Photonics Developments in Electronics

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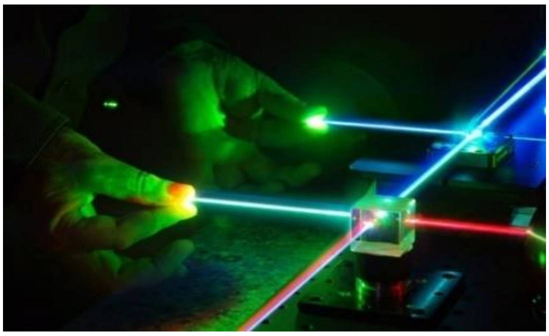
***Abstract**:-* **Light has found applications in data transmission, such as optical fibres and waveguides and in optoelectronics .It consists of a series of electromagnetic waves, with particle behaviour. Photonics involves the proper use of light as a tool for the benefit of humans. It is derived from the root word "photon", which connotes the tiniest entity of light analogous to an electron in electricity. Photonics have a broad range of scientific and technological applications that are practically limit less and include medical diagnostics ,organic synthesis, communications, as well as fusion energy. This will enhance the quality of life in many areas such as communications and information technology, advanced manufacturing, health, medicine and energy. The signal transmission methods used in wireless photonic systems are digital baseband and ROF (Radio-over-fibre) optical communication. Microwave photonics is considered to be one of the emerging research fields. The mid infrared (mid-IR) spectroscopy offers a principal means for biological structure analysis as well as nonintrusive measurements. There is a lower loss in the propagations involving waveguides. Waveguides have simple structures and are cost-efficient in comparison with optical fibers. These are important components due to their compactness, low profile, and many advantages over conventional metallic waveguides. Among the waveguides, op to fluidic wave guides have been found to provide a very powerful foundation for building optofluidic sensors. These can be used to fabricate the biosensors based on fluorescence. In an optical fiber, the evanescent field excitation is employed to sense the environmental refractive index changes. Optical fibers as waveguides can be used as sensors to measure strain, temperature, pressure, displacements, vibrations, and other quantities by modifying a fiber. For some application areas, however, fiber-optic sensors are increasingly recognized as a technology with very interesting possibilities. In this review, we present the most common and recent applications of the optical fiber-based sensors. These kinds of sensors can be fabricated by a**

modification of the waveguide structures to enhance the evanescent field; therefore, direct interactions of the measure and with electromagnetic waves can be performed. In this research, the most recent applications of photonics components are studied and discussed.

Keywords:- Photonics, ROF, opto fluidic



INTRODUCTION

The role of light is significant in our lives today. The importance of light cannot be taken for granted because it is vital to most aspects of our contemporary society. It is used everywhere whether it be building, telecommunication, transportation, entertainment, or clothing. Light has applications in data transmission, such as optical fibers and in optoelectronics. It is used in compact disc players where a laser reflecting off of a CD transforms the returning signal into music. It is also used in laser printing and digital photography. Connections between computers and telephone lines are possible with the help of light (fiber-optic cables). It is used in optical fiber lasers, optical fiber interferometers, optical fiber modulators, and sensors. Light is used in the medical field for image production used in hospitals and in lasers that are used for optometric surgery. Light consists of a series of electromagnetic waves, with particle behavior under certain circumstances. Light is the range of wavelengths in the electromagnetic spectrum.

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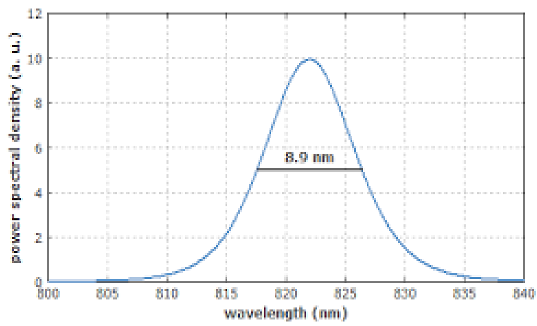
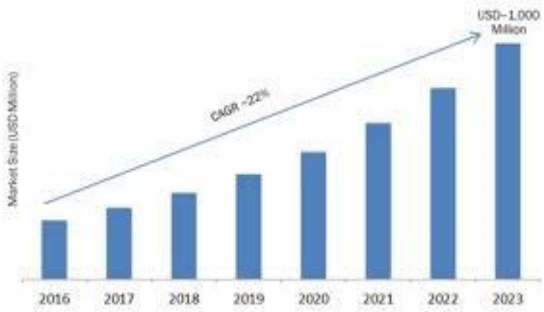
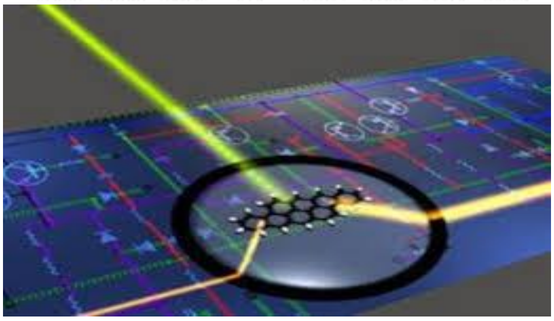


