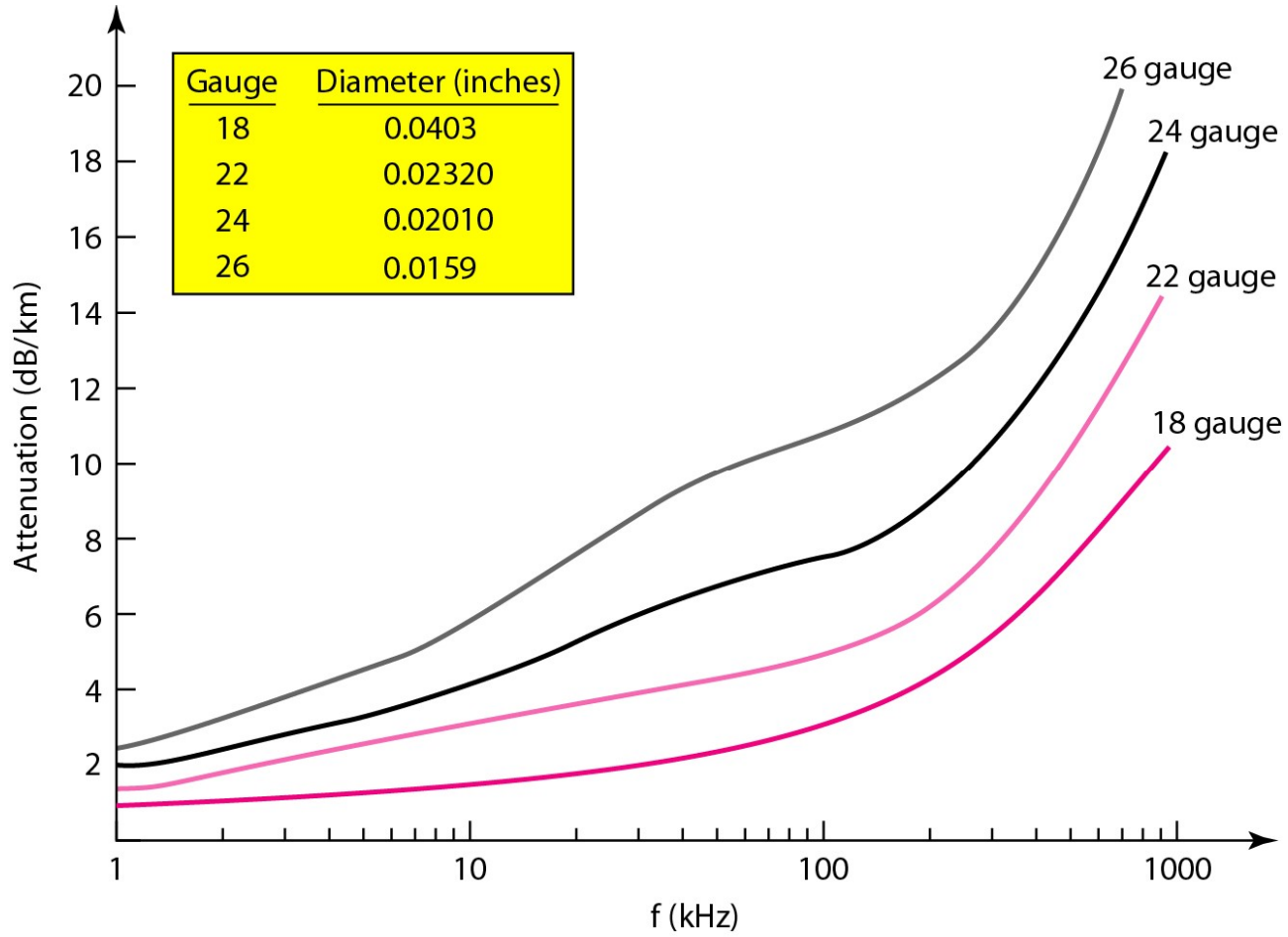


Figure 7.7 *Coaxial cable*

- ***A coaxial cable is a type of electrical cable known for its cylindrical shape and layered design.***
- ***Commonly used in various applications, including cable television (CATV), telecommunications, etc.***

