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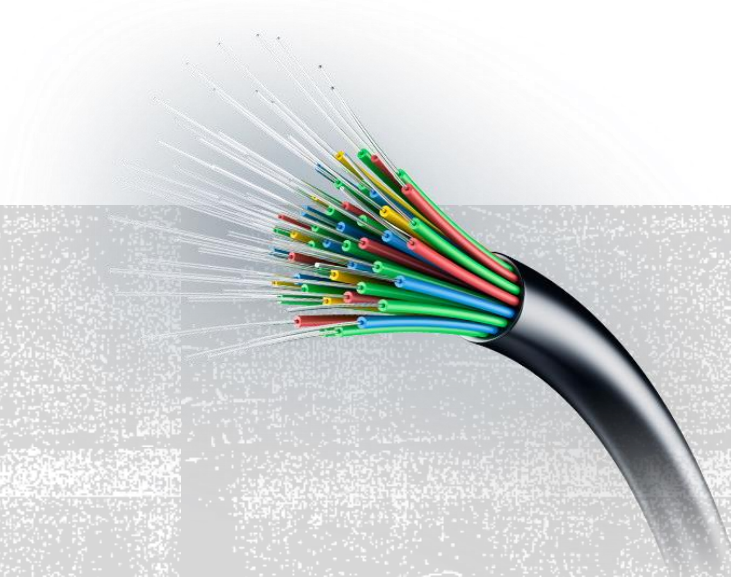


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1 AN OPTICAL FIBRE



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Transmission or teletransmission

Definition: a communication process that distributes any information (data), between the sender and the receiver, then codes it in defined, understandable for both side form over the well-specified route (transmission media).

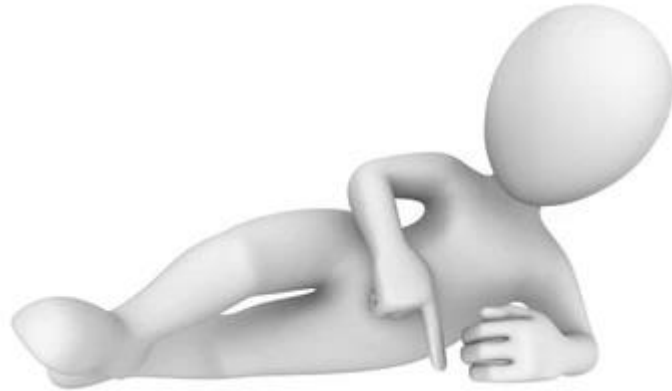


Transmission media

Definition: a pathway of physical propagation of electromagnetic or light waves.
Transmission media is the information carrier between single elements of a computer network or a telecommunication network



Types of transmission media



1. Wired/bounded
 - a. Copper (e.g. coaxial cable, twisted pair cable)
 - b. Optical fibre (e.g. single-mode/monomode, multimode)
2. Wireless/unbounded
 - a. Radiowaves and microwaves (e.g. Wi-Fi)
 - b. Infrared (e.g. irDA)



An optical fibre

- An optical fibre is made up of fibreglass or synthetic material (plastic)
- Transmission in optical fibre occurs in the visible light area (infrared)
- Source of light may be a semiconductor laser or an electroluminescent diode.



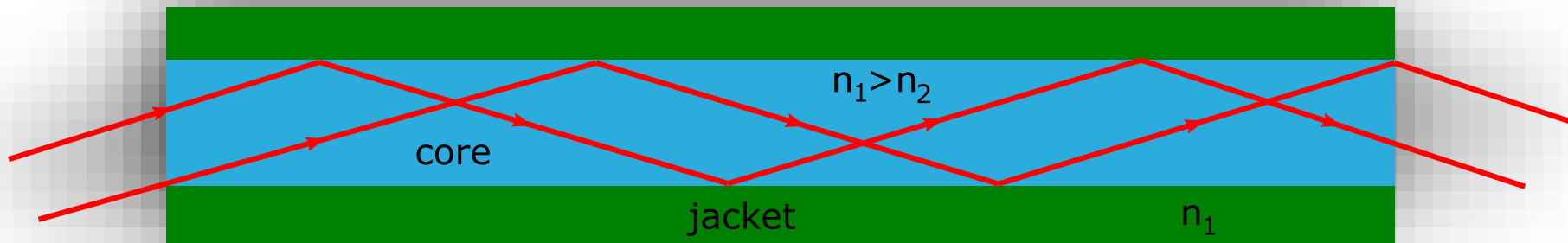
Signal transmission

- Transmission in optical fibre occurs in the visible light area (infrared)
- It is based on the total internal reflection of light rays inside the fibre optic core
- The total reflection of the light ray is obtained by adjusting the index of refraction in two parts of the optical fibre, those are core and jacket.



