Low-complexity Coherent Transceivers for Intra-Datacenter Optical Interconnects

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Abstract

We propose a self-homodyne coherent detection (SHCD) system using 25 GHz modulator and 30 GHz photodiode. 480Gb/s PDM-16QAM transmission is realized in 10 km and 2 km with simplified digital signal processing.

Setup

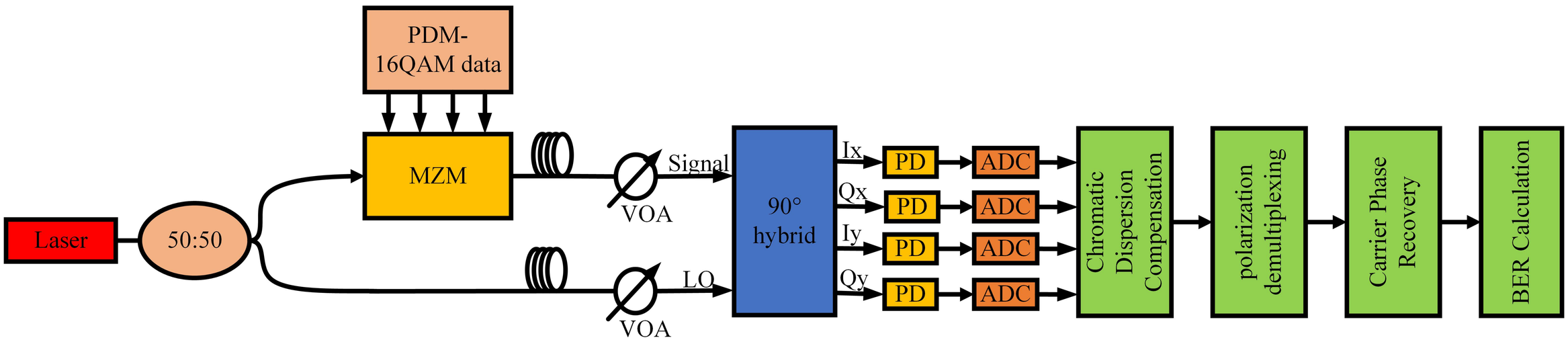

Figure 1. Simulation setup for PDM-16QAM self-homodyne coherent detection system; MZM: Mach–Zehnder modulator; VOA: variable optical attenuator; LO: local oscillator; PD: photodiode; ADC: analog-to-digital converters.

Results

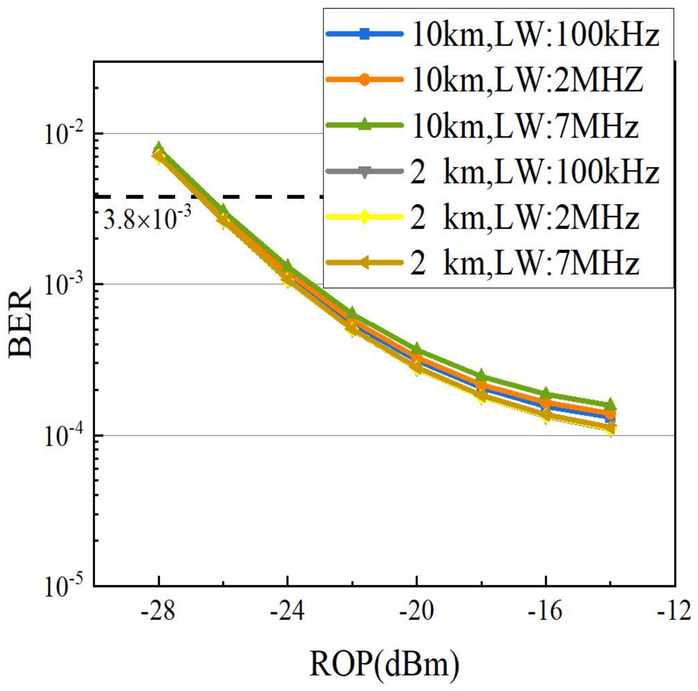

Figure 2. BERs as functions of ROP with different linewidth lasers in the link length of 2km and 10km for 400Gb/s PDM-16QAM. ROP: received optical power. LW:linewidth.

