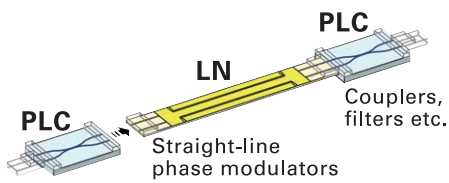


PLC-LN hybrid modulators for 100-Gb/s advanced modulation schemes

NTT Photonics Laboratories and NTT Network Innovation Laboratories have developed high-performance integrated optical modulators with a hybrid configuration of silica-based planar lightwave circuits (PLCs) and an array of LiNbO₃ (LN) phase modulators for advanced multilevel and multiplexed modulation schemes with line rates of 100 Gb/s.

PLC-LN hybrid configuration

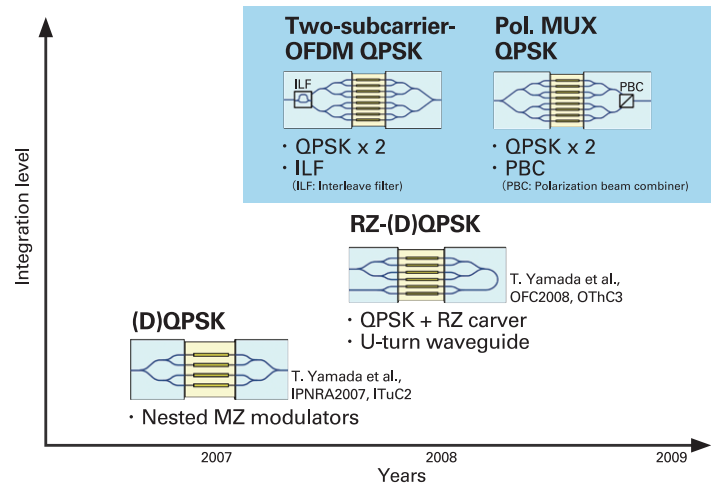


Features

- Flexible circuit design
- Low loss
- Large EO bandwidth

Integrated modulators for multilevel and multiplexed modulation schemes

Evolution of PLC-LN hybrid modulators



Two-subcarrier-OFDM QPSK modulator

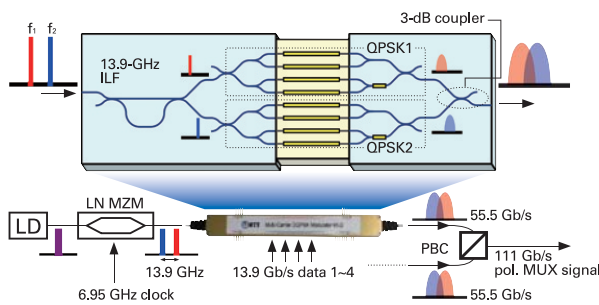


Fig. 1 Module configuration

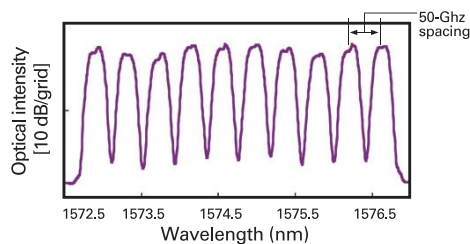


Fig. 2 Signal spectrum (10-Ch DWDM, after 2100-km transmission)

- ✓ Insertion loss: 6.5 dB (incl. 3-dB coupling loss)
- ✓ f_1/f_2 crosstalk: < -25 dB
- ✓ 111 Gb/s (13.9 Gbaud) transmission

A. Sano et al., ECOC2007 PD1.7 / E. Yamada et al., OFC2008 PD8 / E. Yamada et al., OECC2008 PDP-6

Pol. MUX QPSK modulator

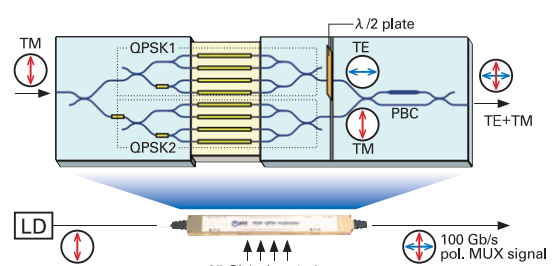


Fig. 1 Module configuration

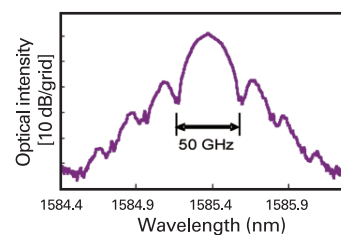


Fig. 2 Signal spectrum (single wavelength channel)

- ✓ Insertion loss: 4.8 dB
- ✓ TE/TM crosstalk: ~ -25 dB
- ✓ 100 Gb/s (25 Gbaud) operation

H. Yamazaki et al., ECOC2008 Mo.3.C.1