Towards Peta-bit/s Optical Links

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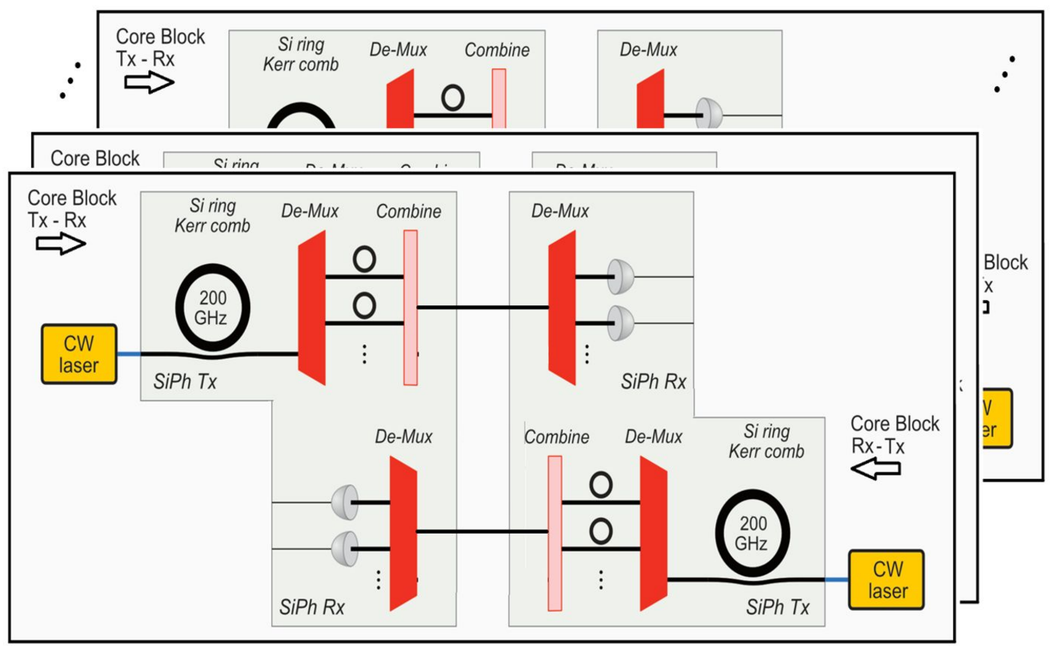
Introduction

- At high data-rates, low-power chip-to-chip and board-to-board communication using electrical interconnects is challenging.
- Innovative optical interconnects can address these challenges:
  - *Advance integrated photonic devices offer large available bandwidth, low propagation loss, Immunity to electromagnetic interference*
  - *Kerr microresonator frequency combs offer compact solution for high quality WDM light source*
  - *Inverse design can be used to significantly improve the loss, bandwidth, and chip area*

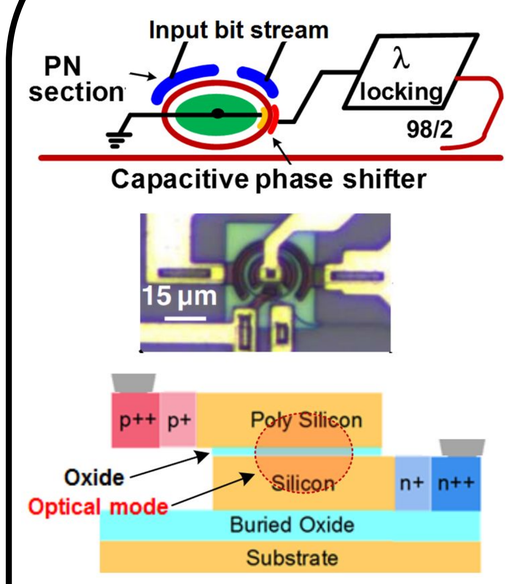
Comb-enabled monolithic electronic-photonic massive link architecture

System architecture

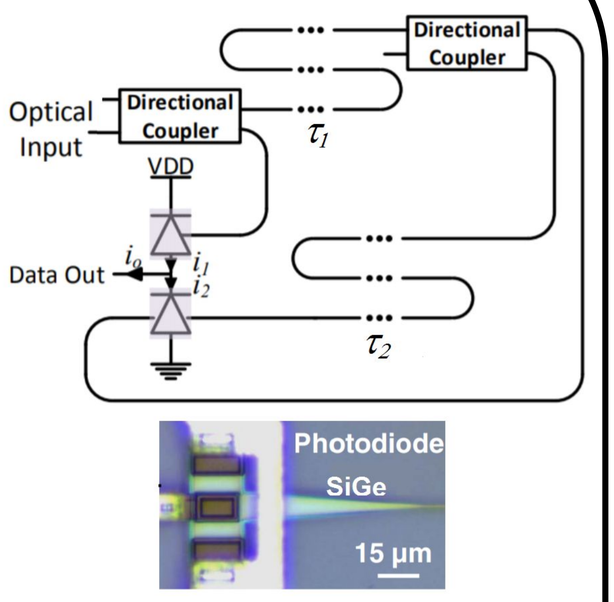


Larger than 100 Tbps: WDM of 128 PAM-4 channels at 80 Gbps/channel.