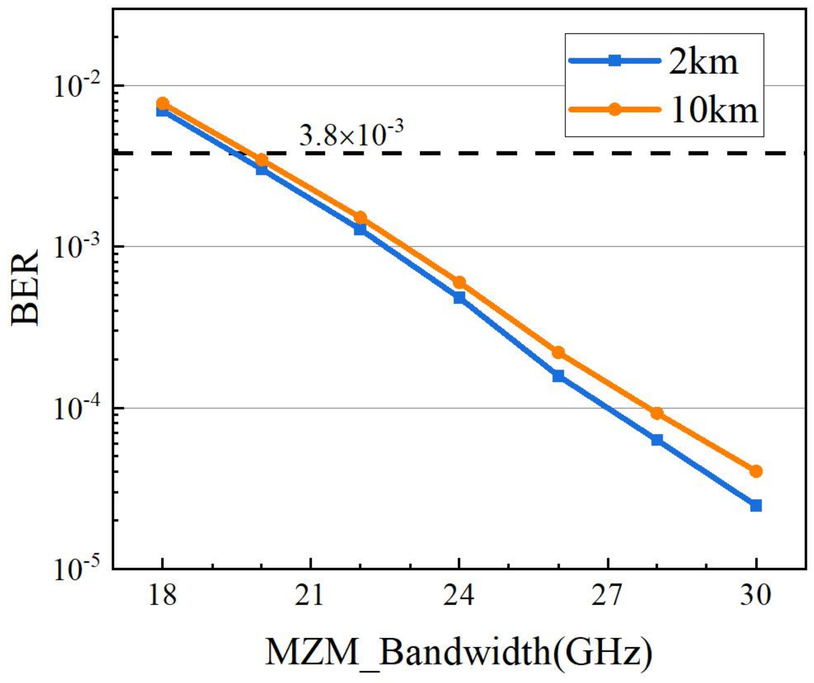

Figure 3. BER curves versus the bandwidth of MZM; MZM: Mach–Zehnder modulator.

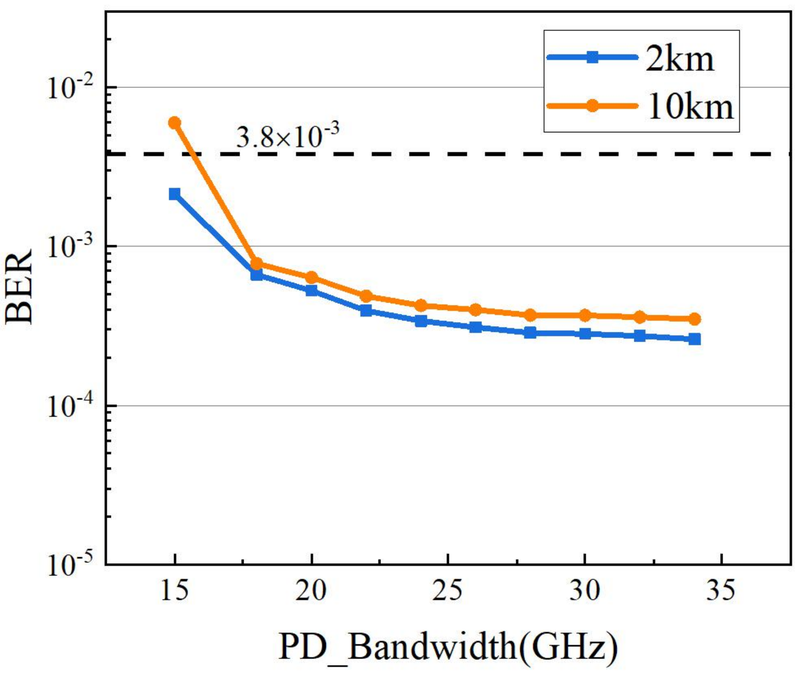

Figure 4. BER curves versus the bandwidth of PD; PD: photodiode.

