

# Physical Media

- Cables:
  - - same room / same building
  - CAT - 3
  - CAT - 5
- } **TP** **insulated wires twisted together -5-10 twists/cm**
- Bandwidths 10-100Mbps, distance 100m

# Physical Media

- ThinNet coax: (10 – 100 Mbps, 200m)
- ThickNet coax: (10 – 100 Mbps, 500m)
- Multimode fibre: (100 Mbps, 2km)
- Single mode fibre: (100 – 2400 Mbps, 40km)

# Twisted Pair

- Twisted pair: oldest, most common.
- On line connection two insulated wires typically 1 mm thick.
- Wires are twisted together.
  - reduce EMI from similar pair

# Twisted Pair

- Bandwidth:
  - 64 Kbps – 4 Mbps long distances (2 – 5 km)
  - 10 Mbps – 100 Mbps short distances 100 m – 10 m

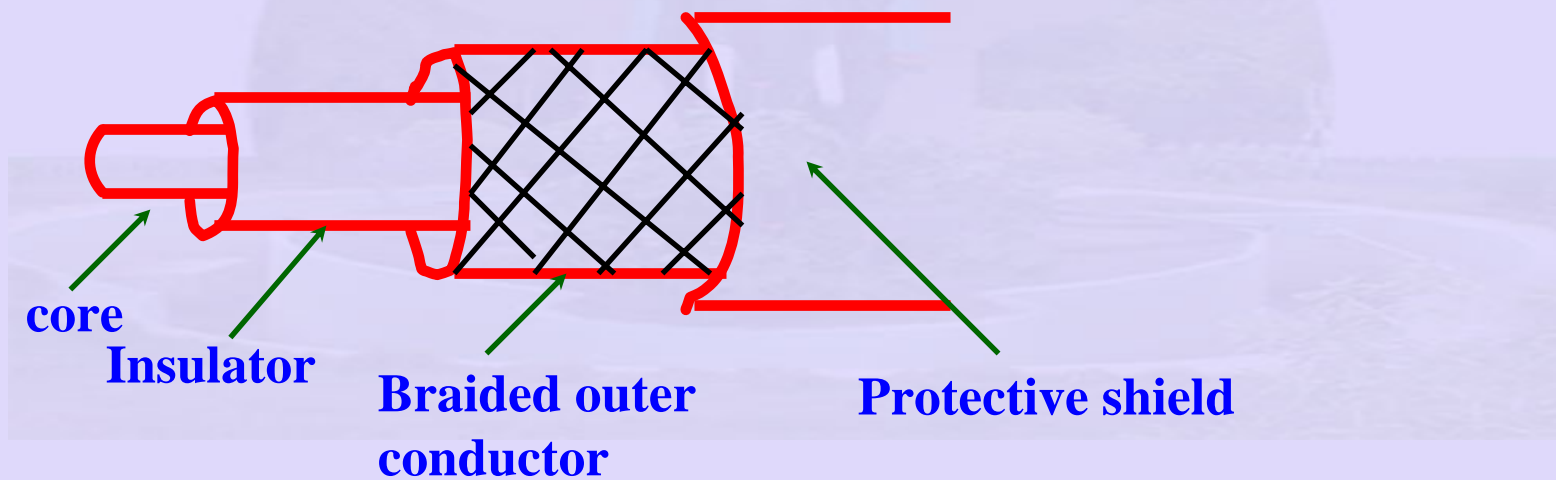


**Twist length**

# Twisted pair

- Most important:
  - widely used
  - low cost
- UTP (Unshielded Twisted pair):
  - CAT5
    - Two insulated wires twisted together – four such pairs grouped together- for protection eight wires together.
  - CAT6
    - more twists / connection – less cross talk better signal quality over
    - long distances.

