



LIGHTWAVELOGIC®

ECOC 2026

Scaling Silicon Photonics Platforms: Enabling Foundry PDKs and Ecosystems for 400G and Beyond

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September 22, 2026

Forward Looking Statements

This slide presentation contains “forward-looking statements” and “forward-looking information” within the meaning of the Private Securities Litigation Reform Act of 1995. This information and these statements, which can be identified by the fact that they do not relate strictly to historical or current facts, are made as of the date of this presentation or as of the date of the effective date of information described in this presentation, as applicable. The forward-looking statements herein relate to predictions, expectations, beliefs, plans, projections, objectives, assumptions or future events or performance (often, but not always, using words or phrases such as “expects”, “anticipates”, “plans”, “projects”, “estimates”, “envisages”, “assumes”, “intends”, “strategy”, “goals”, “objectives” or variations thereof or stating that certain actions, events or results “may”, “can”, “could”, “would”, “might” or “will” be taken, occur or be achieved, or the negative of any of these terms and similar expressions) and include, without limitation, statements with respect to projected financial targets that the company is looking to achieve.

All forward-looking statements are based on current beliefs as well as various assumptions made by, and information currently available to the company’s management team. A more detailed description of the risks presented by those assumptions and other risks are more fully described by the company under the caption “Risk Factors” included in our SEC filings and other risks to which our company is subject, and various other factors beyond the company’s control.

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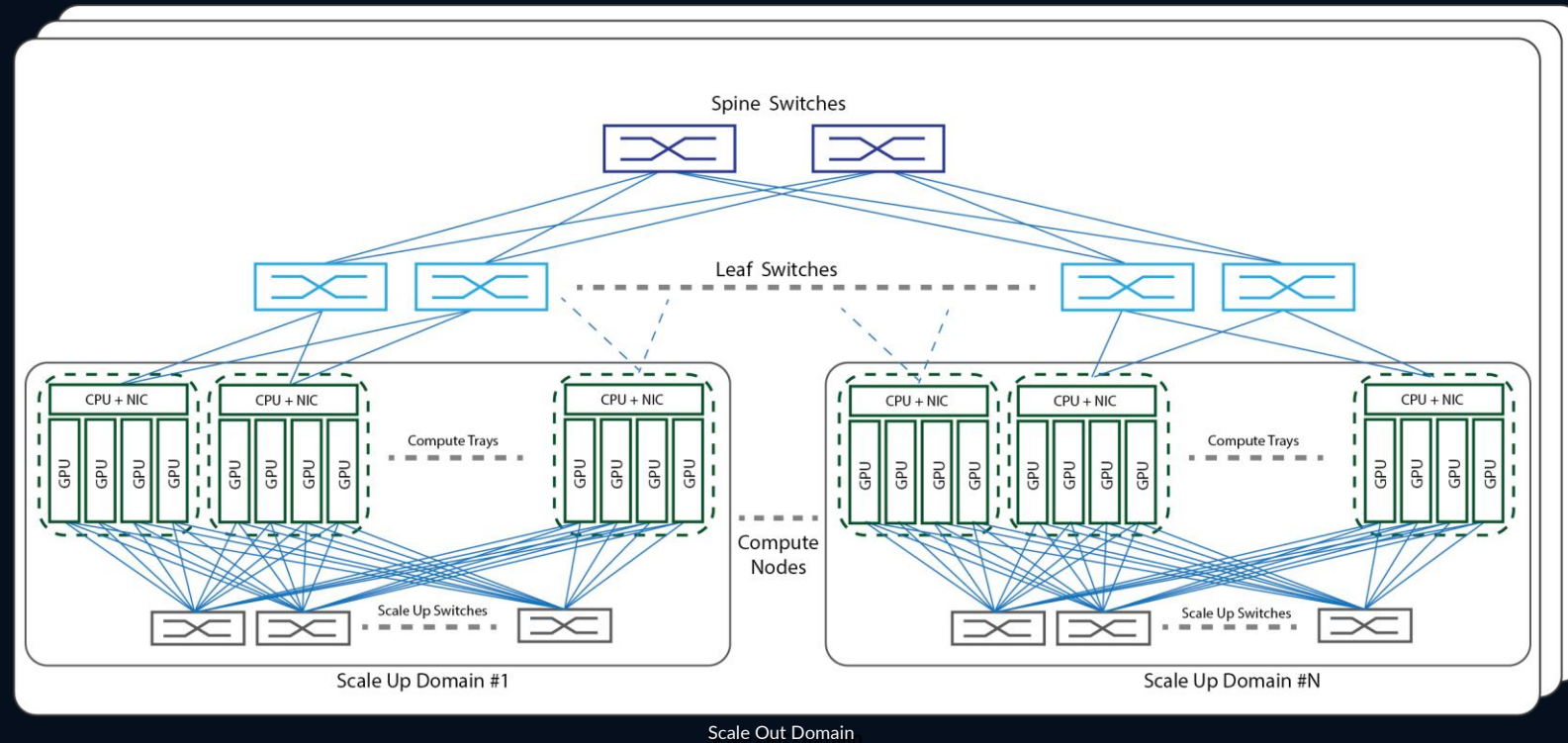
The company does not undertake to update any forward-looking statement, whether written or oral, that may be made from time to time by company or on behalf of the company except as may be required by law.

