

Power-Limited Spectral Amplitude Coding OCDMA System Using Random Diagonal Code With And Without Optical Amplifiers

Abstract

A new code structure for spectral amplitude coding in optical code division multiple access (OCDMA) systems called Random Diagonal (RD) code is proposed. RD code is constructed using code level and data level. One of the important properties of this code is that the cross correlation at data segment is always zero, which means that Phase Intensity Induced Noise (PIIN) is reduced. It has been observed through theoretical analysis and experimental simulation that RD code performs significantly better performance than Hadamard and modified frequency-hopping (MFH) codes. In this study, point-to-point power limited transmission (laser source with maximum input power=0 dBm) with three RD-encoded channels are tested at the bit rate of 10 Gbit/s per channel. Results show that the uses of optical amplifiers are necessary to improve system performance by increasing transmitted power. To achieve practically desirable (high) spectral efficiencies, Erbium-doped fibre amplifier (EDFA) is used for simulating system performance. It has been shown that by using this type of amplifier, the transmission distance is greatly improved. Transmission of 10 Gb/s with a power limit of 0 dBm laser source is made feasible over a total reach of 30 km for 3 channels by the use of pumped EDFA.