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Optical Signal-To-Noise Ratio Monitoring Based on Delay Tap Sampling Using Artificial Neural Network

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Abstract : With the development of optical communication, optical performance monitoring (OPM) has received more and more attentions. Since optical signal-to-noise ratio (OSNR) is directly related to bit error rate (BER), it is one of the important parameters in optical networks. Recently, artificial neural network (ANN) has been greatly developed. ANN has strong learning and generalization ability. In this paper, a method of OSNR monitoring based on delay-tap sampling (DTS) and ANN has been proposed. DTS technique is used to extract the eigenvalues of the signal. Then, the eigenvalues are input into the ANN to realize the OSNR monitoring. The experiments of 10 Gb/s non-return-to-zero (NRZ) on–off keying (OOK), 20 Gb/s pulse amplitude modulation (PAM4) and 20 Gb/s return-to-zero (RZ) differential phase-shift keying (DPSK) systems are demonstrated for the OSNR monitoring based on the proposed method. The experimental results show that the range of OSNR monitoring is from 15 to 30 dB and the root-mean-square errors (RMSEs) for 10 Gb/s NRZ-OOK, 20 Gb/s PAM4 and 20 Gb/s RZ-DPSK systems are 0.36 dB, 0.45 dB and 0.48 dB respectively. The impact of chromatic dispersion (CD) on the accuracy of OSNR monitoring is also investigated in the three experimental systems mentioned above.

Keywords : artificial neural network (ANN), chromatic dispersion (CD), delay-tap sampling (DTS), optical signal-to-noise ratio (OSNR)
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