

Design and Performance Analysis of a newly designed 32-User Spectral Phase Encoding system operating at 2.5Gb/s for Fiber-Optic CDMA Networks

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Abstract— Multiple access techniques are required to meet the demand for high-speed and large-capacity communications in optical networks, which allow multiple users to share the fiber bandwidth. Optical code-division multiple-access (O-CDMA) is receiving increased attention due to its potential applications for broadband access networks. We analyze a new technique for encoding and decoding of coherent ultra short light pulses. In particular, we discuss the temporal pseudo noise bursts generated by spectral phase coding of ultra short optical pulses. This paper describes a performance analysis of Spectral Phase Encoding optical code-division multiple-access scheme based on wavelength/time (W/T) codes and random phase codes. We have studied the optical simulator Encoding/Decoding at different fiber lengths & gain in terms of Quality factor (Q) and Bit Error Rate (BER) performance. We derive the bit error rate (BER) and QoS as a function of data rate, number of users, receiver threshold. We find that performance improves dramatically with optical power normalizer. Ultrashort light pulse CDMA could provide tens to hundreds of users with asynchronously multiplexed, random access to a common optical channel. The system supports 32 users while maintaining bit-error rate (BER) $< 10^{-9}$ and required QoS for the correctly decoded signal at 2.5 Gbits/s bit rate.

Keyword— BER, ISD, MAI, NRZ, OCDMA, OOC, PSO, QoS, RZ



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