The Challenge of Powering AI: Density, Power, Reliability

Explosive growth in AI connectivity requires **advanced optical modulators**:

- Denser Integration
- Higher Bandwidth
- Reduced Driving Voltage
- Reduced Insertion Loss
- High Reliability

Possible solutions include **enhanced silicon photonics** devices:



- 1 **Inorganic EO Materials**
 - Thin-Film Lithium Niobate (TFLN), Barium Titanate (BTO), etc.
- 2 **Organic EO Materials**
 - EO Polymer SOH Modulators

Data Center Power Consumption Continues to Grow Exponentially with AI Connectivity Demands

Lightwave Logic at a Glance

Leveraging proprietary electro-optic polymers to enable high-speed optical modulators for AI scaling and data communications

Englewood, CO
Global HQ

LWLG
NASDAQ Listed

1997
Founded

~50
Employees¹

69 Granted Patents
and 99 Applications
Pending

>\$100M
R&D Investment

\$96M
Cash Balance²

Proven Technology

- >\$100M cumulative investment in technology platform since inception
- 2,000+ hours of damp heat stress testing in AI data center heat/humidity conditions show thermal stability, high performance and exceed industry standards
- Polymer, processes and designs are ready for 400Gb/s device developments

Fully Domestic Supply-Chain

- Specialty chemical precursor suppliers are all U.S.-based
- Proprietary EOP materials are synthesized and processed in Colorado
- 100% U.S.-based operations and labor
- Supply-chain is 100% free of rare Earth elements

Robust Patent Portfolio

- 69 granted patents, 99 pending across U.S. and international markets
- Issued patents cover all stages of operations from molecular structure of polymers to device designs, fabrication, and packaging (encapsulation)
- Essential IP protection to scale licensing revenue model

(1) As of August 8, 2026

(2) As of June 30, 2026, includes Marketable Securities

Unlocking the Power of Silicon Photonics with EO Polymers

Perkinamine®

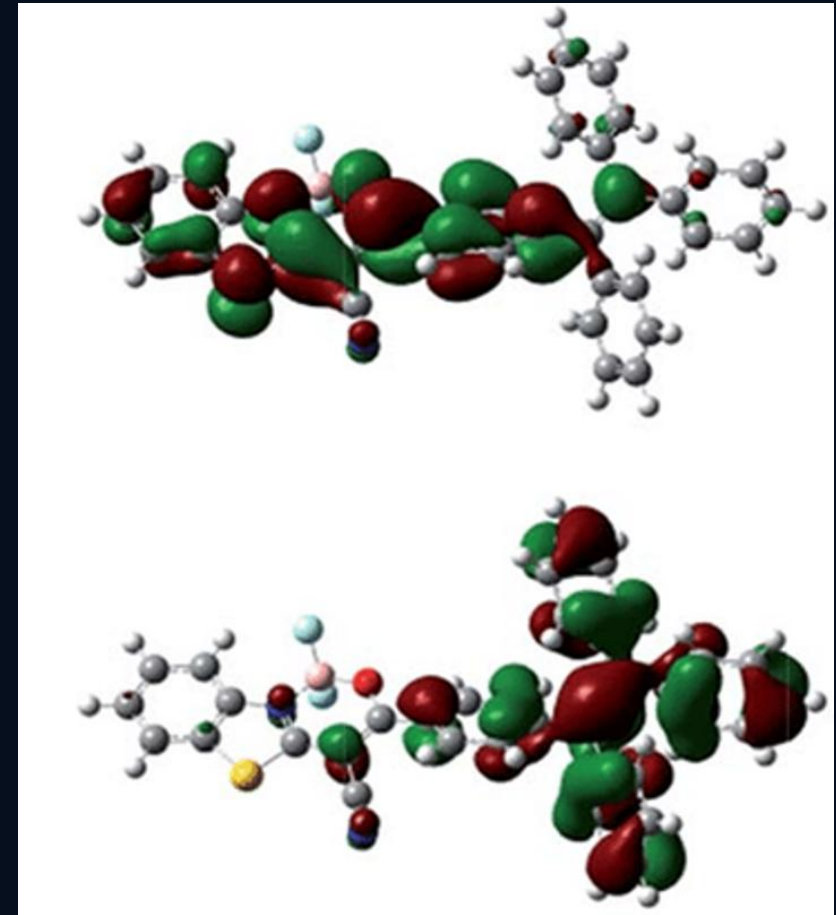
The Fastest Way to Convert Electrical Signals to Optical Signals

AI infrastructure depends on high-bandwidth optical connectivity

Silicon photonics enables optical connections at CMOS scale, but performance is limited

Lightwave Logic's Perkinamine® electro-optic polymers unlock the bandwidth, size, and power efficiency limitations of silicon photonics

