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Photonic Hybrid Integration Devices based on Silica Planar Lightwave Circuits

NTT

Motivation

A silica-based planar lightwave circuit (PLC) is an excellent platform for various optical circuit elements, such as couplers and filters. By combining it with optical components that employ other material platforms, such as dielectrics, semiconductors or liquid crystals, we can develop a variety of novel optical devices.

Originality

Recently, we demonstrated the first optical 64QAM modulator and the first TODC for independent multichannel operation. Both were implemented with PLC-based hybrid configurations, and appear to be difficult to achieve with monolithic approaches.

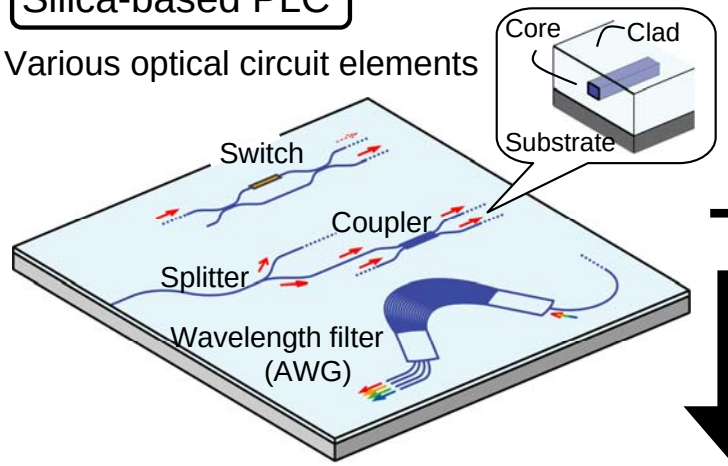
64QAM: 64-level quadrature amplitude modulation
TODC: tunable optical dispersion compensator

Impact

Hybrid integration based on PLCs is a key technology for achieving future 100-Gb/s-class ultrahigh-speed transmission, and will open up a new world of optical devices.

Silica-based PLC — PLC: planar lightwave circuit

Various optical circuit elements



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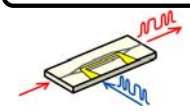
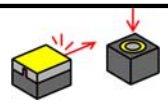
Dielectrics ($LiNbO_3$ etc.)



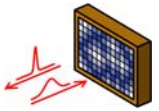
High-speed modulation
Wavelength conversion

Semiconductors



Emitting/receiving
Amplification

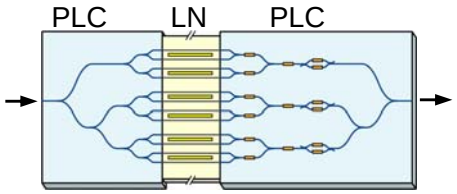
Liquid-crystals

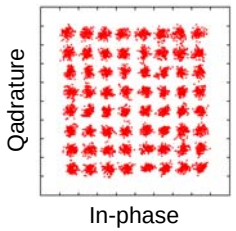


Spatial light modulation

Novel hybrid-integrated optical devices

PLC-LN 64QAM modulator('09)



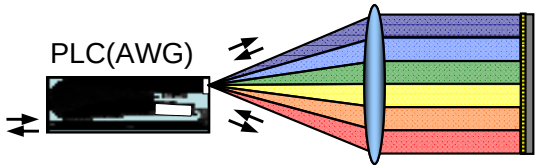


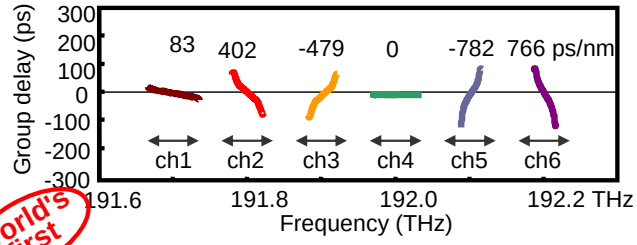
World's first

60-Gb/s 64QAM operation

PLC-LCOS multichannel TODC ('08)

LCOS: liquid crystal on silicon





World's first

8-channel independent compensation

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