Fiber nonlinearity mitigation of WDM-PDM QPSK/16-QAM signals using fiber-optic parametric amplifiers based multiple optical phase conjugations

We demonstrate fiber nonlinearity mitigation by using multiple optical phase conjugations (OPCs) in the WDM transmission systems of both 8 x 32-Gbaud PDM QPSK channels and 8 x 32-Gbaud PDM 16-QAM channels, showing improved performance over a single mid-span OPC and no OPC in terms of nonlinear threshold and a best achievable Q(2) factor after transmission. In addition, after an even number of OPCs, the signal wavelength can be preserved after transmission. The performance of multiple OPCs for fiber nonlinearity mitigation was evaluated independently for WDM PDM QPSK signals and WDM PDM 16QAM signals. The technique of multiple OPCs is proved to be transparent to modulation formats and effective for different transmission links. In the WDM PDM QPSK transmission system over 3600 km, by using multiple OPCs the nonlinear threshold (i.e. optimal signal launched power) was increased by similar to 5 dB compared to the case of no OPC and increased by similar to 2 dB compared to the case of mid-span OPC. In the WDM PDM 16-QAM transmission system over 912 km, by using the multiple OPCs the nonlinear threshold was increased by similar to 7 dB compared to the case of no OPC and increased by similar to 1 dB compared to the case of mid-span OPC. The improvements in the best achievable Q(2) factors were more modest, ranging from 0.2 dB to 1.1 dB for the results presented. (C) 2017 Optical Society of America