



# Optical Fiber Cable in high speed Communications

Dr. S. Mary Praveena

*Department of Electronics and Communication Engineering  
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India*

A. Mirdulaa

*Department of Electronics and Communication Engineering  
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India*

K. Divya Vidya

*Department of Electronics and Communication Engineering  
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India*

S. Abirami

*Department of Electronics and Communication Engineering  
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India*

J. Kayalvizhe

*Department of Electronics and Communication Engineering  
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India*

S. Jaganayaki

*Department of Electronics and Communication Engineering  
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India*

**Abstract - Optical Fiber Communication is that the method of communication during which signal is transmitted within the sort of light and glass fiber is employed as a medium of transmitting those light signal from one place to a different. The signal transmitted in glass fiber is converted from the electrical signal into light and at the receiving end, it's converted back to the electrical signal from the sunshine. the info sent are often within the sort of audio, video or telemetry data that's to be sent over long distances or over Local Area Networks. glass fiber communication having good leads to long-distance data transfer at high speed, it's been used as an application for various communication purposes.**

**Keywords – light, glass fiber, telemetry data, Local area network, long distance data transfer, high speed**

## I. INTRODUCTION

Fiber optic innovation has practically supplanted copper wire in significant distance phone lines, and it is utilized to interface PCs inside neighborhood. Fiber optics is likewise the premise of the fiberscopes utilized in analyzing inner pieces of the body (endoscopy) or reviewing the insides of fabricated underlying items. Each Cable contains unquestionably slender strands of glass or plastic: optical filaments. Each link can be comprised of as not many as two strands or upwards of a few hundred.

The strands, each only one-10th the width of a human hair, are equipped for communicating around 25,000 calls each. Thus, a link made of many strands has the ability to convey a huge number of calls. Deeply, or internal communicating chamber, may have a distance across as little as 10  $\mu\text{m}$ .

Through a cycle known as all out inner reflection, light beams radiated into the fiber can proliferate inside the center for huge spans with strikingly little constriction, or decrease in force. The level of constriction over distance changes as per the frequency of the light and to the arrangement of the fiber.

## II. PROPOSED ALGORITHM

### 2.1 Development of fiber optics

Since the earliest long periods of media communications there has been a steadily expanding need to send more information much quicker. At first single line wires were utilized. These gave way to coaxial links that empowered a few stations to communicate over a similar link. Anyway these frameworks were restricted in transmission capacity and optical frameworks were researched.

Optical interchanges turned into a chance after the main lasers were created during the 1960s. The following piece of the jigsaw became alright when the primary optical filaments with an adequately low misfortune for interchanges designs were created during the 1970s. Then, at that point, during the last part of the 1970s a lot of examination was attempted. This brought about the establishment of the main optical fiber media communications framework. It ran over a distance of 45 km and utilized a frequency of 0.5 mm and had an information pace of only 45 Mbps - a small portion of what is conceivable today.

From that point forward, extensive upgrades have been made in the innovation. Information rates have improved and notwithstanding this the exhibition of the optical fiber has been improved to empower a lot more prominent distances to be accomplished between repeaters. As a sign of this the rates that can now be accomplished along through a fiber optic framework surpass 10 tbps. Whenever the main fiber optic transmission frameworks were being created, it was imagined that the fiber optic cabling and innovation would be restrictively costly.

### 2.2 How do Fiber Optic Communication functions:

As indicated by the absolute interior reflection guideline, optical filaments work. There is an issue here - light beams travel in straight lines, which can make it challenging for them to convey a lot of information. Therefore, tackling this benefit will be truly challenging without a long straight wire with no curves. To conquer this bending, optical links are planned so that every one of the light shafts are bowed internal (utilizing TIR). All through the optical strands, light beams skip off the dividers and send information from one finish to the next. Over longer distances, lights do debase, contingent upon the virtue of the material, yet they do as such at a much lower rate than utilizing metal links. Fiber Optic Relay Systems are made out of the accompanying parts:

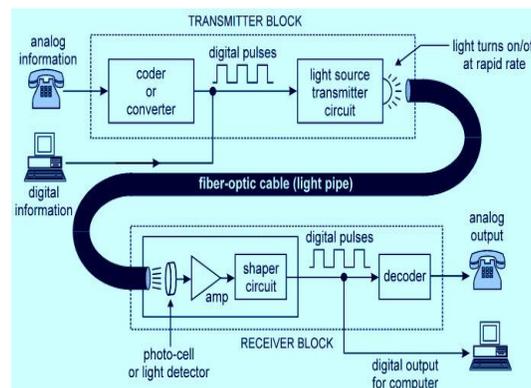


Fig 1

**Transmitter**-Light signals are delivered and encoded to be communicated.

**Optical Fiber**-Light heartbeats (signals) are communicated thereby.

**Optical Receiver**-The beneficiary gets the communicated light heartbeats (flags) and interprets them into usable signs.

**Optical Regenerator**-Data transmission over significant distances requires this.

### 2.3 Fiber utilization

**Large Transmission capacity:** one silica fiber can carry many thousands of telephone channels, utilizing only alittle a part of the theoretical capacity.

**Small Losses:** Approximately 0.2 dB/km signal is lost for contemporary single-mode silica fibers in order that many tens of kilometers are often bridged without amplifying the signals.

**Easy Amplification:** an outsized number of channels are often reamplified during a single fiber amplifier if required for very large transmission distances.

