Performance Comparison of Different OCDMA Encoding and Decoding Techniques

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Abstract

Optical code-division multiple access (OCDMA) is a promising network access technique that can accommodate ultra high transmission capacity and all optical processing to avoid the speed bottleneck of electronics. As one of the most important core technologies in the development of OCDMA local area networks is the optical encoder-decoder technology, different schemes using time domain or frequency domain encoding approaches have been proposed. This paper compares the performance of different encodingdecoding techniques used in OCDMA systems. Three basic implementations of the encoding scheme of an OCDMA local area network are investigated and their bit-error-rate (BER) performance calculated using a photoncounting statistical model: time domain encoding using optical delay lines, spectral intensity encoding, and optical fast frequency hopping (FFHCDMA). A comparison of these three techniques is carried out based on their performance in OCDMA networks of the same bit rate and number of active users. It is found that the spectral intensity encodingdecoding technique has a better BER performance than the time domain and FFH-CDMA techniques. This is because the multiple access interference (MAI) in this technique is very low compared to the other considered techniques.