Optical Communication Methods

Infrared

Infrared (IR) light is electromagnetic radiation with a wavelength longer than that of visible light, but shorter than that of microwaves. The wavelength of infrared radiation varies from about 750 nanometres (the near infrared) to 1 millimetre (the far infrared). Frequencies range from about 300 GHz to 400 THz. Infrared transmission systems are widely used for short-range communications. A common application for infrared is in remote control systems for televisons, VCRs, DVD players and set-top boxes of various descriptions.

Advantages	Disadvantages
• cheap • available • wireless features in consumer devices that already allow transmission and receiving • low power consumption • higher security • simple to set up • portable (no antenna required) • it does not penetrate walls which improves the security of data transmitted • no licensing required	• operates over a very short range • very limited bandwidth • line of sight limitation. it is blocked by common materials: people, walls wtc • speed is slow in comparison to other transmission methods • outdated connection as most devices use bluetooth

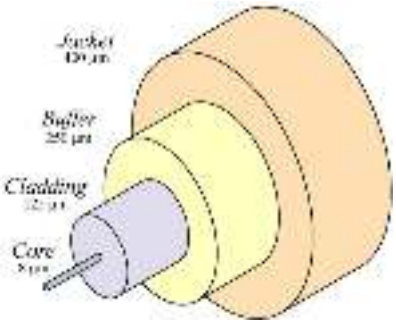
Fibre optic

Fiber optics, or optical fiber, refers to the medium and the technology associated with the transmission of information as light pulses along a glass or plastic strand or fiber. Fiber optics is used long-distance and high-performance data networking.

Fiber optics are also commonly used in telecommunication services such as internet, television and telephones. Fiber optic cables are used since they hold a number of advantages over copper cables, such as higher bandwidth and transmit speeds.

A fiber optic cable can contain a varying number of these glass fibers -- from a few up to a couple hundred. Surrounding the glass fiber core is another glass layer called cladding. A layer known as a buffer tube protects the cladding, and a jacket layer acts as the final protective layer for the individual strand.

How fiber optics works



Fiber optics transmit data in the form of light particles -- or photons -- that pulse through a fiber optic cable. The glass fiber core and the cladding each have a different refractive index that bends incoming light at a certain angle. When light signals are sent through the fiber optic cable, they reflect off the core and cladding in a series of zig-zag bounces, adhering to a process called total internal reflection. To renew, or boost, the signal throughout its journey, fiber optics transmission sometimes requires repeaters at distant intervals to regenerate the optical signal by converting it to an electrical signal, processing that electrical signal and retransmitting the optical signal.

Advantages	Disadvantages
• Support of higher bandwidth capacities. • Light can travel further without needing as much of a signal boost. • They are less susceptible to interference, such as electromagnetic interference. • They can be submerged in water- fiber optics are used in more at-risk environments like undersea cables. • Fiber optic cables are also stronger, thinner and lighter than copper wire cables • They do not need to be maintained or replaced as frequently.	• Copper wire is often cheaper than fiber optics. • Glass fiber also requires more protection within an outer cable than copper. • Installing new cabling is labor-intensive. • Fiber optic cables are often more fragile. For example, the fibers can be broken or a signal can be lost if the cable is bent or curved around a radius of a few centimeters.

Laser

Lasers can be used as a communication system. Unlike the tiny LEDs used in fibre-optic communication, this method uses high power laser beams to transmit light signals.

It is sometimes called a 'free-space' laser system because the beams travel directly through the air. For example, setting up a high bandwidth data link between two line-of-sight buildings can make use of a free-space laser system.

There are commercial systems available that offer Gigabit Ethernet connection speed up to 3 kilometers.

One disadvantage of this kind of system is that it is affected by the weather. Fog or haze can block the beams. On the other hand it can be set up very quickly, and easily, making it ideal for setting up a video feed to cover outdoor events at a sports arena.

Laser communication is also used to exchange data between satellites. In space the beams remain strong and highly focused offering speeds of up to 10 Gbps.

Uses

- Campus wide communication
- Emergency data links (disaster relief etc)
- Outdoor events requiring high speed data feeds
- Building - to - Building communication
- Satellite - to - Satellite communication
- Backup network in case main cabled network fails

Advantages	Disadvantages
• Wide bandwidth compared to infrared • Can be set up quickly (compared to laying cable)	• Affected by weather (at least on Earth) • Requires line-of-sight to work