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An Overview on Optical Fiber and Its Application in Communication

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Description

The twentieth century is often called the century of electronics because of the technological breakthroughs enabled by the electron. It is likely that the twenty-first century will be known as the century of photonics. The applications of photonics are as diverse as that in science. Optoelectronics and photonics are two firmly related terms in the present technological aspect. Photonics is the examination of light. It is the advancement of making controlling and distinguishing light waves and photon. Photonics is all over the place; for instance, in buyer gadgets (standardized identification scanners, remote control devices), in telecommunications (Internet), in medical science (eye surgery, medical instruments), in manufacturing industry (laser cutting and sealing), in defense and security (infrared camera, remote sensing), in entertainment (laser shows), etc. The use of light in fiber optics has revolutionized the field of optical communication and sensor design and applications.

Communication means the exchange of Information between two trans-receivers separated by few meters/kilometers or by intercontinental distance or more. Information is carried by modulating the electromagnetic carrier waves whose frequency range can vary from a few megahertz to several hundred terahertzes. Nowadays multimedia data such as pictures and video are increasing exponentially and demand increased data transmission rates and higher bandwidth. Traditional electronic communication systems failed to fulfill such demand, but the same demand may be implemented in optical communicational systems having carrier frequency -100 THz in the visible or in the near infrared region of the electromagnetic spectrum. The fundamental difference between optical systems (-100 THz) and microwave systems (-10 GHz) are in their carrier frequencies; therefore, optical frameworks are multiple times quicker in data handling and transmission with respect to microwave systems.

Current state-of-the-art all optical WEN systems operate at bit rates of -1. But still today there is a lot of scope for further improvement in this field. It consists of three main components: optical transmitter, communication channel and optical receiver. Optical correspondence frameworks might be ordered into two classifications: directed and unguided. Optical fibers are used in guided optical communication systems. Unguided optical frameworks have some particular applications in detecting and identifying systems but are not suitable in broadcasting systems like microwaves because optical beams spread mainly in the forward direction. Fiber optics is basically a part of optics or photonic engineering that mainly concentrates with the study of the propagation of light (rays or modes) through transparent dielectric waveguides, e.g., optical fibers. Fiber optic systems were deployed worldwide in around 1980 and have indeed revolutionized the telecommunications industry.

Benefits of Optical Fiber

There are a few benefits of optical correspondence over electronic and microwave communication systems. The principle benefits are summed up underneath.

High bandwidth

The information carrying capacity of a communication system is directly proportional to the carrier frequency of the transmitted signals. The optical carrier frequency is much greater than the radio waves and microwaves. Generally, optical fiber operates in the range of 1013-1015 Hz. This frequency band has higher transmission bandwidth than the microwave band, and the data rate -1 Tb/s. Further expansion in information rate can be accomplished by moved WOM procedures.

Low transmission loss

Due to the implementation of ultra-low loss fibers, dispersion shifted fiber other than ebium doped silica fibers as optical speakers; one can design fundamentally lossless transmission systems. The most modern optical communication systems have transmission loss of 0.002 dB/km. By using erbium doped silica fibers over a short length in the transmission path, one can achieve optical amplification with negligible distortion. This prompts the increment in repeater separating >100 km.

Dielectric waveguide

Optical fibers are mainly produced from silica, which are electrical insulators. Since optical signs in strands are liberated from electromagnetic impedance and crosstalk, many fibers may be

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accommodated in single optical cable. Optical filaments are additionally reasonable in touchy conditions.

Signal security

The information security in optical communication is very high because the transmitted signal through the fibers does not radiate. The trapping of optical information from the fibers is practically impossible.

Size and weight

Optical strands are created with little measurement, and they are flexible, compact and lightweight. The fiber links can be bowed or bent with next to no harm of the singular filaments. In this way the capacity, dealing with and establishment of fiber links are simple.

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