Abstract

Next generation communication systems need to dispense higher data rate in the efficient manner with capability to customize according to the dynamic data transfer framework in an economically dominant approach. The optical fiber communication networks fulfill these requirements along with small attenuation loss and better quality of services. In the last a few years the rapid progress of the data rate transmission over the existing optical transmission networks accentuated the need of more worthwhile usage of the transmission capacity of the prevailing networks. The forthcoming optical communication systems needs to support 10 Gbps and above over the single wavelength in the optical fiber channel. The Inter-Symbol Interference (ISI) due to dispersion limits the repeater less maximum transmission data rate and maximum transmission distance for the optical fiber channel [1]. Various endeavors have been taken for the advancement of the schemes and dispersion compensation devices to mitigate the effect of the dispersion causing inter-symbol interference. The primary instrument to achieve this objective is to use an equalizer. Orthogonal Frequency Division Multiplexing (OFDM) is a very favorable scheme for the high data rate data transmission because of its ability to overcome the effect of the dispersion, tolerance to the dispersive channel, high spectrum efficiency and better flexibility of operation. For mitigating dispersion impact OFDM transmits a large number of modulated sub-carriers at the same time operating at low data rate. These
cause the symbol period relatively longer than the channel impulse response, hence mitigating the impact of inter-symbol interference. OFDM is a multicarrier modulation scheme, extensively investigated and deployed in wireless as well as wire line communication. It is getting increased interest in the fiber optic research community for its robustness against dispersion causing inter-symbol interference. It utilizes the spectrum efficiently and dynamically controls the dispersion. This suggest that OFDM can be the best method for the mitigating the dispersion for the long distance high data rate optical fiber communication systems. Therefore, the integration of OFDM with the optical fiber can be the excellent scheme for providing long distance high data rate efficiently. A comparative performance analysis of the dispersion compensated optical system carried out for examining the impact of the OFDM to mitigate the dispersion at 10 Gbps and above. The systems with and without using OFDM has been configured and its performance has been investigated, various results obtained exhibited that transmission performance is entirely dependent upon a proper selection of data rate, transmission length, and modulation schemes etc. For evaluating the systems performance, constellation and bit error rate are evaluated for system with and without using OFDM and subsequently compared. The various results of the investigation depicts that for high data capacity transmission for the long distance the systems with using OFDM shows better results, and having better spectrum utilization than the systems without using the OFDM. The use of a large number of sub-carriers has been observed to be more effective in overcoming the fibre dispersion.

References

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Critical Analysis of Dispersion Compensated Optical Communication System

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Index Terms

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Keywords

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