DEVELOPMENT IN PHOTONICS

There has been an exponential growth in the research activities in the field of photonics and optics over the years, as illustrated by the publication and citation trends from the Thomson Reuters web of science database. Photonic networks are the backbone of data dissemination, specifically in the modern and upcoming wireless communication systems. Photonic networks continue to gain interest for distribution of data from, say, central location to a remote antenna unit at base stations. While the demand for wireless photonic systems continues to rise, there is a need for implementation of low-cost systems. Two of the most popular data transmission methods in wireless photonic systems are digital baseband and RoF (Radio-over-Fiber) optical communication. In addition, further emerging fields are opto-atomics, in which there is an integration of both atomic and photonic devices. Opto-atomics applications include precise time-keeping. Opto-mechanics, metrology, and navigation, as well as polaritonics, are different from photonics due to the presence of polarization as the primary carrier of information. Micro wave photonics is considered to be an emerging research field. Micro wave photonics is an enabling technology for the generation, control, distribution, measurement, and detection of microwave signals. It also deals with the operation of new systems and devices. Part of the various functionalities facilitated by photonics, microwave measurements centered on photonics can offer greater performance regarding broad frequency coverage, significant direct bandwidth, high immunity to electromagnetic interference (EMI) and low frequency-dependent loss. Photonic microwave measurements therefore have been widely investigated in recent times. Moreover, several new methodologies have been offered to address the challenges confronting electronic solutions. Plasmon lasers are among the categories of optical frequency amplifiers that send strong, penetrating, and guiding superficial plasmons underneath the diffraction walls. The interactions between light energy and matter can be intensely improved by the tightly held electric fields in plasmon lasers.

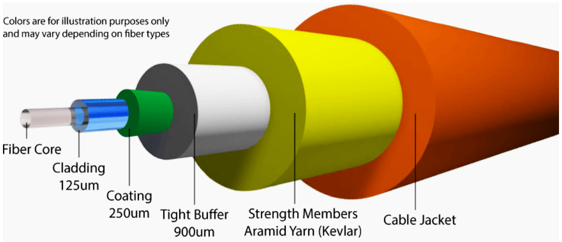


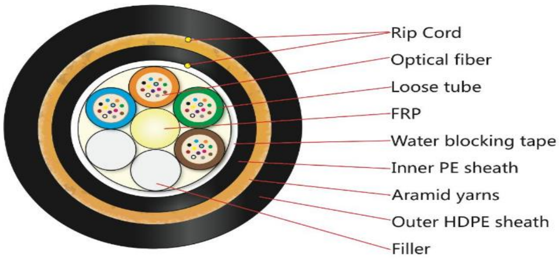


HELLENIC PHOTONICS

APPLICATIONS OF PHOTONICS

The two most important components of optical fibers are the core and the cladding. The “core”, which is the axial part of the optical fiber, is made up of silica glass. The optical fiber core is that area of the fiber where light is transmitted. Sometimes, doping elements are used to modify the fiber refractive index, thereby changing the light velocity through the fiber. The “cladding”, on the other hand, is the layer that surrounds the core completely. The cladding refractive index is less than that of the core. This enables the light inside the core to strike the core-cladding interface at a “bouncing angle”, is confined inside the core by the total internal reflection, and keeps moving in the appropriate direction along the fiber length to a certain point. The cladding is usually surrounded by another layer known as “coating,” which normally is comprised of protective polymer films coated during the process of fiber drawing, before being in contact with any surface. Additional protective layers of “Buffers” are further applied on top of the polymer coatings.The silica fibers are the common type of fibers that can transmit light with wavelengths below the mid-infrared range. High attenuations affect the distance at which signals can be transmitted. The variation in attenuation with wavelengths for a wide range of fiber optic cables.





ADDS OPTICAL FIBRE

CONCLUSION

Waveguides and optical fibers have applications for assisting us in various aspects of our lives. As anticipated, optical fiber-based sensors can be appropriate instruments for monitoring physical parameters such as strain and temperature. A review of some of the recent advances related to the design and application of optical fiber sensors has been given. It has been established that optical fiber grating sensors and side-polished fibers continue to play a significant role in the development of various sensors with the combination of new fiber materials and structures.Fiber optics sensors have been developing for many years but have not achieved great commercial success yet due to the difficulties of introducing modern technologies that could replace currentwell-established technologies. However, for applications such as sensing in high-voltage and high-power machinery, or in microwave ovens, the fiber optics sensors are well recognized for presenting many advantages. Fiber Bragg grating sensors have developed significantly, and these can now be used to monitor conditions within the wings of airplanes, in wind turbines, bridges, large dams, oil wells and pipelines. In smart structures, which are the main drivers for the further development of fiber-optic sensors, the fiber sensors can monitor and obtain essential information about the strain, vibrations, and other phenomena. Since the year 2000, fiber optics has provided a significant contribution in applications such as optical communications, transmission fibers used underwater, in terrestrial areas, metro and local area networks (LAN).The wideband multimode fibers can be used in wider frequency ranges from visible to infrared such as the short wavelength-division multiplexing ranges 850 to 950 nm. Another rapidly growing technology is free-space communication, where the optical signals can be used for satellite–satellite communications. Recently, optical fibers have been used for transmission from light emitting sources such as high-power lasers, where the sudden changes in wavelength can be controlled easily in these devices. Other special fibers have been used in amplifiers, lasers, sensors and photonics devices. Further improvements of the fiber optics can be done by providing higher bandwidth, transmissions capacities for longer distances, and introducing devices with at a lower cost. For instance, in the LAN fiber world, the use of new wideband multimode fibers is recommended to improve the overall system efficiency. Each market and application has its separate advantages derived from Fiber Bragg grating based sensor applications.

INTEGRATED PHOTONICS

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