

Title and Research Team

Compact Robust Integrated PPM Laser Transceiver Chip Set with High Sensitivity, Efficiency, and Re-Configurability

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Approach

Use monolithic photonic integration on silicon platform, with integrated lasers, amplifiers, and photodetectors.

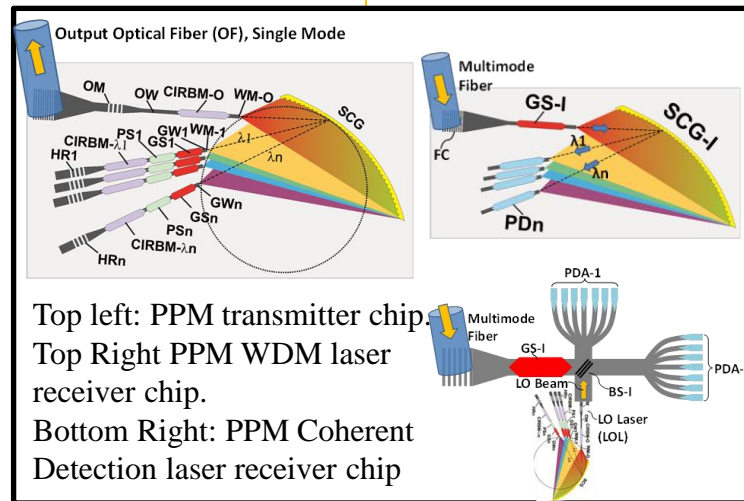
Wavelength division multiplexing (WDM) capability is achieved with an integrated diffraction grating Technology.

The receiver has capability to couple to multimode fiber. On-chip gain and spectral filter enable Avalanche Photodiode (APD) like high photodetection sensitivity. Capable of individually detecting 10 or more wavelength channels at 0.1nsec speed. Alternative coherent-detection chip will have array detector capability, enabling high sensitive detection that reduces the effect of air turbulences.

Research Objectives

Realize a pulse-position modulation (PPM) laser transmitter chip and matching receiver chips with high robustness, multi-function capabilities, re-configurability, high signal sensitivity and power efficiency. From TRL 2 to TRL 4.

Capable of 10 or more wavelength channels with 25-50mW per channel, individually modulated with 0.1nsec pulse, variable bit rate from 10Mbps to >1Gbps, with ability to emit into a single beam with 250-500mW if needed.



Top left: PPM transmitter chip.
Top Right PPM WDM laser receiver chip.
Bottom Right: PPM Coherent Detection laser receiver chip

Potential Impact

Such integrated chips will enable space optical communication transceivers to be realized with higher robustness, enhanced capabilities, multiple functionalities, and lower costs.

The technology will also benefit the photonic device and optical communication technology areas by realizing highly sophisticated integrated optical transceiver chips.