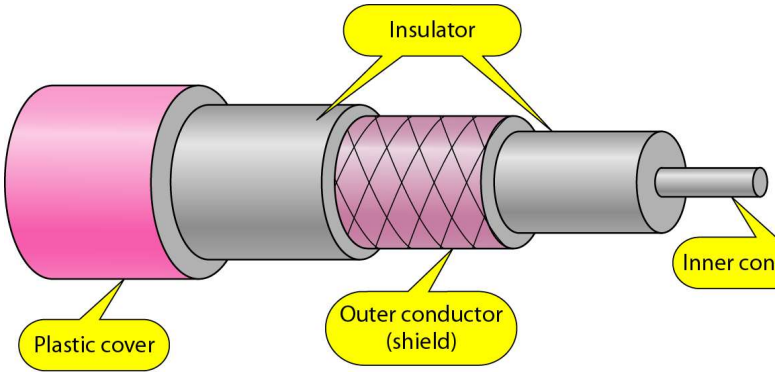


Table 7.2 *Categories of coaxial cables*

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

Figure 7.8 *BNC connectors*

- ***A BNC connector, is a type of electrical connector commonly used in electronics and telecommunications for connecting coaxial cables.***

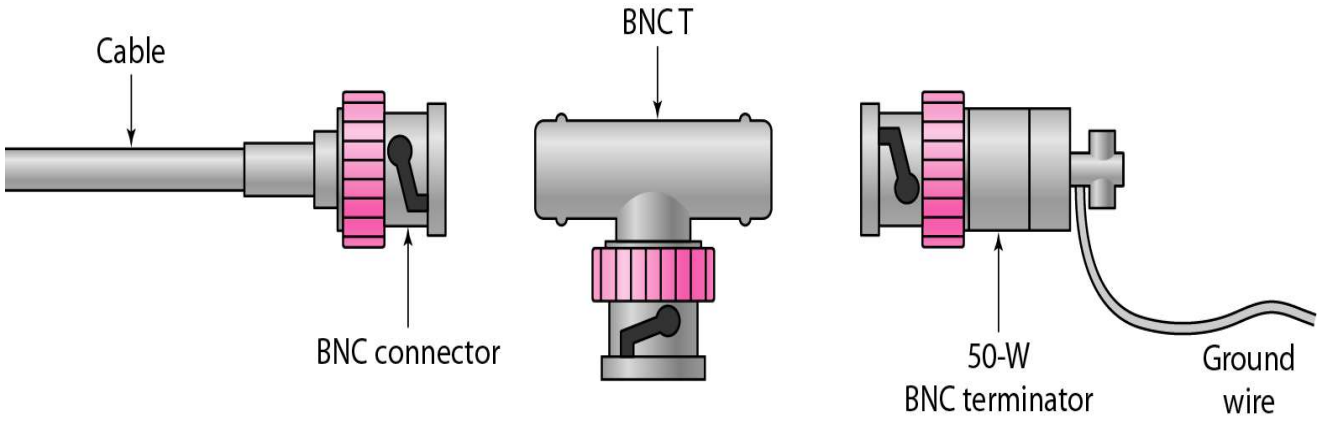


Figure 7.9 *Coaxial cable performance*

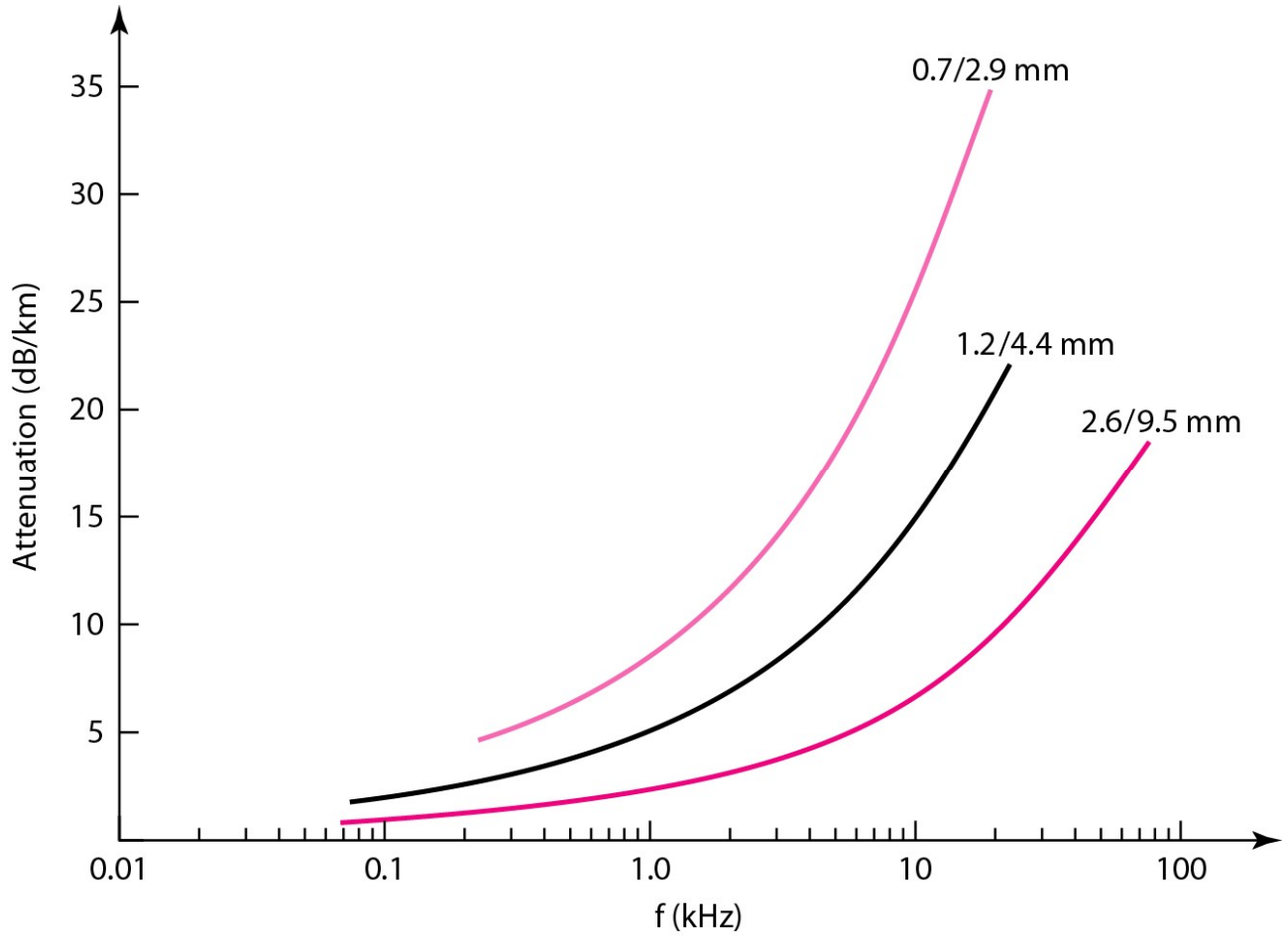


Figure 7.11 *Optical fiber*

- ***Optical fiber is a super faster that carries information using light, allowing information to travel over long distances with very little loss or interference.***