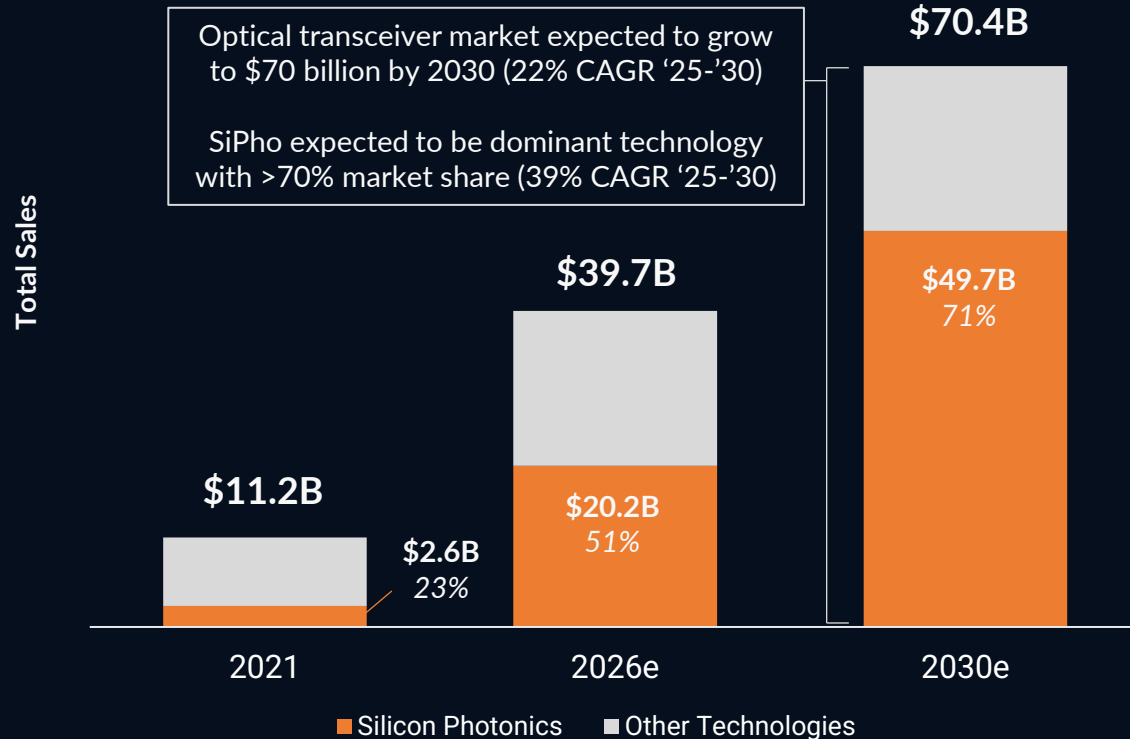
Perkinamine® enables the highest performing photonic integrated circuits for AI



Silicon Photonics is Winning

Silicon photonics is winning integration platform battle for hyperscale and AI networking

Total Optical Transceiver Market ¹ (by technology)



DCD Channels Media Intelligence Inc

Marvell acquires silicon photonics device startup Polariton Technologies to advance optical scaling

Financial terms of the deal have not been disclosed

April 23, 2026 By Charlotte Trueman Have your say

GlobalFoundries Acquires Advanced Micro Foundry, Accelerating Silicon Photonics Global Leadership and Expanding AI Infrastructure Portfolio

Samsung enters SiPh foundry market

Tuesday 31st March 2026



Reuters World Business Markets Sustainability Legal Commentary Technology Investigations

AMD buys Enosemi to boost co-packaged optics offerings

By Reuters

May 28, 2025 1:10 PM CDT - Updated May 28, 2025

Marvell to acquire Celestial AI for as much as \$5.5 billion

PUBLISHED TUE, DEC 2 2025-5:12 PM EST | UPDATED TUE, DEC 2 2025-6:40 PM EST

Kif Leswing @KIFLESWING

SHARE f x in e

Credo Agrees to Acquire DustPhotonics, Accelerating Expansion into Silicon Photonics and Next Generation Optical Connectivity

April 13, 2026

(1) Lightcounting: Total Optical Transceiver Market by Technology; April 2026
News sources: CNBC, Data Center Dynamics, Credo, GlobalFoundries, PIC Magazine, Reuters