**Low Cost:** thanks to the large transmission rate achievable, the values per transported bit are often extremely low.

**Light Weight:** Compared with electrical cables, fiber-optic cables are very lightweight.

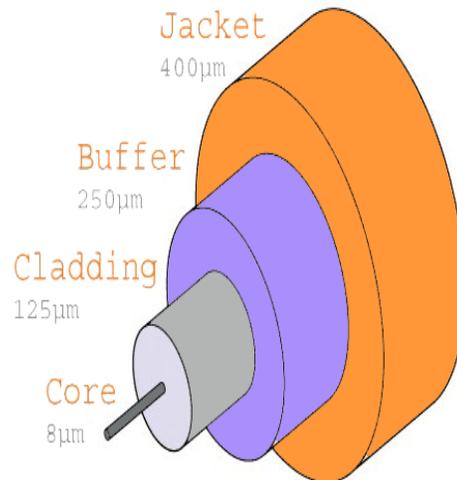


Fig 2

**No Interference:** Fiber-optic cables are resistant to problems that arise with electrical cables, like ground loops or electromagnetic interference (EMI).

The reasons clearly explain that the fiber optic cables are much better than the coaxial copper cables and this is often why Fiber optic cables are preferred over the conventions transmission mediums.

#### 2.4 Light over Electricity

Light or Laser light (to be precise) is employed for the glass fiber communication due to the rationale that the laser light may be a single wavelength light. While the opposite light signals like sunlight or bulb light have many wavelengths of sunshine and as a result, if used for communication they might produce a beam which is very less powerful and on the other hand, the laser having a single beam would result in a more powerful beam as output.

So, **Less Dispersion, transmitting more number of signals & consuming less time** makes the light a good source for communication.

#### 2.5 Qualities of Fiber Optic Communication

In glass fiber communication, light is employed as a sign which transmitted inside the glass fiber cable. This mode of communication has characteristics which are important to be discussed and makes it an honest mode of communication.

**Bandwidth** – Single laser light dispersion means an honest amount of signal are often transmitted (Information being transferred in bits) per second which ends up in high bandwidth for long distances.

**Smaller diameter** – The diameter of glass fiber cable is about 300 micrometers in diameter.

**Light-weight** – The glass fiber cable is light in weight compared to the copper cable.

**Long-distance signal transmission** – Since the laser light doesn't disperse, it are often easily transmitted over long distances.

**Low attenuation** – The fiber is formed of glass and laser is traveling through it, the signal transmitted has only 0.2 dB/km loss.

**Transmission security** – Optical encryption and no presence of the electromagnetic signal make the info secure over glass fiber.

#### 2.6 Optical Fiber Impact on IoT

The Fiber Optics Communication will have an excellent impact on IOT and this stuff listed will inform you ways IOT would require Fiber Optics.

**Fast Transmission Media** - the longer term are going to be IOT and every one of our devices and things are going to be connected to the web , which needs good communication and high speed. The only transmission media that supports such a requirement is glass fiber . The future needs IOT and IOT need glass fiber for best communication that would help reach Wireless data speed up to 100 Gbps speed, making communications and enormous size data transfer in seconds.

**Data Security** – Security in IoT is that the main concern once we consider great deal of knowledge to be transferred between billions of devices connected together. Hacking of knowledge from communication media is feasible unless it's glass fiber . The optical fibers are very difficult to hack and hacking them without being detected is like next to impossible. So again, an glass fiber can help secure the info and transfer it at very high speed.

**No data loss thanks to interference** - The glass fiber cables are often installed anywhere (even underwater or at high-temperature areas) and don't have any electromagnetic interference leading to no data loss due to interference.

#### 2.7 At the point when the Entire World Is Fully Connected by Fiber Optics

In the field of medicine, fiber optic networks allow high-definition cameras for doctors at healthcare facilities to have video conferences with students showing videos and addressing their queries in real time. It doesn't take a certified fiber optic technician to imagine the possibilities once IoT is applied in hotels, restaurants, and our homes – though it would help if you are. The possibilities are endless, and it will eventually creep into other industries just like how computers with internet did. And like any other new and exciting things, well, IoT will cease to be new and exciting. Eventually, one day, it will be hard to imagine that all things were once mute and that the benefits of IoT run by fiber optics hadn't always been with us from the start.

## IV. CONCLUSION

However fiber optics have been around for quite a long time, our innovation is a few seconds ago making up for lost time to utilizing them to their fullest potential. Sooner rather than later, researchers and scientists will keep on tracking down ways of consolidating fiber optics into our lives. With their capacity to further develop correspondence and gadgets, there is no question that fiber optics will proceed to advance and permit people to keep working on our correspondence, medication, and military.

## REFERENCES

- [1] Salehi JA, Weiner AM, Heritage JP. Coherent ultrashort light, pulse code-division multiple access communication systems. J Lightwave Technol 1990;8:478–91.
- [2] Agrawal GP. Fiber-optic communication systems, 2nd ed. Sections 2.2.3 and 2.3.5, New York: Wiley, 1997.
- [3] Chen L, Yanez M, Huang C, Bao X. Pulsewidth compression in optical components with polarization mode dispersion using polarization controls. J Lightwave Technol 2001;19:830–6.
- [4] Kudou T, Iguchi M, Masuda M, Ozeki T. Theoretical basis of polarization mode dispersion equalization up to the second order. J Lightwave Technol 2000;18:614–7
- [5][http://www.morikita.co.jp/soft/mo/mathdata.lzh\(dcf\\_jm.prn\)](http://www.morikita.co.jp/soft/mo/mathdata.lzh(dcf_jm.prn)).
- [6] Harada K, Ozeki T. Foundation of optical systems on mathcad. Tokyo, Japan: Morikita Shuppan; 1999 (in Japanese).
- [7] Leeb,W. R.; Scholtz, A. L.; Bonek, E.; Krammer, Assessment of Modulators for High Data Rate Laser Links. ESTEC contract no.3189/77/NL/AK(SC), Final Report, 1978.
- [8] Englisch,W.: Study on intersatellite laser communication links. ESTEC contract no. 3555/78, Final Report, 1979