# Coaxial Cable

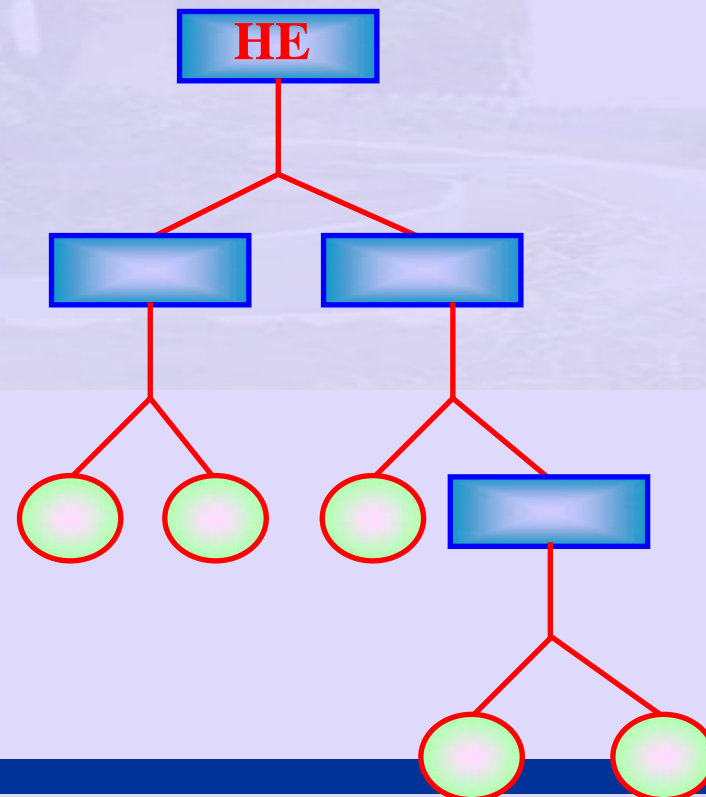
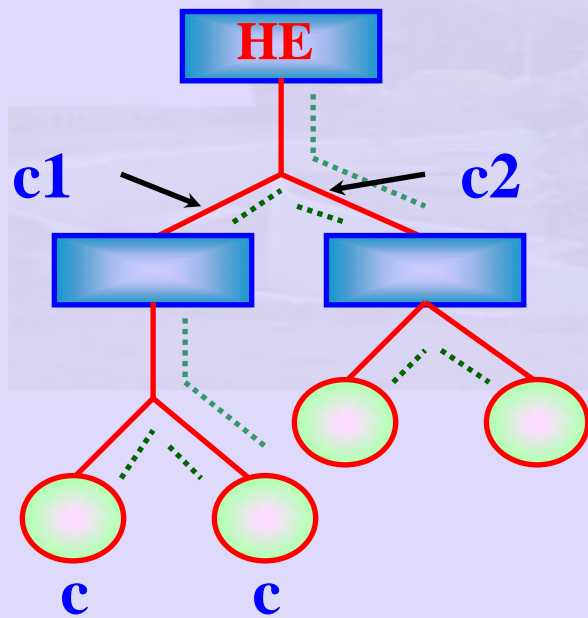


# Coaxial Cable

- High band width (450 Mbps possible)
- Excellent noise immunity
- coaxial cable used in telephone replaced by fibre

# Cable based Communication

- Two frequencies – one inband another out of band



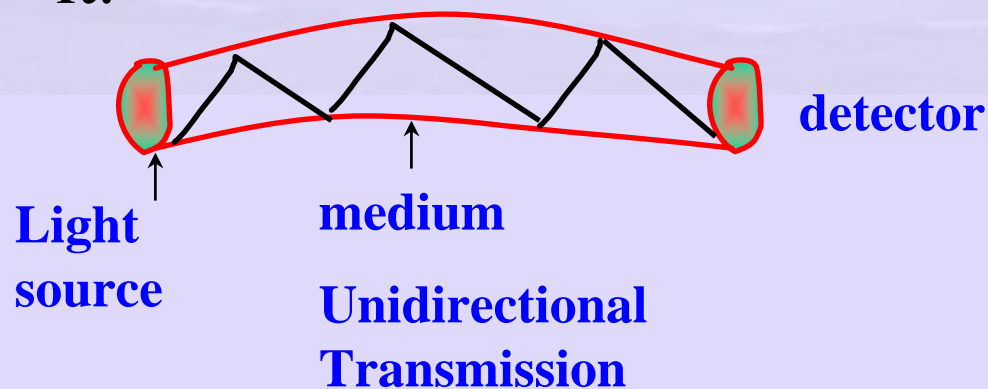


# Fibre

- light source, transmission media and detector
- presence of light – 1
- absence of light – 0
- enormous BW potential – 10 – 5 G b / s
- light source: LED, laser

# Fibre

- Transmission medium
  - Ultra thin fibre glass
- Detector:
  - generate an electrical pulse when light falls in it.