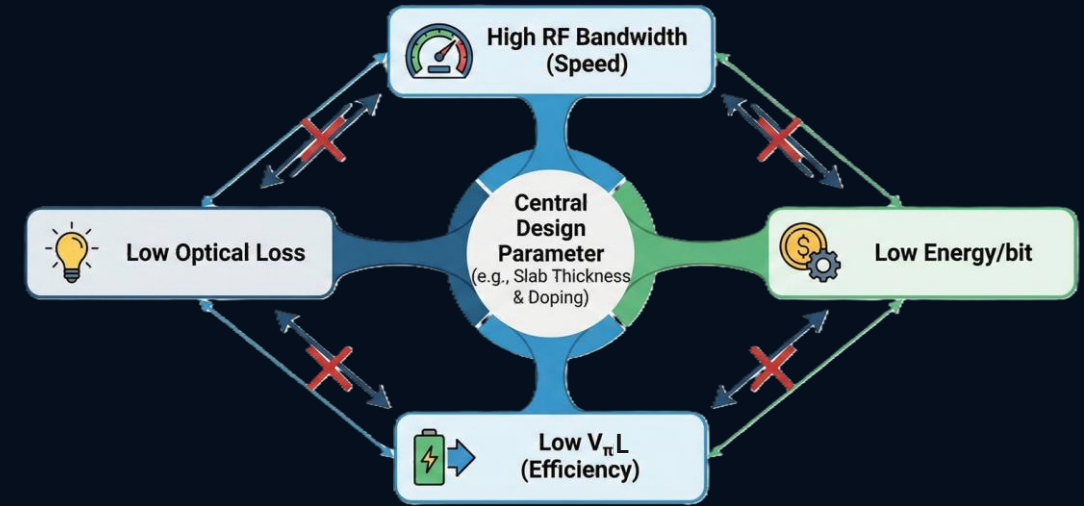
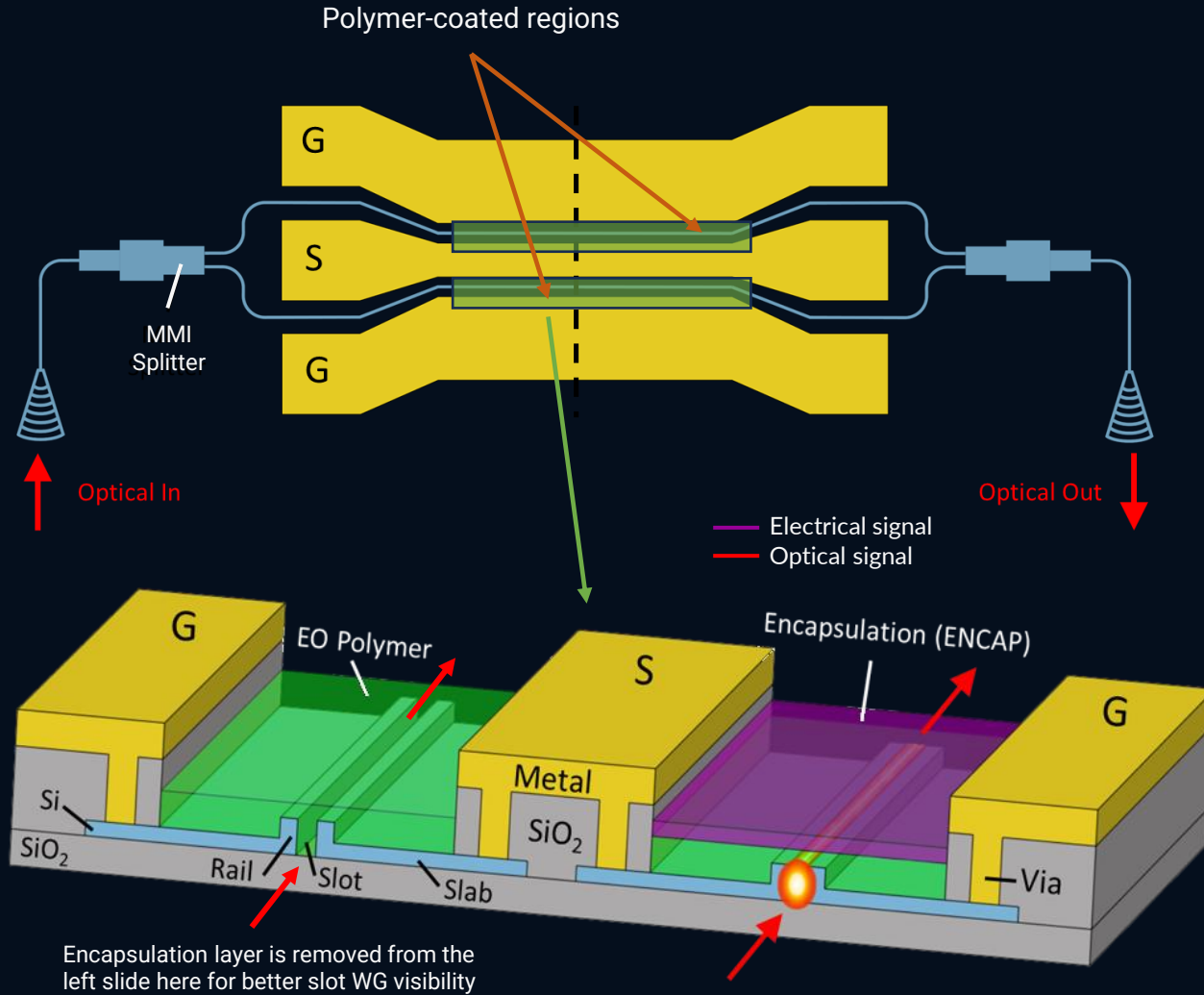
Competitively Advantaged Material

LWLG EO polymers have inherently high performance and are fully Si-foundry compatible



	Silicon Photonics (SiPh)		Thin Film Lithium Niobate (TFLN)	Silicon Organic Hybrids (SiPh + EOP)
Modulator Type	Ring	Mach-Zehnder (MZ)	MZ	MZ or Ring
Speed	●	●	●	●
Power Consumption	●	●	●	●
Size	●	●	●	●
Cost	●	●	●	●
Novel material	●	●	●	●
Integration (Si & CMOS Compatible)	●	●	●	●

