MULTI SLOT AMPLITUDE CODING FOR NEXT GENERATION HIGH SPEED OPTICAL COMMUNICATION SYSTEM

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Abstract

In optical communication systems, due to cost restriction and setup complexity issues, intensity modulation and direct detection (IM/DD) are the best options to be implemented compared to coherent system. In IM/DD technique, a modulator at the transmitter and a photo detector at the receiver are required, where the implementation of this technique, typically, employed line codes such as non return-to-zero (NRZ) or return-to-zero (RZ). This technique has been standardized in Optical Transport Network (OTN), Synchronous Digital Hierarchy (SDH) standard, and Ethernet. However, using the existing technique, the chromatic dispersion (CD) tolerance was reduces significantly as bit rate increasing. This issue will be more serious for RZ compared to NRZ even though RZ has high clock information. Therefore, a new multi-slot and multi-level coding technique, which is a combination of multiplexing and coding technique, known as Multi Slot Amplitude Coding (MSAC) is proposed. This research work is divided into two phases. The first phase, is proposing and formulation a new concept of MSAC which includes MSAC line code properties; mathematical formula of MSAC system and theoretical comparison analysis with DCDM, TDM and M-ary; and estimation of the probability of error for MSAC symbol/bit. The second phase of this research, MSAC technique has been simulated in an optical fiber communication system using commercial software: OptiSystem and Matlab. The performance of the system such as bit error rate, optical spectral width, CD and nonlinear tolerance was analyzed and compared with other technique in various impairments condition including attenuation, dispersion.