# Fibre

- Glass or plastic core
- Laser / LED source
- Specially designed jacket
  - Single mode vs multimode diagram.  
comparable wavelength
  - fibre acts as a wave guide

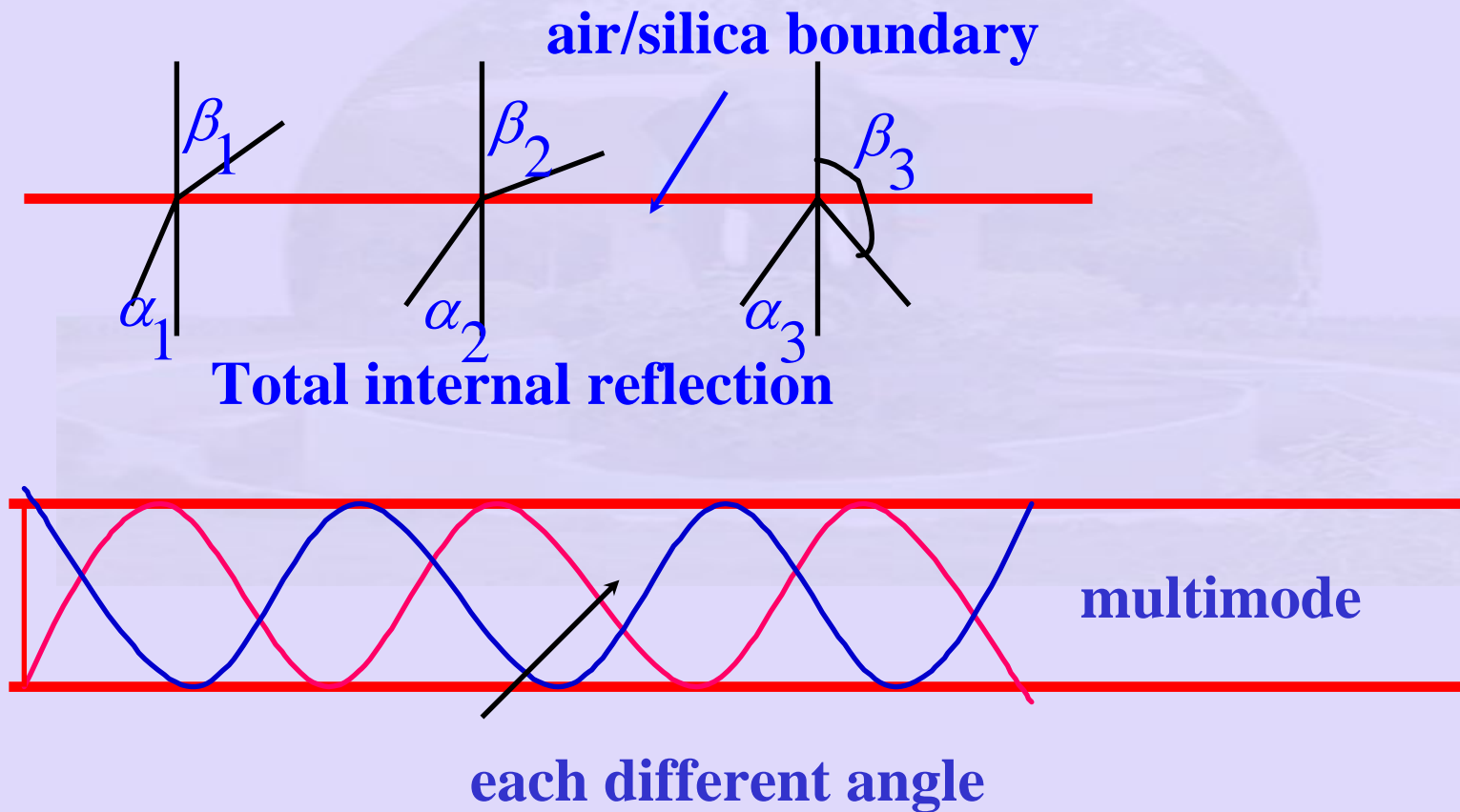
# Fibre

- multimode: 5 dB / km
- single mode 0.2 – 2 dB / km
- Detector – photo diode – gives if an electrical pulse when struck b,
- light response time of diode – limits BW!

