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# Future Trends in Fiber Optics Communication and SDM

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## Abstract–

Fiber optic systems are important telecommunication infrastructure for world-wide broadband networks. Wide bandwidth signal transmission with low delay is a key requirement in present day applications. Optical fibers provide enormous and unsurpassed transmission bandwidth with negligible latency, and are now the transmission medium of choice for long distance and high data rate transmission in telecommunication networks. This paper gives an overview of fiber optic communication systems including their key technologies, and also discusses their technological trend towards the next generation. Index Terms- Bandwidth, Broadband, Fiber optics, Latency, Telecommunication.

### I. INTRODUCTION

The major driving force behind the widespread use of fiber optics communication is the high and rapidly increasing consumer and commercial demand for more telecommunication capacity and internet services, with fiber optic technology capable of providing the required information capacity (larger than both wireless connections and copper cable). Advances in technology have enabled more data to be conveyed through a single optical fiber over long distances. The transmission capacity in optical communication networks are significantly improved using wavelength division multiplexing .

## FUTURE TRENDS IN FIBER OPTICS COMMUNICATION

Fiber optics communication is definitely the future of data communication. The evolution of fiber optic communication has been driven by advancement in technology and increased demand for fiber optic communication. It is expected to continue into the future, with the development of new and more advanced communication technology. Below are some of the envisioned future trends in fiber optic communication. A. All Optical Communication Networks An all fiber optic communication is envisioned which will be completely in the optical domain, giving rise to an all optical communication network. In such networks, all signals will be processed in the optical domain, without any form of electrical manipulation. Presently, processing and switching of signals take place in the electrical domain, optical signals must first be converted to electrical signal before they can be processed, and routed to their destination. After the processing and

routing, the signals are then re-converted to optical signals, which are transmitted over long distances to their destination. This optical to electrical conversion, and vice versa, results in added latency on the network and thus is a limitation to achieving very high data rates. Another benefit of all optical networks is that there will not be any need to replace the electronics when data rate increases, since all signal processing and routing occurs in the optical domain [9]. However, before this can become a reality, difficulties in optical routing, and wavelength switching has to be solved. Research is currently ongoing to find an effective solution to these difficulties. B. Multi – Terabit Optical Networks Dense Wave Division Multiplexing (DWDM) paves the way for multi-terabit transmission. The world-wide need for increased bandwidth availability has led to the interest in developing multi-terabit optical networks. Presently, four terabit networks using 40Gb/s data rate combined with 100 DWDM channels exists. Researchers are looking at achieving even higher bandwidwith 100Gb/s. With the continuous reduction in the cost of fiber optic components, the availability of much greater bandwidth in the future is possible.

**Advancement in Network Configuration of Optical Submarine Systems**

In order to improve the flexibility of network configuration in optical submarine communication systems, it is expected that the development of a technology for configuring the mesh network will be a step in the right direction. As shown in figure 5, while a ring network joins stations along a single ring, a mesh network connects stations directly. Presently, most large scale optical submarine systems adopt the ring configuration. By adopting the optical add/drop multiplexing technology that branches signals in the wavelength domain, it is possible to realize mesh network configuration that directly inter-connects the stations. Research is ongoing, and in the future such network configuration will be common.

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