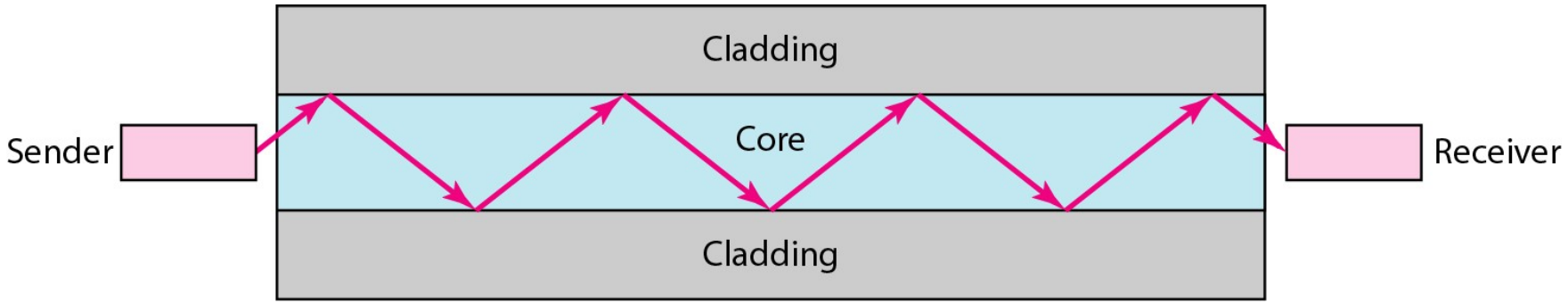
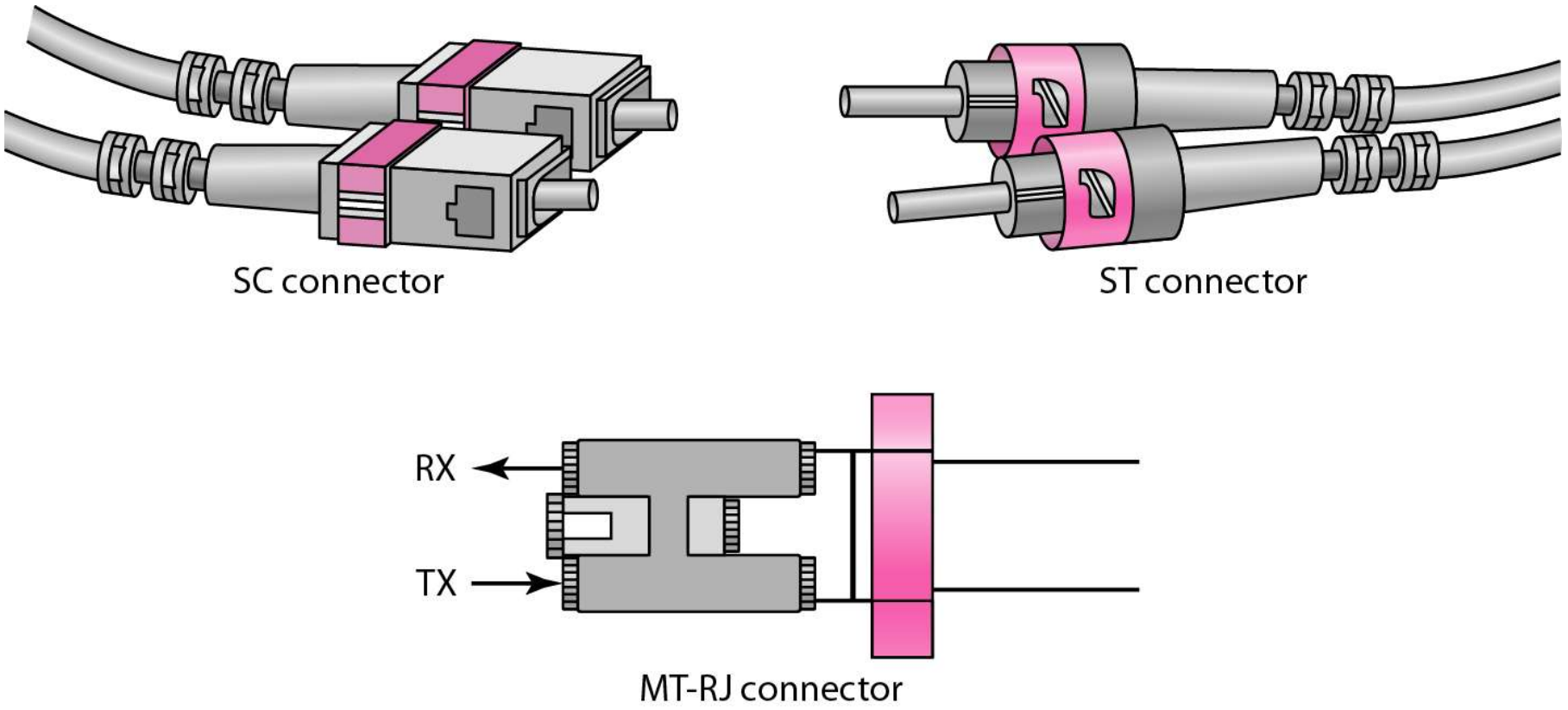


Figure 7.15 *Fiber-optic cable connectors*



7-2 UNGUIDED MEDIA: WIRELESS

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

Topics discussed in this section:

Radio Waves
Microwaves
Infrared

Figure 7.17 *Electromagnetic spectrum for wireless communication*

The electromagnetic spectrum refers to the range of all types of electromagnetic radiation.