# Fibre



# Transmission through Fibre

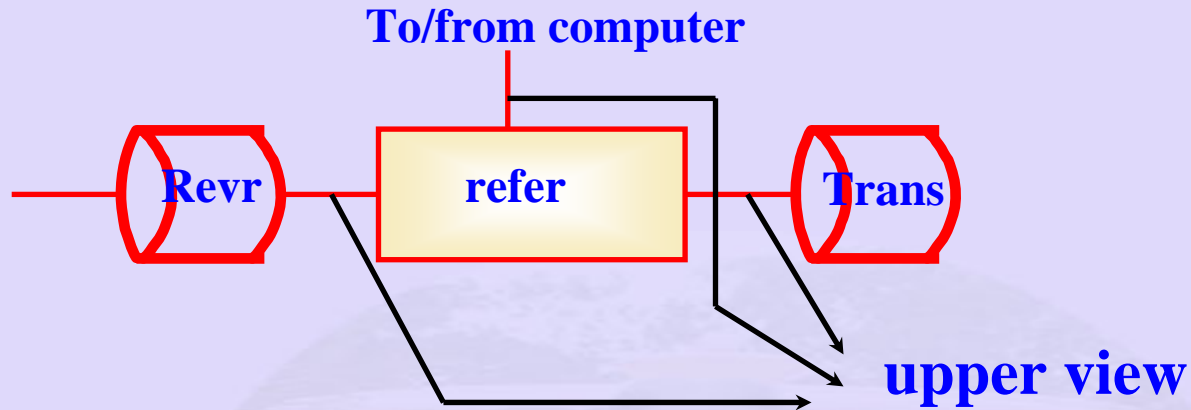


# Transmission through Fibre



