

# New Trends in Telecommunication



Pooja Rani, Eirtty Kapoor

**Abstract:** This is the new trend of different wires used in telecommunication like fiber optic and copper wire. This study includes various parameters for comparison. For fabrication of any telecommunication, every wire play important role. A pair of Fiber can carry over eight thousand simultaneously voice channels. This paper gives us the idea of high immunity to electromagnetic interference for optical fiber and copper wire. According to this we will explain about Optical Fiber, type, features, theory and principles. Different specification and features of optical fiber cables are also studied. Optical Fiber's linear features are wavelength window, bandwidth, attenuation and dispersion. Non-linear features are fiber manufacturing, geometry etc. Copper cable has different types such as: Coaxial cable and twisted cable.

**Keywords:** Optical Fibers, Dispersions, Communication Medium, Copper Cable, Coaxial cable, twisted cable.

## I. INTRODUCTION

In data transmission, since the innovation of the telephone as usual copper wires have been used. But as the increased requirement, some of the reasons for lesser utilization of copper cables. These days, Copper wires have low bandwidth, small transmission length and incapability. New media is Optical Fiber, in which audio, information or Video is imparted through a glass or plastic fiber as a light waves with total internal reflection mechanism. The field of science and technology related with the plan, development as well as the application of fibers is known as study of optical fiber [1]. Fibers can be applicable in study of optical fiber; this leads to transfer of data along greater distances and more data rates as compared to different wires of telecommunication. Fibers can be joined to other or concluded other part with the help of connector method. It may be main basis for induction of fiber [2]. Fiber provides vital function because more bandwidth, high transmission, and more security. The transmission follows as:-

- I. Data converted into electrical pulses.
- II. Electrical pulses changed into light pulses.
- III. Pulses of light move from starting point of fiber to last point.

- IV. The light signals can be converted into electrical signals by detector.
- V. Data can be decoded by the use of electrical signals [3].

Optical fibers are thin like hair as glass. These can take pulses of light (frequently infrared light) along more distances. One end of the fiber joined to transmitter. The transmitter changes the electronic waves into light waves. With the help of fiber wire, light waves converted into optical signals [4]. Fiber wires other end connected to a receiver. Receiver decoded the optical signal into digital signal [5]. Channels required following a signal due to this, they may be transmitting from one place to another place. Telecommunication channels are optical fiber wire and copper wires. Fiber optics called optical fiber [2].

## II. COPPER WIRE

Copper is a comparative soft metal and reddish metal. It is a good conductor of heat and electricity. Resistance and interference created by copper wire using electrical properties. The telecommunication signals transmit high for the transmission of data. It can be feeble through electrically connected. [6]. Resistance of copper material decreases the motion of electrons. Telecommunication transmission speed and distance limited by use of copper wires electrical properties [4]. There are classifications of cables containing copper wire required telecommunication: Coaxial and Twisted Pair.

**Twisted Pair** :First telephone invented by Alexander Bell. He used twisted copper pair as a transmission medium [7]. On this basis, all telecommunication technology and services today use twisted copper pair

**Coaxial type Cable:** It is a kind of copper wire. These utilize by entertainment companies for wave dispersal between people user and receiver. It created in 1929 and commercially utilized in 1941[8].



Fig. 1: Fiber optic wire



Fig. 2: Twisted pair wire



Fig. 3 Coaxial copper wire

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\* Correspondence Author

**Pooja Rani\***, Department of Applied Science, G L Bajaj Institute of Technology and Management, Greater Noida, UP, India. Email: poojapadam25@gmail.com

**Eirtty Kapoor**, Department of Information Technology, G L Bajaj Institute of Technology and Management, Greater Noida, UP, India. Email: erunnatti@gmail.com

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III. OPTICAL FIBRE

Optical fiber is thin like hair. It made up of glass or plastic. Light moves from one end to another end through zig zag by using principle of total internal reflection [9]. It has main two types: Single mode fiber and Multimode fiber on the basis of modes. But on the basis of index profile, it has classified: step index fiber in single and multimode, Graded multimode type fiber .When light moves through fiber then some losses occur and these losses known as Attenuation. Attenuation occurs due to geometry of fiber, material of fiber and number of modes [10].

IV. MECHANISM OF OPTICAL FIBER:

**Total Internal Reflection** – When Light ray in one media hits on other media of different Material and reflected back into same media without any attenuation called Total Internal Reflection [2].

