

A novel economical duty cycle division multiplexing with electrical multiplexer and demultiplexer for optical communication systems

ABSTRACT

A duty cycle division multiplexing (DCDM) is proposed as an alternative multiplexing technique. It can be applied in either wired or wireless communication systems, although the focus in this paper is in optical fiber communications. The channel multiplexing and demultiplexing is performed electrically at single user bit rate which is very economic. In this paper, we examine 3 channels each operating at 10 Gb/s over a single optical carrier. The performance comparison is made against return-to-zero (RZ) transmitted pulses. Back-to-back receiver sensitivity and required optical signal-to-noise ratio (OSNR) of this system are examined and compared with 10 Gb/s RZ pulses. Effect of the chromatic dispersion is tested for DCDM channels and compared with 30 Gb/s RZ coding at the same transmission power. Also, the launched power of these two techniques is measured against system dispersion at BER of 10^{-9} . The results show that, DCDM can support higher amount of chromatic dispersion than that RZ technique. In the end, receiver sensitivity and OSNR of 3-channel DCDM is tested at different bit rate of 2.5, 10, 25 and 40 Gb/s. A receiver sensitivity and OSNR of -16.8 dBm and 34.6 dB is required for the worst DCDM user when the system running at 3 times 40 Gb/s respectively.