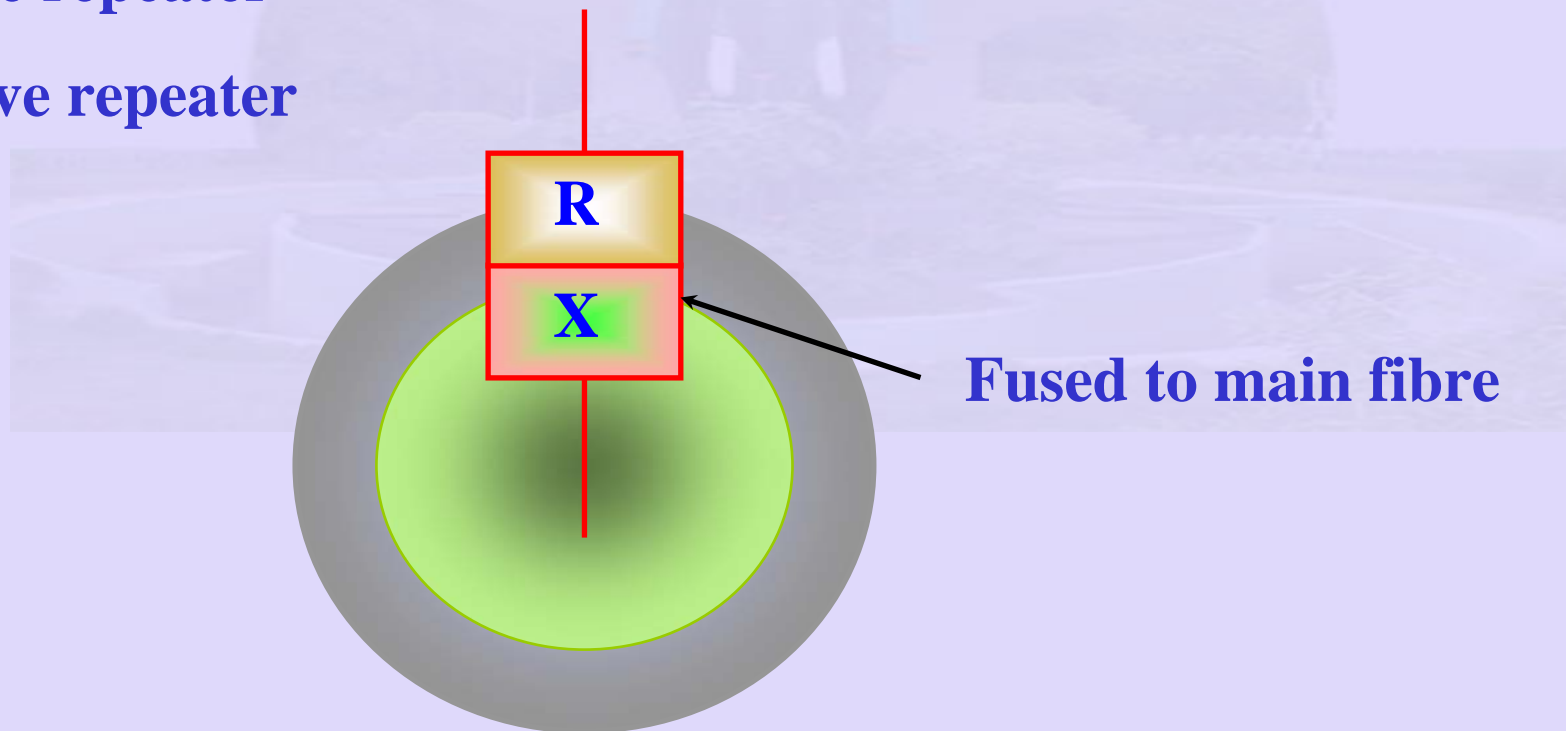
**single mode fibres no boundary**

**Behave like wave guides**



Active repeater

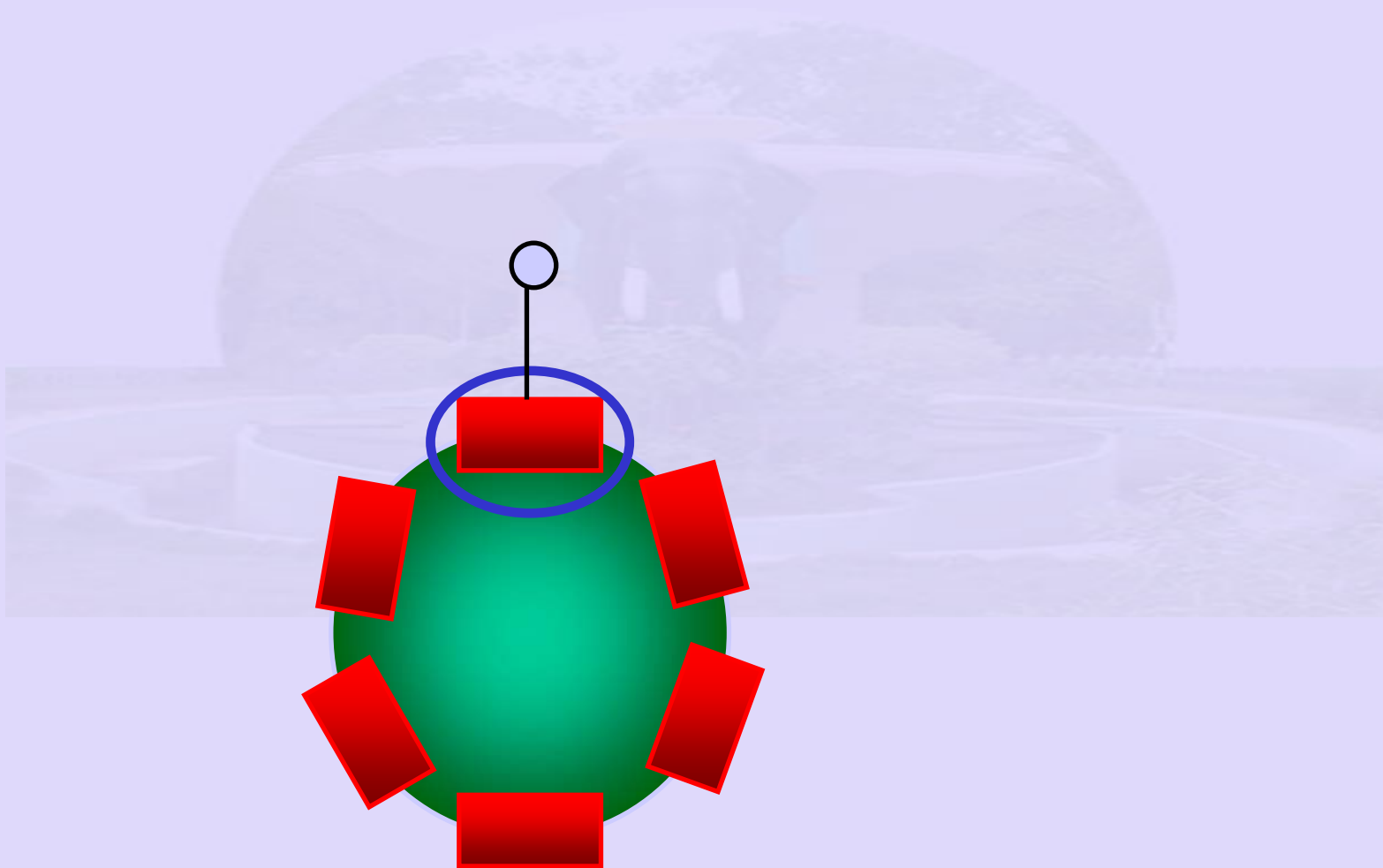