EO Polymer SOH MZI Slot Modulator Structure

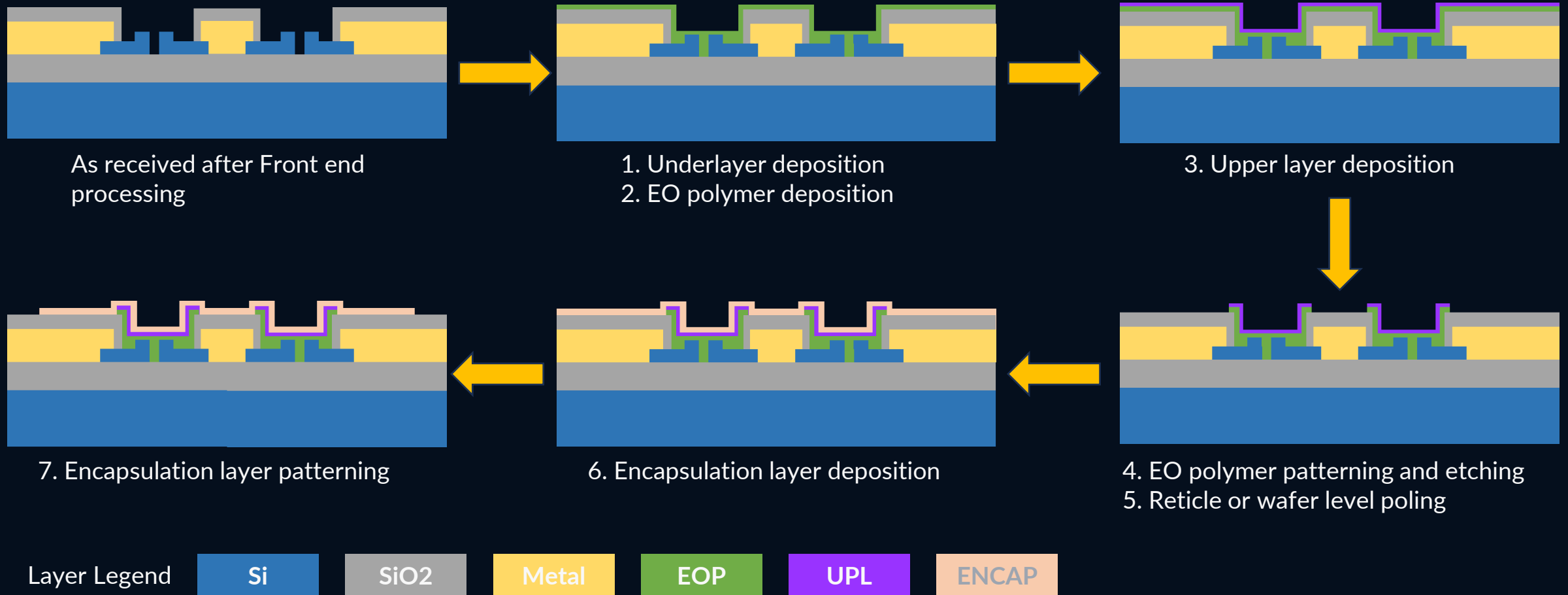


The SOH (Silicon-Organic Hybrid) Advantage:

- Combines the maturity of Silicon Photonics with the strong EO response of polymers
- Offers significant promise for scalable deployment in the datacom and telecom spectrum (O- and C-bands)
- Core technology is CMOS compatible and mass-scalable

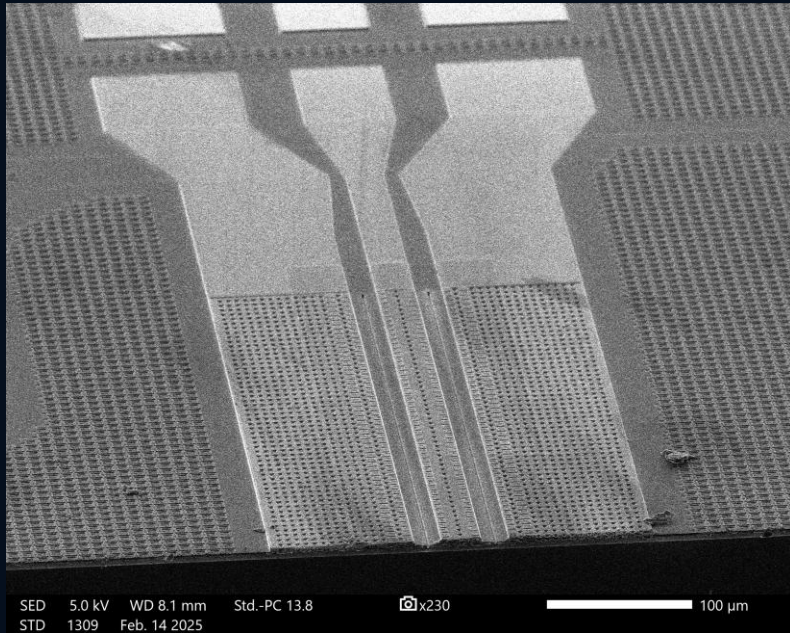
Source: J.A. Drisko et.al. Frontiers in Optics, pp. FM1C-1. Optica Publishing Group (2024)

