Polarization diversity DPSK demodulator on the silicon-on-insulator platform with simple fabrication

We demonstrate a novel polarization diversity differential phase-shift keying (DPSK) demodulator on the SOI platform, which is fabricated in a single lithography and etching step. The polarization diversity DPSK demodulator is based on a novel polarization splitter and rotator, which consists of a tapered waveguide followed by a 2 × 2 multimode interferometer. A lowest insertion loss of 0.5 dB with low polarization dependent loss of 1.6 dB and low polarization dependent extinction ratio smaller than 3 dB are measured for the polarization diversity circuit. Clear eye-diagrams and a finite power penalty of only 3 dB when the input state of polarization is scrambled are obtained for 40 Gbit/s non return-to-zero DPSK (NRZ-DPSK) demodulation.