Effect of fiber attenuation and dispersion on the transmission distance of 40-Gb/s optical fiber communication systems using high-speed lasers

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Abstract

We have modeled and simulated the effect of fiber attenuation and dispersion on the maximum fiber length of 40-Gb/s optical fiber links using directly modulated high-speed laser diodes. We present the modulation characteristics of multiple-quantum-well laser diodes with a modulation bandwidth reaching 28 GHz, including the eye diagram and frequency chirp. We compare new results obtained using return-to-zero (RZ) and non-return-to-zero (NRZ) patterns of pseudorandom modulation bits. The characteristic relations for the bit error rate and received power are simulated and the receiver sensitivity of the fiber communication system is evaluated. The eye diagrams of the received signal at the fiber attenuation and dispersion-limited transmission distances are characterized. The results show that the laser chirp operates with the fiber dispersion to limit the fiber length to 2.51 and 1.37 km under the RZ and NRZ bit patterns, respectively.

Keywords

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