Simplified BEOL Process Flow

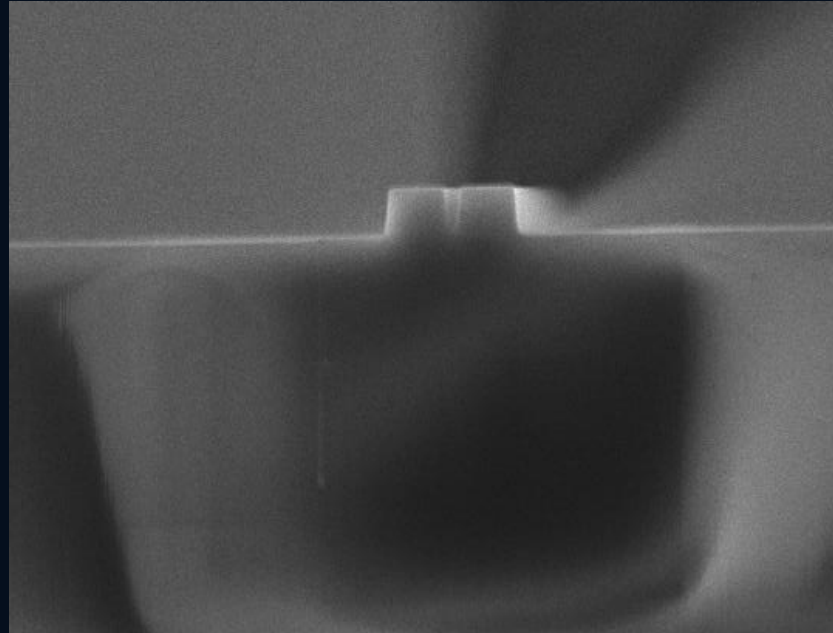


Silicon Slot Waveguide Cross Sections

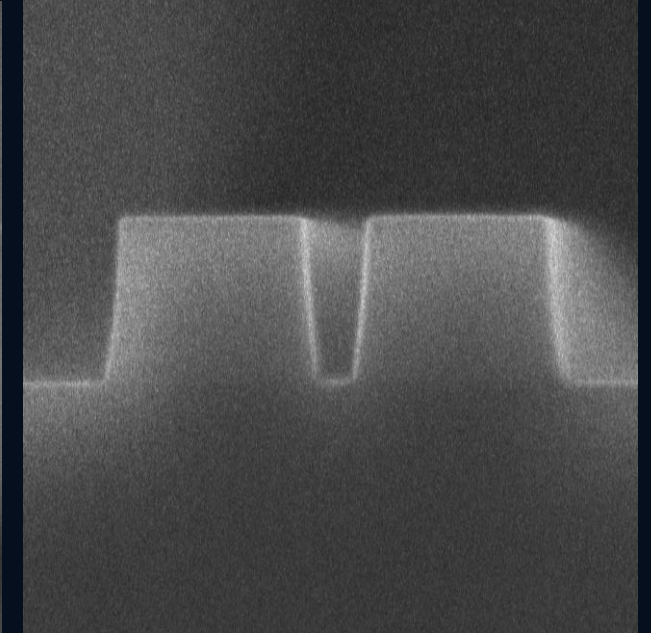
Collaborating with foundries to produce consistent slot waveguides for optimal performance



100 μm



500 nm



100 nm

Clean, sharp and smooth Si slots for polymer deposition and encapsulation

Reliability Performance Exceeds Industry Standard

Material Reliability Challenges Addressed

Loss of Poling

Data demonstrates LWLG EO polymer is very stable at high temperatures (>>100yr projected lifetime at 85°C)

Chromophore Decomposition

Data showed no decomposition in harsh environments (e.g., 85°C/85% r.h.)

Photolysis

N/A for applications in which EO polymers is not exposed to 3.8eV photons (326nm or lower)

Photo-Oxidation

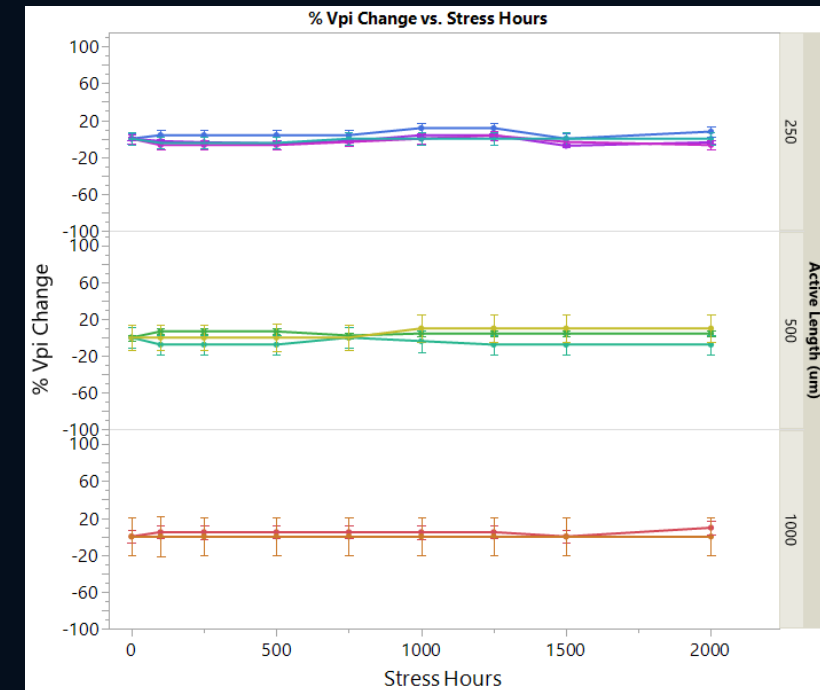
Data showed this failure mode is not likely with proprietary encapsulation