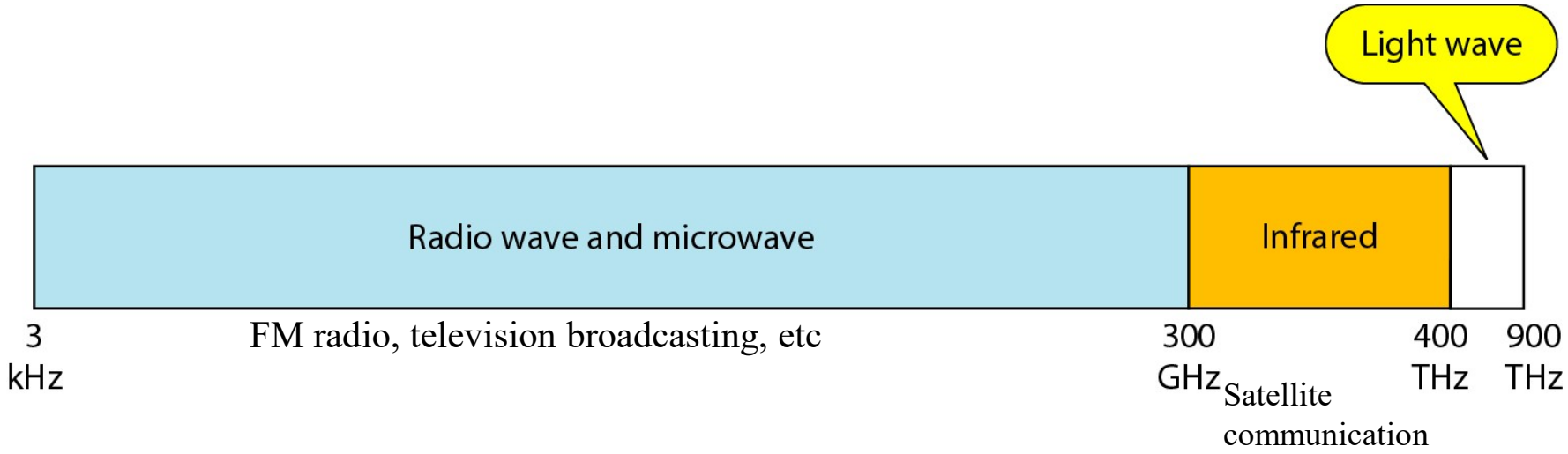


Figure 7.19 *Wireless transmission waves*

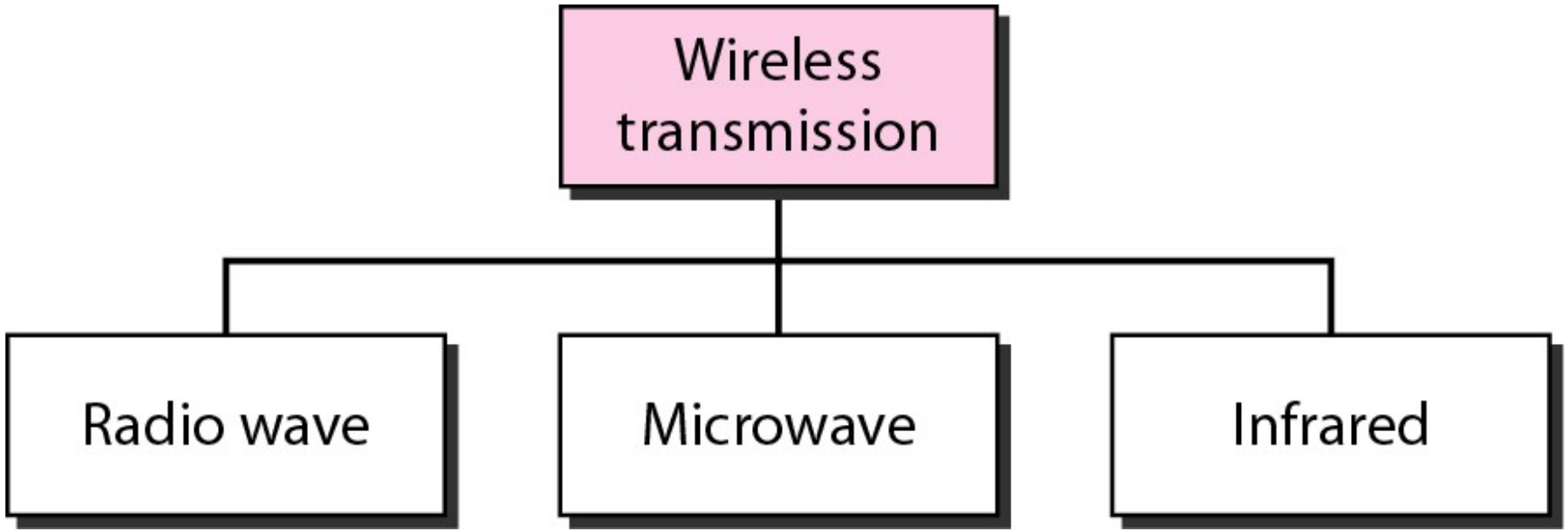
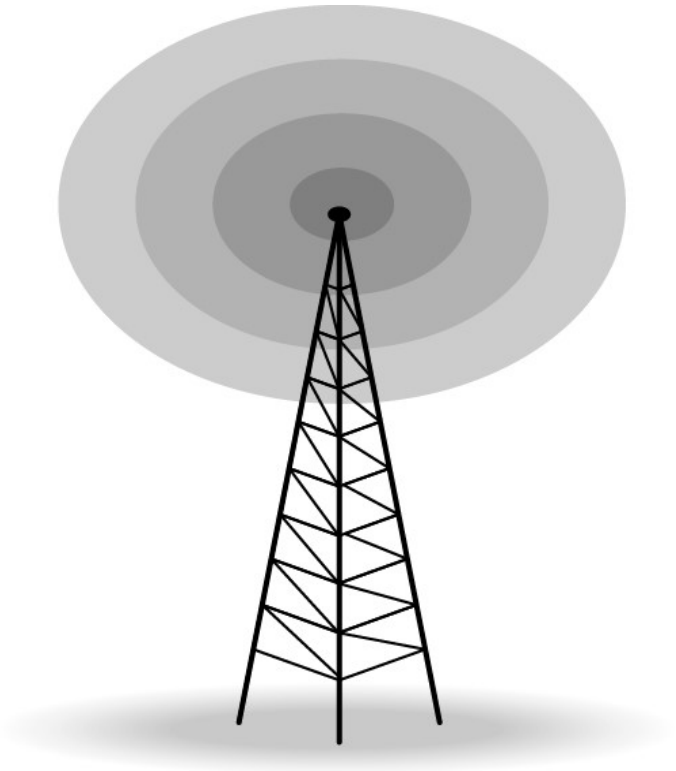