Electronic-photonic blocks

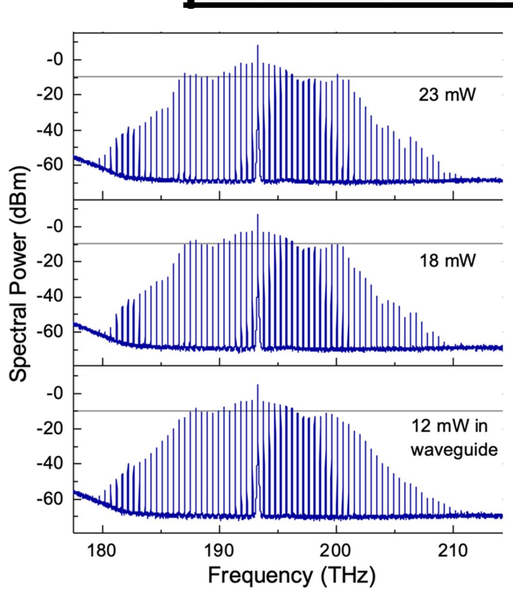


Electro-optic DAC: multi-section ring modulator with capacitive tuning.

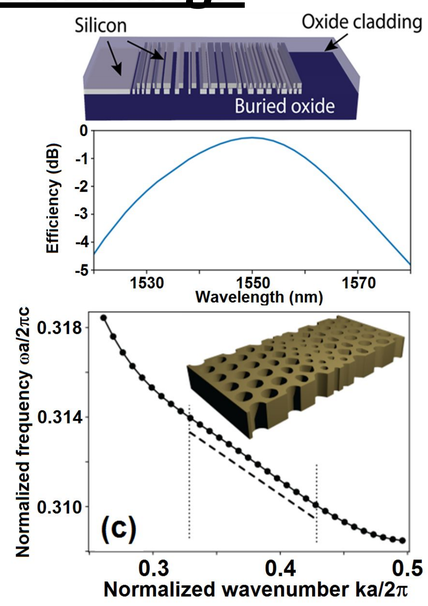


Self-equalizing PD for data detection.

Dark soliton frequency comb and photonic inverse design

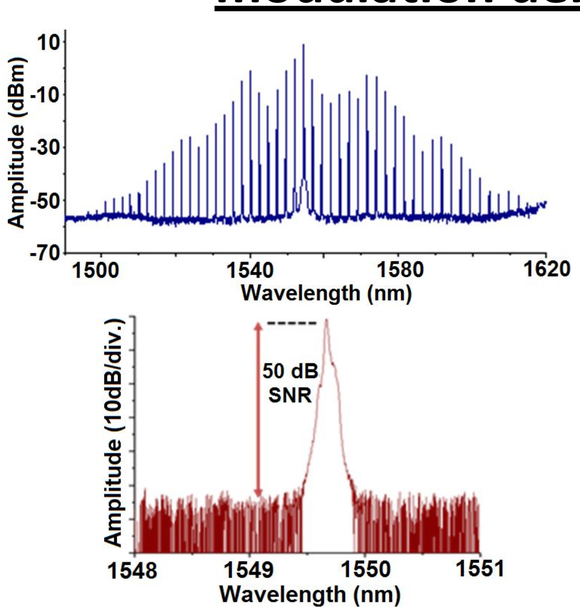


Dark soliton frequency comb as WDM light source.

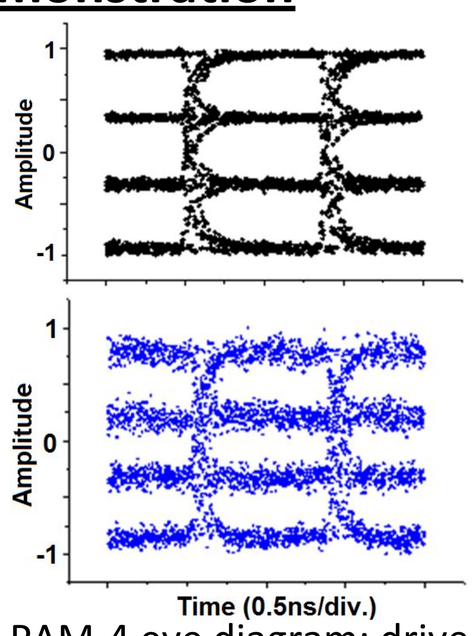


Inverse design: grating structure with 0.25dB loss. Dispersion engineering.

MRR generated comb and PAM-4 modulation demonstration



280GHz line spacing with more than 50 dB OSNR used for PAM-4 demonstration.



PAM-4 eye diagram: drive signal (top) photo-detected (bottom).