2025 Milestone: Validated that latest generation LWLG EO polymers pass Telcordia stress tests when used with proprietary encapsulation

Device Reliability In Progress

Temperature = 85 °C

Humidity = 85%rh



Ongoing chip and device level reliability tests to validate reliability for foundry specific processes and device level encapsulation

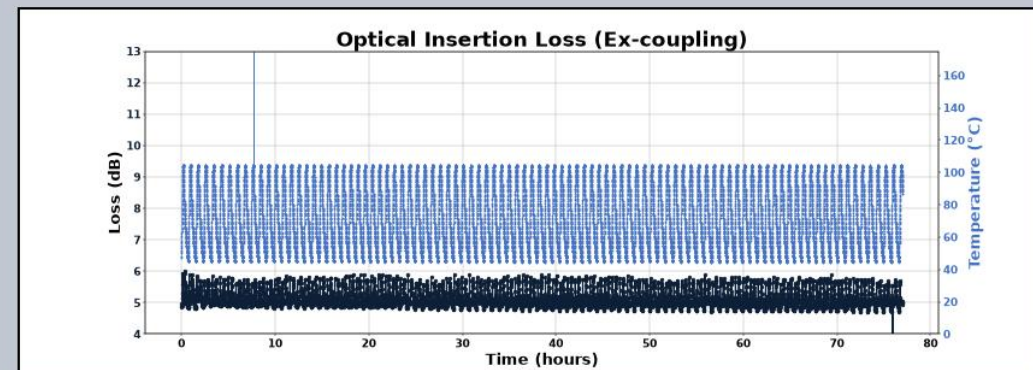
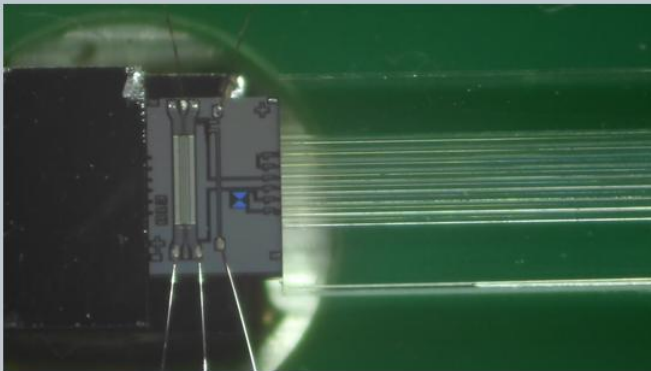
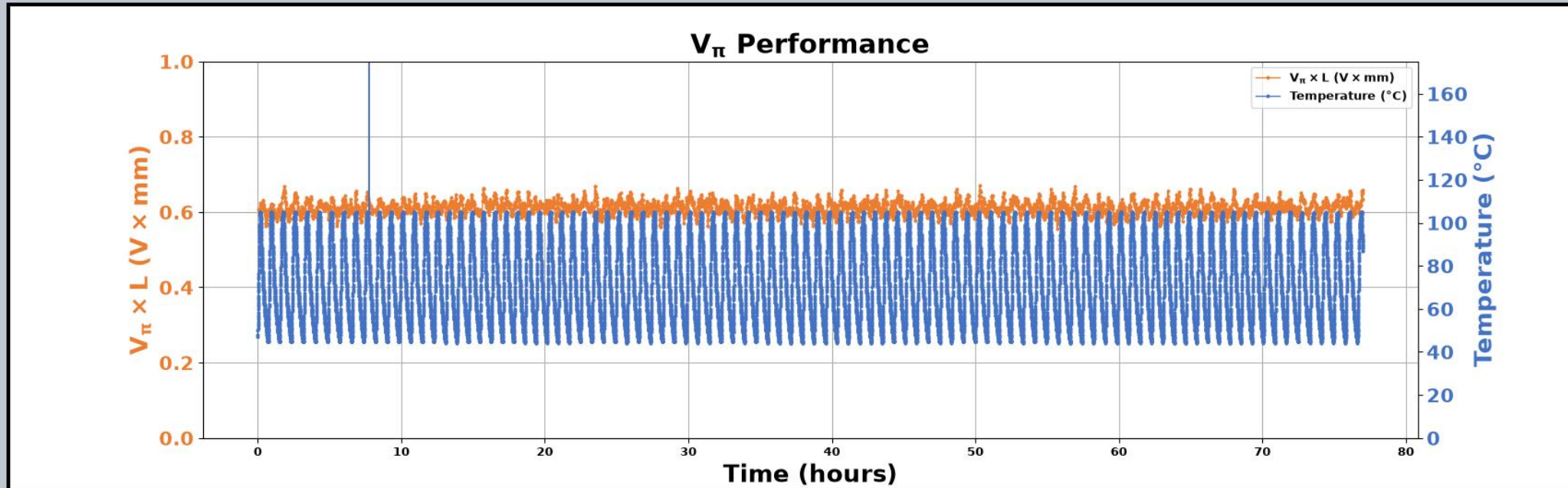
45C – 105C Temperature Cycling Test