Passive repeater



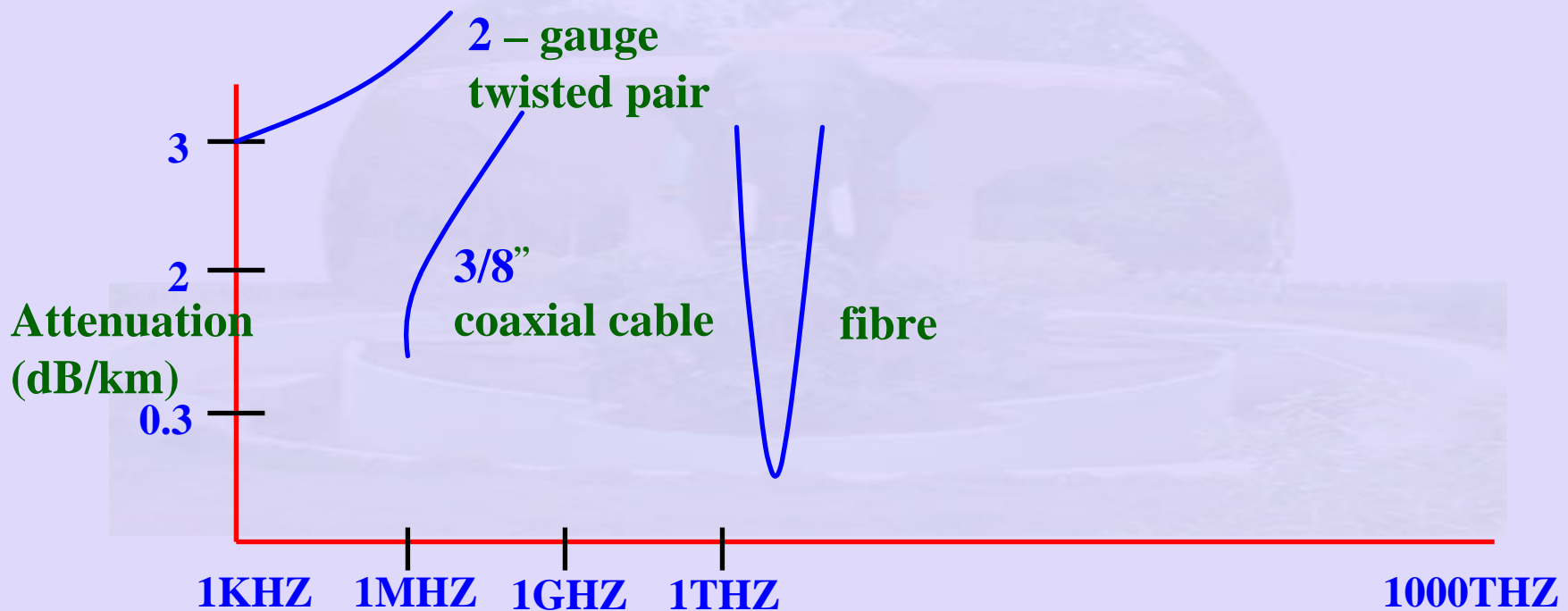
**If they do not work do not disconnect the network.**