Signal transmission

- Transmission in an optical fibre reaches speed 3Tb/s and is resistance to external conditions of electromagnetic interference
- Very low unit of attenuation (0,2dB/km) enables a very large transmission range and reaches a value of several hundred kilometres



Signal transmission

An optical fibre transmission uses an infrared portion of the spectrum called a transmission window

- the first wavelength of the transmission window is 850nm,
- the second wavelength of the transmission window is 1310nm,
- the third wavelength of the transmission window is 1550nm



Construction of an optical fibre

An optical fibre is made up of:

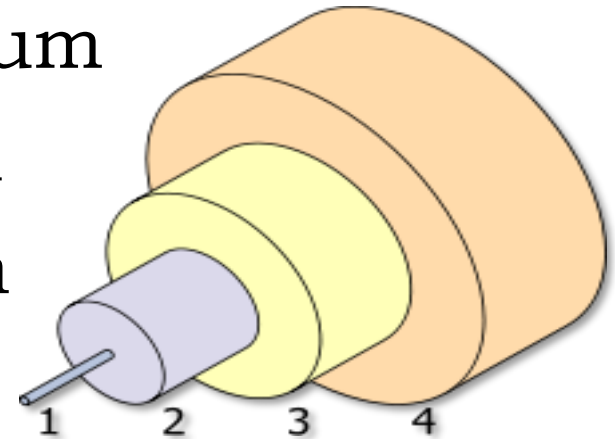
1. Core – made of quartz glass
2. Cladding – made of quartz glass
3. Buffer – made of acrylic varnish
4. Jacket - made of polyester



Construction of an optical fibre

An optical fibre is made up of:

1. Core – diameter 5-62,5 μm
2. Cladding – diameter 125 μm
3. Buffer – diameter 150 μm
4. Jacket - diameter 250 μm

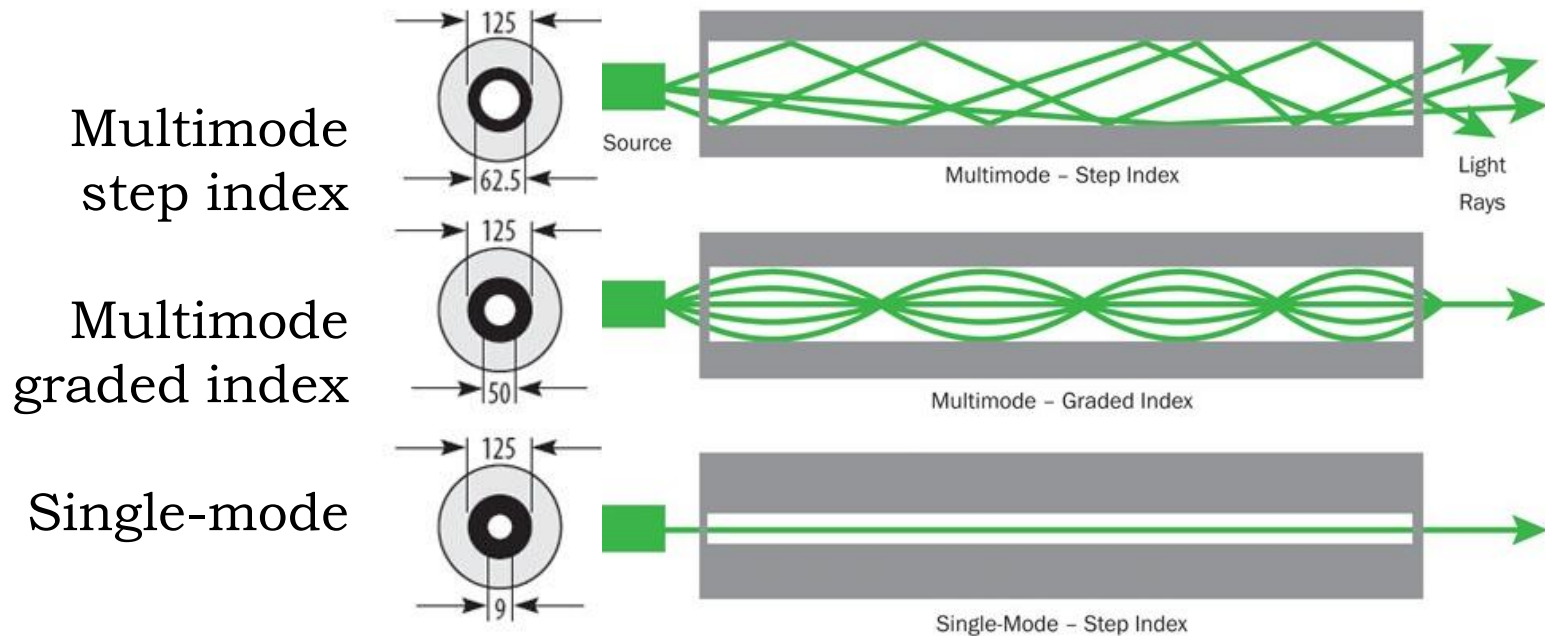


Type of an optical fibre

1. Single-mode optic fibre – a light wave propagates as a single ray of light, called elementary mode
2. Multimode optic fibre - a light wave propagates in many modes at different angles:
 - a. step index profile – index of refraction changes stepwise between the optic fibre core and cladding
 - b. graded index profile – index of refraction changes continuously between the optic fibre core and cladding



Type of an optical fibre



Advantages of an optical fibre

- very fast speed of transmission reaching Gb/s, speed in a lab environment is several Tb/s.
- large transmission distance without amplification and signal regeneration, several hundred km
- resistance to external electromagnetic interference
- very high reliability of transmission devices
- low installation cost, fibre optic cable price is cheaper than the copper cable
- transmission of many independent signals possibility in the many wavelength division multiplexing (WDM multiplexing)