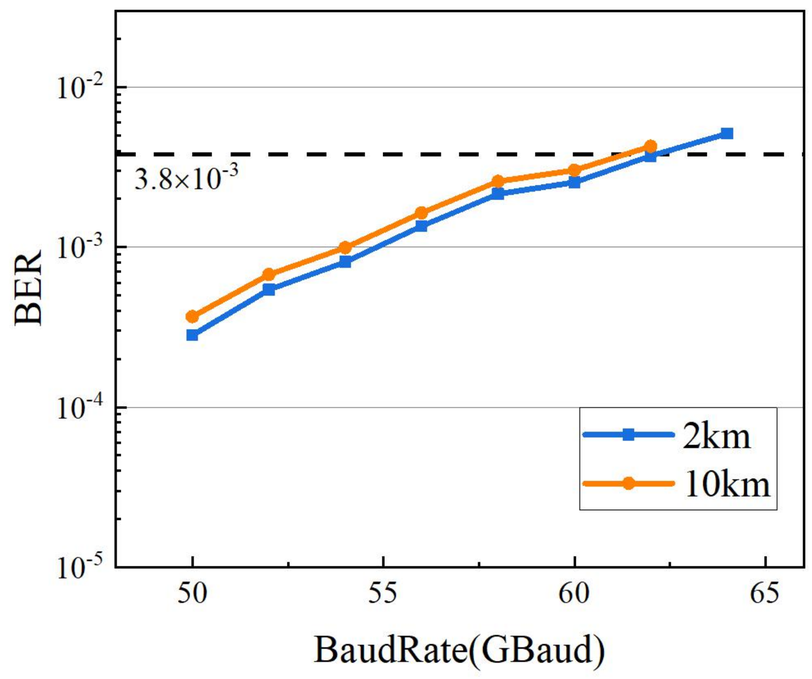

Figure 5. (a) BER curves versus baud rate for PDM-16QAM in 10km and 2km.

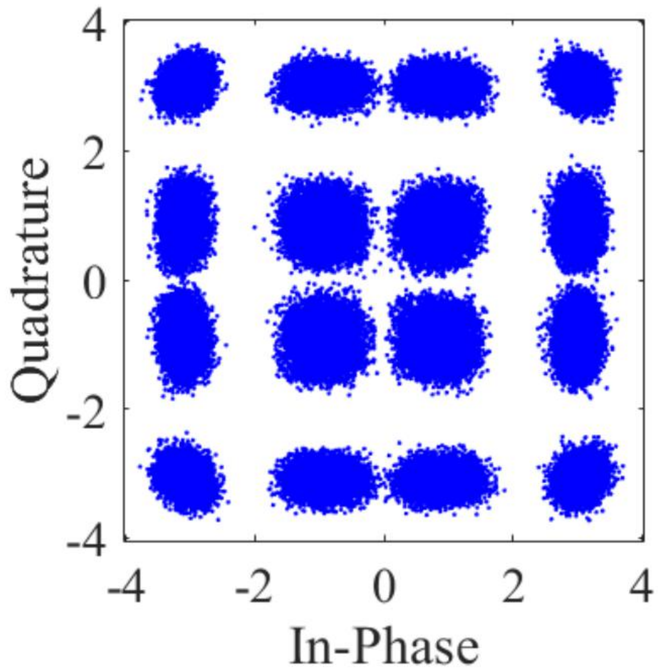

Figure 5. (b) Constellation diagram for 50 GBaud PDM-16QAM

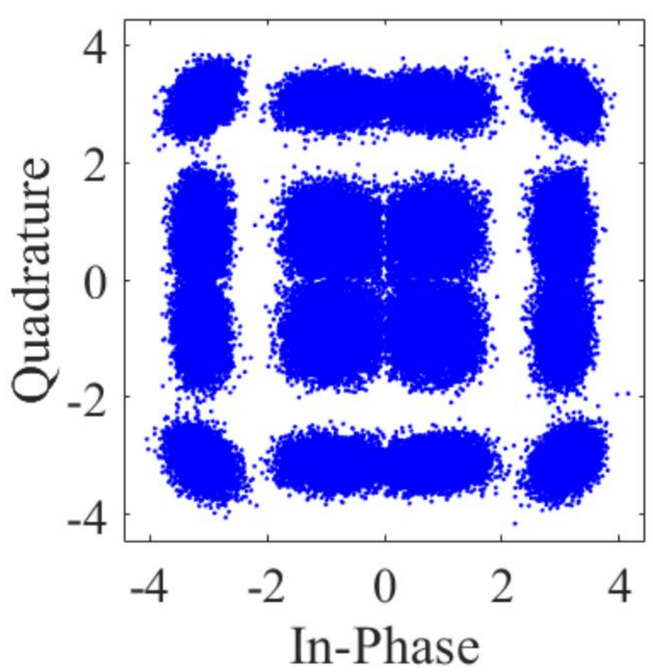

Figure 5. (c) Constellation diagram for 60 GBaud PDM-16QAM.

Conclusion

We demonstrate the realization of a SHCD system transmission over a link length of 10 km with simpler DSP functions and lower cost. With the laser linewidth of 7 MHz and MZM and PD bandwidths of are 25 GHz and 30 GHz, respectively, 480Gb/s transmission is achieved by using the PDM-16QAM modulation format. Those results indicate the potentials and feasibilities of coherent technique for future high-speed IDC optical interconnects with high power and cost sensitivity.