DW-ZCC code based on SAC-OCDMA deploying multi-wavelength laser source for wireless optical networks

ABSTRACT

In this paper, double weight zero cross correlation (DW-ZCC) code is proposed for spectral amplitude coding optical code division multiple access (SAC–OCDMA) system. DW-ZCC takes the advantages of two previously proposed SAC-codes namely modified double weight (MDW) and zero-cross correlation (ZCC) codes, while providing optimized code length and maximum cross-correlation of zero. Although the proposed code can be utilized in SAC–OCDMA system with any optical medium, this research work focuses on outdoor wireless optical networks (WON) deploying multi-wavelength laser source, where optical bandwidth is much limited. The mathematical and simulation analysis of proposed system employing direct decoding (DD) is developed, considering the influences of turbulence and system noises including relative intensity noise, optical beat interference (OBI) and receiver noises. It is shown that employing DD detection; it is possible to completely avoid OBI which enhances system capability. The results show that SAC–OCDMA–WON system is noticeably improved using DW-ZCC in term of transmission distance by at least 200 m in comparison with MDW and conventional ZCC codes.

Keyword: Spectral amplitude coding; Wireless optical networks; Free space optics (FSO); Multi-wavelength laser; Optical code division multiple access (OCDMA)