Optical Fiber

Telecom, Cabell Connectivity & Communication

Tannay Kumar¹, Chaudhary Vivek²

¹Jamnabai Narsee International School, Mumbai, India

²Mumbai University, Mumbai, India

¹kumartannay@gmail.com, ²Chaudharyvivek363@yahoo.in

Abstract – Optical Fiber was initial created during the 1970s, the utilisation of and demand for optical fibber have boosted hugely. The uses of optical fibber these days are quite many. With the explosion of data traffic because of the net, electronic commerce, computer networks, multimedia, voice, data, and video, the necessity for a transmission medium with the information measure capabilities for handling such vast amounts of data is paramount. Fibber optics, with its comparatively infinite information measure, has proved to be the answer.

Keywords - Optical Fiber, Fiber optics.

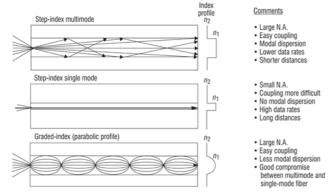
I. INTRODUCTION

Amotivating force in telecommunications research has been the need for economical and reliable transmission media with a broad capacity to carry information. the first fibber-optic communication systems developed in 1978 were able to transmit signals at 100 mb/s using multimode fibers operating close to 0.85 µm (repeater spacing of < 10 km but considerably larger than the coaxial heritage system). this is accompanied by the introduction of single-mode fibers that propelled the system ability to gb / s with repeater spacing reaching 50kms with an improvement in system operating wavelength to 1.55 µm. the increased propagation distance provided by lower loss of fibers and the greater dispersion of fibers at 1.55 µm defined fibre dispersion as the next challenge to be tackled. several systems with reduced dispersion were developed that could operate more than 10 gb/s with repeater spacing up to 100 kms.

II. Types Of Optical Fibbers

There are three main types of optical fibers that are used in the field of communication and are also used for large digital transfers of data.

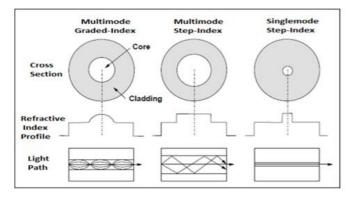
- Step index multimode
- Step index single mode
- Graded index



The fiber is a dielectric waveguide made up of a distinct number of propagating modes. The fibers can be categorized as single and multi-mode depending on the modes.

- Step-index multimode fibber has a refractive profile index that "tracks" from low to high to low as calculated from core to core to core to core. This fiber is characterized by a relatively large core diameter and numerical aperture. A standard multimode fibre used for telecommunication has a core / cladding diameter of 62.5/125 µm (about the size of a human hair). The term "multimode" refers to the fact that there are several modes or paths It's easy to use the fibre. Step-index multimode fibers are used in applications requiring high bandwidth (< 1 GHz) over relatively short distances (< 3 km) such as a local area network or backbone of a campus network. Step Benefits-Multimode index fibers are relatively easy to work with; due to their larger core size, light is easily linked to and from it; it can be used with both Lasers and LEDs as sources; and losses of coupling are smaller than those of singlemode fiber. The downside is that it suffers from modal dispersion due to the fact that many modes are permitted to spread (a function of core diameter, wavelength, and numerical aperture). Bandwidth restriction, which translates into lower data levels, is the product of modal dispersion.
- Single Mode Step-Index fiber: The central core diameter (ranging from 8-12 μm) is significantly smaller than any of the multimode fiber. Light rays entering the fiber propagate down the core or are only reflected a few times. All rays take approximately the same time to travel the fiber's length. The cross-section, refractive index profile and light path for various types of fibres are shown in the figure below.
- Graded-index fiber is a compromise between the large core diameter and N.A. Multimode fiber and a reduced single-mode fiber bandwidth. With the formation of a kernel whose refractive index parabolically decreases from the core center to the cladding, light passing through the center of the fiber experiences a higher index than light traveling in the higher modes. It means that the higher-order modes are traveling faster than the lower-order modes, allowing them to "catch up" to the lower-order modes, thus reducing the amount of modal dispersion, which reduces the fiber bandwidth.

