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# Performance enhancement of PCTWs technique by employing RZ-coding in phase-modulated optical communication systems

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## Abstract

Phase-modulated optical communication systems that employ phase-conjugated twin waves (PCTWs) technique are becoming attractive since they transfer a high information rate for longer transmission distance. However, noise of optical amplifiers and its interaction with fiber nonlinearity lowered efficiency of PCTWs technique. In this paper, we proposed a new method to enhance the efficiency of PCTWs technique by using return-to-zero (RZ) coding. In proposed method, twin waves are firstly modulated with m-array quadrature amplitude modulation (mQAM) format and then their envelopes are shaped by RZ-coding. Consequentially, RZ-mQAM twin signals are multiplexed and launched into optical link. The received signals are synchronously combined to eliminate nonlinear distortions. To show influence of proposed method, system performance is mathematically modelled and numerically studied. The results reveal that transmission operation is noticeably enhanced. Transmission distances of the 4QAM and RZ-4QAM systems with PCTWs technique are elongated by 44.4% and 73.3%, respectively, in comparison to that of 4QAM transmission.