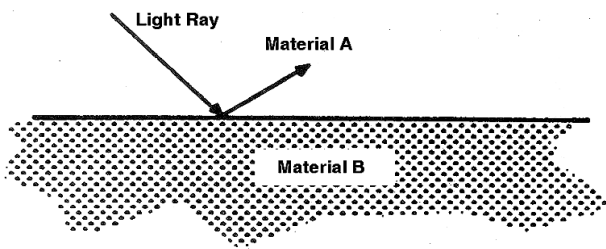


FIG. 4: TOTAL INTERNAL REFLECTION MECHANISM

V. DISPERSION:

Dispersion is the spreading of light pulse travels from one part to other part along the length of fiber. The data taking capability of fiber is limited by dispersion. Dispersion restricts data taking capability of fiber. The greater dispersion can be tolerated due to less bit rates [11] .These may be classified as:

- A. Modal type Dispersion.
- B. Material type Dispersion.
- C. Waveguide type Dispersion.

VI. THREE BASIC PARTS OF FIBRE-OPTICS SYSTEM

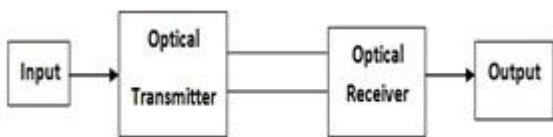


Fig.5 Communication System in optical fiber

**Transmitter:** The electrical signal changes into an optical signal with the use of transmitter. A light-emitting diode or a laser diode can be used as a light source. The source of light converts transformation of electrical wave to an optical wave. The driving set up used to form driving current by using light source.[12].

**Fiber Wire:** It is travelling media for taking light wave from one end to another. The wire has property of Fibers like safe sheath.

**Receiver:** It receives light wave and changes into an electrical wave. The output wave is same as the input wave gives to the transmitter. The main parts of receiver are the

detector that changes the light into an electrical wave [4] and other is the output system, which reconstruct the input wave. Manufacture a fiber transmission system like couplers, multiplexers, amplifiers, and switches allow path for making complicate telecommunications [13].

VII. COMPARATIVE ANALYSIS OF ADVANTAGES OF OPTICAL FIBER OVER COPPER WIRES

Parameter	Copper wire	Optical Fiber
Bandwidth	Low bandwidth	High data rate or bandwidth
Material	Copper is a relatively soft, reddish metal. It is high conductor of heat and electricity.	Optical fibers, is thin like hair , glass that take pulses of light (frequently infrared light) over large distance distances
Communication	The signal or flow of current slows down within the copper wire due electrical resistance. So communication is slow.	Fast communication
Security	it is required to joined a copper wire to hack the system . Security is poor.	Security is good due to glass material
Weight	Weight is larger	weight is lesser
Non Flammable	Current can be flow in a Copper and it cause fire when it is old.	Fiber is a dielectric medium. It means no flow of electrical current through it.
Immunity	If Copper wiring is not installed properly. It is weak and easy to hurt physically.	Optical fiber is immune due to not able to conduct electric current.
Size	Large diameter	Diameter and size is small as compared to copper.
Noise Immunity	Susceptible to electromagnetic interference created due to signal movement in copper wire.	In optical fiber, signal is travelling like motion of photons is immune as interference.
Transmission Loss	High attenuation loss due to large diameter of wire.	Optical Fiber exhibit less loss as compared to copper wire.

VIII. CONCLUSION

Optical Fiber technology is new in telecommunication industry and it changes the copper cable transmission waves. Dispersion may be decreased with making less diameter of core which reduce number of modes. But with the use of single mode allow no modal type dispersion. With use of graded type fiber, its light waves permit more distance to travel with fast speed and reached fiber end nearly in same time. A feature comparative study between optical fiber and copper wire introduced.



It represented every wiring has characteristics and limitations to which the performance of the channel depends upon and provides results in agreement with studies.

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## AUTHORS PROFILE



**First author:** Dr Pooja Rani

Mail id: [poojapadam25@gmail.com](mailto:poojapadam25@gmail.com)

Dr. Pooja Rani Msc.,M.Phil.,PhD., is currently working as associate professor in Physics, Department of Applied science, G L Bajaj institute of Technology and Management, Greater Noida.She has teaching experience of 12 years in Polytechnic and Engineering colleges. Her research area includes telecommunication.



**Second author:** Ms. Eirrtty Kapoor

Mail id: [erunnatti@gmail.com](mailto:erunnatti@gmail.com)

Ms. Eirrtty Kapoor is PhD student in department of Computer Science and Engineering, IFTM University, Uttar Pradesh,India. She is working as assistant professor ,Information Technology Department, G L Bajaj institute of Technology and Management, Greater

Noida.