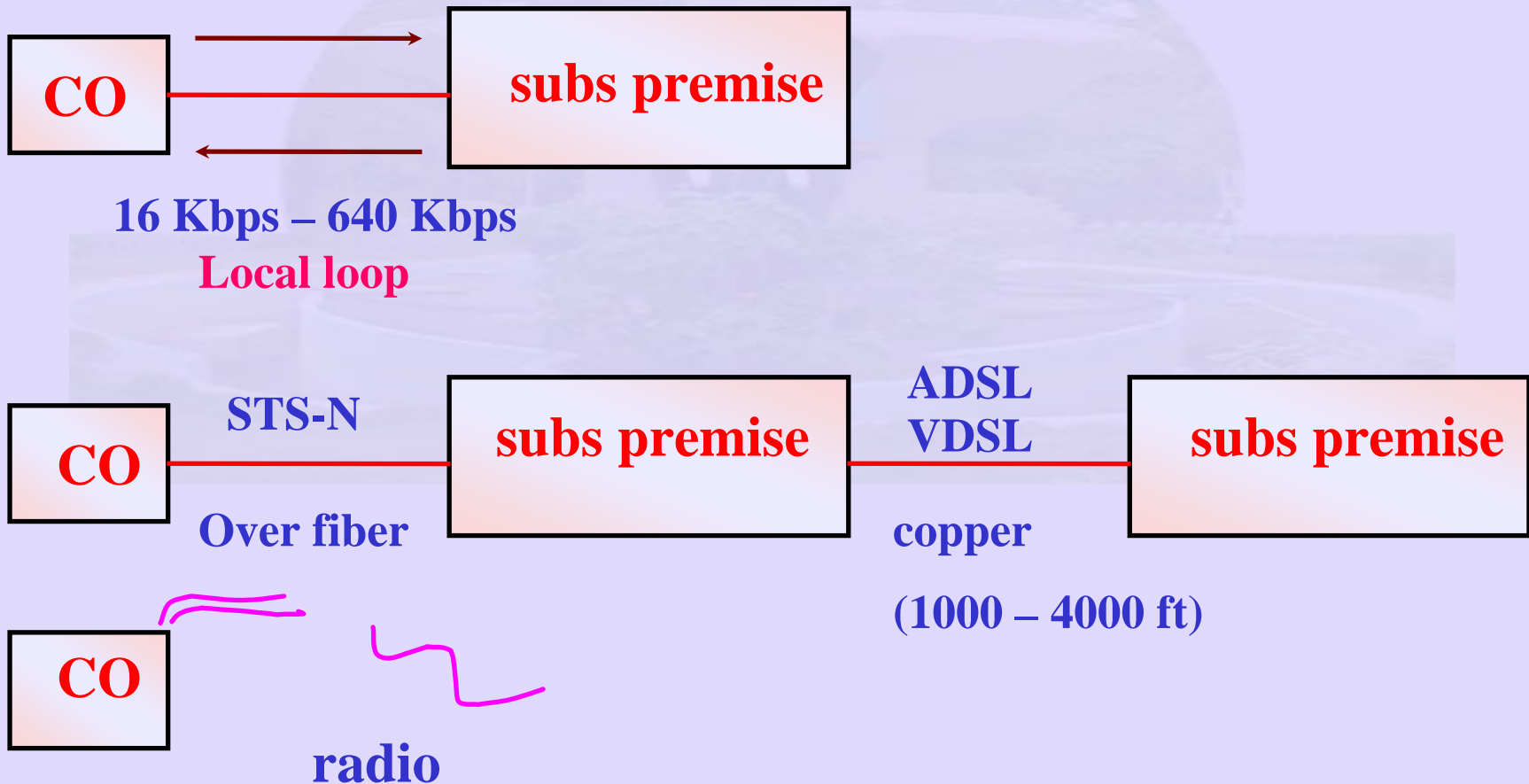
# Fibre Optic Networks



# Attenuation Characteristics of different Physical Media



# Communication Scenario



# Cable Modems

- 40 Million TVs with cable in India
  - 35 Million telephones
- Future may be Cable Modems
  - unidirectional Cable
  - bidirectional - expensive HW to make it
  - also noise problem
  - might be the future.

# Wireless Links

- Cellular phones
  - System of towers for transmission (high power transmitters)
  - 100 MW – one cell phone

# Communcation Scenario

- Low orbit satellites
  - L – band
  - S – band
  - Ka –band
- infrared
  - keyboard to machine– within building – 10m
  - Bluetooth - radio interface
  - eliminate wires in offices

# Communication Scenario

