

Title: Analysis of bit error rate and receiver sensitivity of a DC biased optical OFDM transmission link using single mode fiber with distributed Raman amplifier

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Abstract: In this paper, an analytical method is presented to assess the performance of bit error rate (BER) of a DC biased optical orthogonal frequency division multiplexing (DCO-OFDM) SMF transmission with distributed Raman amplifier (DRA). Formulas are developed to determine the signal-to-noise ratio (SNR) at the output of a DCO-OFDM receiver and the bit error rate (BER) for an OFDM demodulator's output. By considering the Gaussian probability density function (pdf) for the OFDM demodulator output, the average BER is calculated numerically. The results are presented based on receiver sensitivity, bit error rate and optical SNR at a given BER of 10^{-9} , with variations in system parameters such as input signal power, data rate, fiber distance, modulation index and OFDM sub-channel number. A comparison of BER performance indicates that DC biased optical OFDM with intensity modulation direct detection (DCO-DD-OFDM) offers better receiver sensitivity compared to optical OFDM without DC bias at a BER of 10^{-9} . Our analytical results align with the published findings on optical OFDM.

Keywords: direct detection; bit error rate; intensity modulation; optical SNR; output SNR; DC biased optical orthogonal frequency division multiplexing

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