Comparative Performance Analysis of Tanh-Apodized Fiber Bragg Grating and Gaussian-Apodized Fiber Bragg Grating as Hybrid Dispersion Compensation Model

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Abstract Fiber optic systems are used for the prolonged reach transmission systems, but by increasing the bit rate which is the main requirement of the current time, dispersion gets arisen which results in intersymbol interference. Compensation of dispersion to improve the transmission capability of the fiber optic system provides a vast field for research. From the literature survey done, use of Dispersion compensation fiber has been found as the most reliable method for compensating the dispersion, but it becomes expensive as the length of Dispersion compensation fiber is increased for long distance transmission. The Fiber Bragg Grating is also used as a dispersion compensation module as reported in previous works but has been found inefficient method. However, the Performance of the Fiber Bragg Grating can be enhanced by adapting optimum Chirping technique and Apodization profile. From the previous reported works, Tanh-Apodized Fiber Bragg grating and Gaussian-Apodized Fiber Bragg grating are found to have optimum performance characteristics in terms of side lobe suppression and maximum reflectivity, which motivates us to analyze the respective Fiber Bragg Gratings for compensating the dispersion at various chirping techniques and variable grating lengths. In this work, Tanh-Apodized Fiber Bragg grating and Gaussian-Apodized Fiber Bragg grating are analyzed and simulated in various chirping techniques individually, as well as along with the Dispersion compensation fiber, in the hybrid model of dispersion compensation for a 100 km long optical fiber link at the data rate of 10Gbps. The simulation software used is optisystem. Also, the grating length has been varied and the different performance characteristics like Q-factor, BER, and Eye diagram are analyzed and compared. It has been observed that the Gaussian-Apodized quadratic-chirped Fiber Bragg Grating at the grating length of 26.6 mm along with the 11 km long Dispersion compensation fiber makes the cheaper dispersion compensation module with the finest performance.

Keywords Optical fiber communication · Dispersion · Dispersion compensation fiber · Fiber bragg grating

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