

Performance of optical OFDM systems using new PAPR reduction approach

Abstract

The major drawback of optical orthogonal frequency division multiple access (OFDM) system is their inherent intensity noise and peak average power ratio (PAPR). We introduce a new direct detection receiver based on PAPR reduction for optical OFDMA systems that maintains greater noise mitigating and leaves spectral efficiency unchanged. Unlike standard receivers, our scheme does not filter the desired signal. In this paper, we first demonstrate that the newly proposed receiver is equivalent to standard OFDMA receivers when no optical noise is present at the transmitter. Although a 2.9 dB power penalty is incurred, network capacity is unchanged, i.e., bit error rate (BER) floors due to intensity noise are the same. When a PAPR reduction scheme is employed to mitigate severe PAPR, we show that our receiver outperforms the wide filtering strategy by two orders of magnitude. Optical OFDM capacity is demonstrated up to 10 Gb/s using a thermal source, a single mode fiber (SMF), and the direct detection scheme. A BER of 1×10^{-9} is achieved at 10 Gb/s; further improvement is possible using a better OFDM design parameters. This demonstrates the ability of optical OFDM passive optical networks (PONs) to operate at 10 Gb/s at 60 km achieving less system complexity (via, direct detection) and reliable transmission.