way, the filtering effect imposed by the ring add/drop filter is removed. The OSNR vs. BER curve and eye-diagrams for forward and reverse light propagation are shown in Fig. 6. Comparing with the reverse direction, the forward direction exhibits about 0.1-dB OSNR penalty on the BER curve, which is within measurement error. From the eye diagrams, no noticeable degradation on the signal quality can be observed. Therefore, the penalty from the add/drop filter is proven to be minimal.

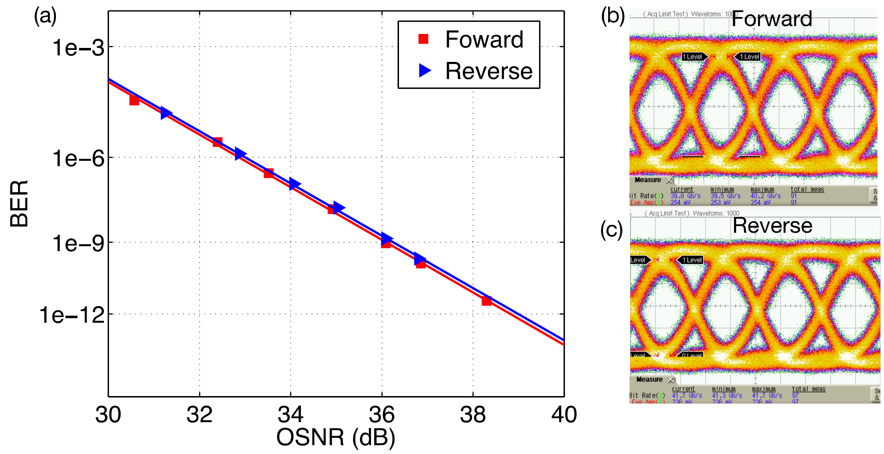

Fig. 6. (a) BER performance of Mod-MUX-Ring transmitter in forward and reverse light propagation at 40 Gb/s. (b) Eye diagram for forward propagation. (c). Eye diagram for reverse propagation.

4. Conclusion

In conclusion, we propose and demonstrate a Mod-MUX-Ring transmitter with 4 WDM channels and 40 Gb/s data rate on each channel. Both 3 dB extinction ratio and 7 dB bias loss are achieved with 2.7V-V_{pp} driving voltage at 40-Gb/s/channel data rate. Under this condition, error-free operation is achieved on all four channels. The high-speed modulation performance of the Mod-MUX-Ring transmitter is characterized and analyzed. Compared to a reference $LiNbO_3$ modulator, the Mod-MUX-Ring transmitter exhibits 5.7 dB OSNR penalty, mainly due to the limited extinction ratio and bandwidth on the ring modulator. The modulation-multiplexing architecture imposed minimal penalty on the signal integrity. The proposed Mod-MUX-Ring architecture can be readily scaled to higher channel counts and integrate with on chip single wavelength laser source, making it a promising candidate for future WDM transmitters.

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