Figure 7.20 *Omnidirectional antenna*

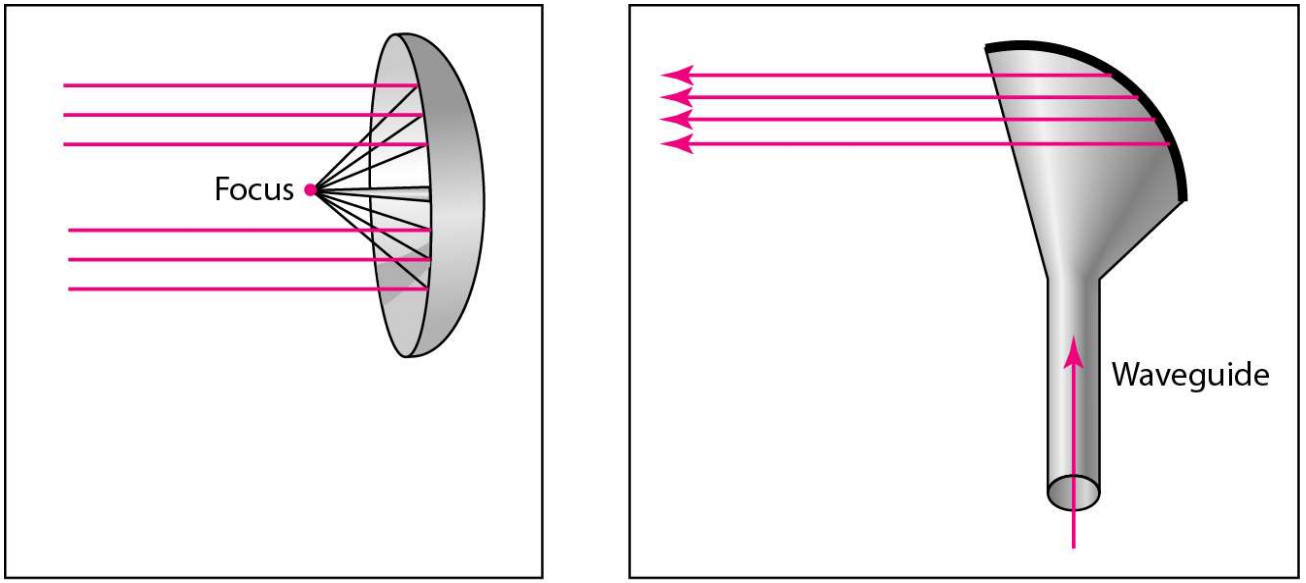
Radio waves are used for multicast communications, such as radio and television.



Note

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

Figure 7.21 *Unidirectional antennas*



a. Dish antenna

b. Horn antenna

Note

Infrared signals can be used for short-range communication such as infrared data transfer between devices.