24



III. BENEFITS OF OPTICAL FIBRES

Optical fiber systems have many advantages over metallic-based communication systems. These advantages include:

- Long distance signal transmission Low attenuation and higher signal integrity in optical systems allow much longer signal transmission intervals than metallic systems.
- Longer than a few kilometers (1.2 miles) of voice-grade copper systems require in-line signals for acceptable performance; it is not uncommon for optical systems to reach more than 100 kilometers (km) or about 62 miles without active or passive processing.
- Big bandwidth, light weight and compact diameter
 The technologies of today demand an everincreasing bandwidth. Therefore, considering the
 space constraints of many end users is significant.
 Installing new cabling inside existing duct or conduit
 systems is popular. The relatively small diameter and
 light weight of the optical cable make such
 installations easy and convenient, saving valuable
 conduit space in these environments.
- Its dielectric character is another advantage of optical fibers. Since optical fiber has no metallic components, electromagnetic interference (EMI) areas, including radio frequency interference (RFI), can be installed. Strong EMI areas contain utility lines, power lines and tracks on the railroad. Although suitable for all-dielectric cables of high lightning-strike incidence.
- In contrast to metallic systems, the dielectric nature
 of optical fiber makes it impossible to detect the
 signal transmitted in the cable remotely. Access to
 the optical fiber is the only way to do so. Accessing
 the fiber involves interference that can be easily
 detected by security monitoring. Such circumstances
 make fiber extremely attractive to institutions of
 government, banks, and others with major security
 concerns.
- Fiber optics is affordable today, as electronics prices are falling and optical cable prices remain small.
 Fiber options are, in many cases, less costly than copper. As demands for bandwidth increase rapidly with advances in technology, fiber will continue to play a vital role in telecommunications ' long-term success.

IV. RELIANCE / JIO OPTICAL FIBRE PROJECT

Building a PAN India optical network like BharatNet is most important to achieving the government's digitization goals. The knowledge super-highway that would be built with BharatNet implementation would allow for deep and wide connectivity across the country's length and breadth. It is indeed commendable for this purpose, and we are grateful to TRAI for seeking the views of all stakeholders, particularly private TSPs. For its new optical fiber-based broadband services in the country, Reliance Jio has officially started the registration process to acquire customers. This will be one of the world's largest broadband greenfield networks Focus on fiber optics. RJIo is expected to bundle packages for television and voice telephony through mobile, Internet-based set-top boxes. RJio, a wholly-owned subsidiary of Reliance Industries Ltd (RIL), will offer highspeed broadband under the JioGigaFiber brand to start with 50 million homes. "Fixed-line broadband provides hundreds of megabits, including gigabits per second, of data speeds. Jio is set to push India to the top five in fixed-line broadband, "said RIL Chairman Mukesh Ambani earlier at the 41st AGM of the firm. "In countries with a better communication network, more than 80% of data consumption takes place indoors via a fixed lineconnectivity. The future is fixed-line optical fiber-based broadband. "JioFiber offers superior internet experience to explore your Digital Life. JioFiber is the future's technology. This offers browsing, streaming, game and work with the ultimate broadband experience. Due to its ultra-fast upload and download speeds, JioFiber beats the rest in just' milli seconds.' Now, imagine a high-speed private internet highway right inside your home. JioFiber connectivity comes directly to your premise unlike in most cases where the fiber reaches only till the building. JioFiber service is based on Fiber Optic technology. This technology offers a lot of advantages over the traditional cables:

- It provides faster Internet connection
- Post-installation fiber networks should not be updated because businesses update them with the latest technology that produces electronic light pulses and does not replace fiber cables

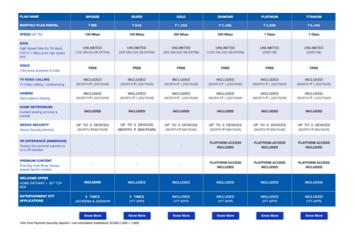
The ultra-fast download and upload speeds of JioFiber allow seamless UHD video services, video conferencing and a wide range of camera applications. Usually, the Jio Home Gateway's Wi-Fi coverage covers an open area of approx. One thousand sq. Ft. (on the floor). However, this range can be affected by several external factors beyond our control, like interference from other Wi-Fi Access Points in the surrounding area, placement of the Home Gateway in the house, user's distance from it and the number of walls between the Home Gateway and the user.

V. CURRENT PLAN PROVIDED BY JIO FIBER.

JioFiber provides you with up to 1Gbps ultra-high-speed internet access to Jio & other Premium OTT apps. Apart from this, a JioFiber user has access to television for television calls, Jio Protection, Home Networking, and much more. Track details of plans and deals https://www.jio.com/fiber/en-in/plans.

Plans Provided:-

25



Link to Image Above ^^ https://www.jio.com/fiber/en-in/plans

VI. OBSERVATION / CONCLUSION

The paper provides an overview of the contact with fiber optics. For a number of information-related uses, optical fibers can be used as a flexible transmission medium. Single mode fiber provides less signal attenuation than multimode and can therefore be used for longer distances of up to 100kms, while multimode fiber can be used for smaller distances of up to 6 km. LED and LASER have been classified as sources of optics. The later, as it can be used with both SMF and MMF, is preferred. In terms of bandwidth, signal reliability, electrical interference, size and weight, the advantages of fiber optic communication over copper wire-based communication are also provided. The

paper also gives information about the new project started by reliance / JIO and the plans provided by them.

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26