Check out live demo at booth #1461

Current temp 85C

Run Time: 3 days, 5:02:55

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Business Model and Foundry PDKs

Business Model

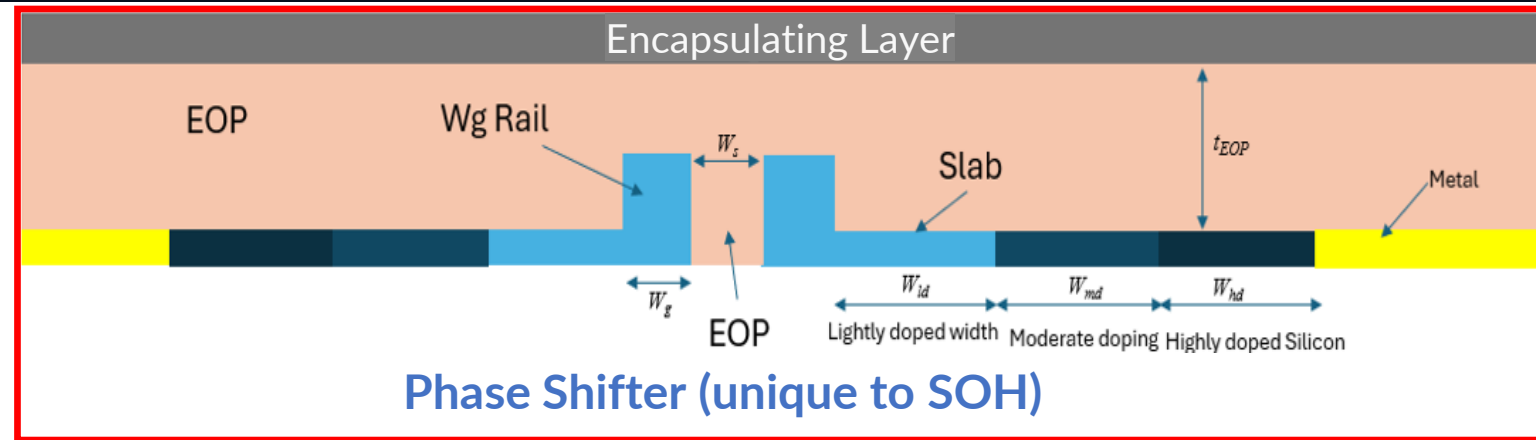
- EO Polymer Material Sales & IP Licensing/ Royalties for Polymer PDK
- Customers can co-design/ co-optimize using LWLG reference design

Various Foundries are Implementing LWLG Reference Designs

Publicly announced:



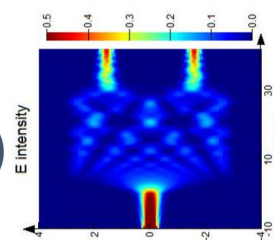
MZI SOH Modulator: PDK Building Blocks



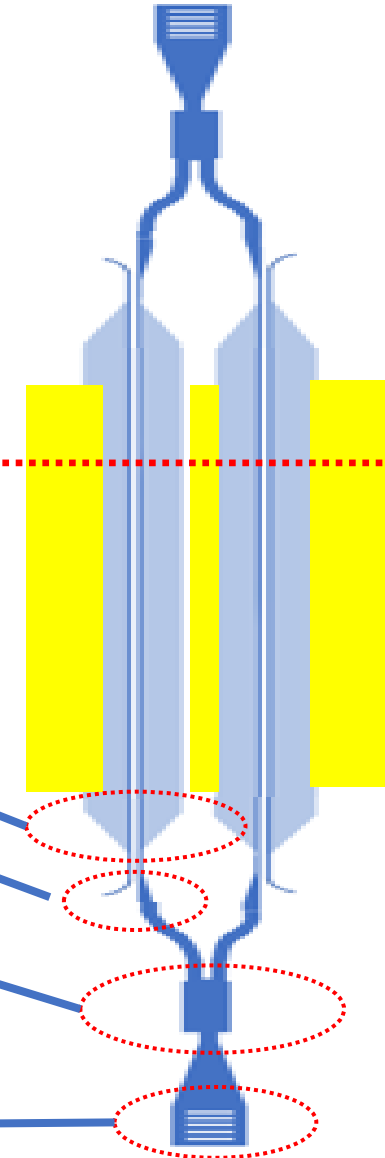
Mode Converter (unique to SOH)

1. Ridge WG to Ridge-Slot WG
2. Ridge Slot WG to Rib-Slot WG

Power Splitter (common w/ SiPh)
(MMI, Y-Junction, Directional Coupler, etc.)



Grating / Edge Couplers (common w/ SiPh)



Photonic Mode Conversion: Optimization Targets

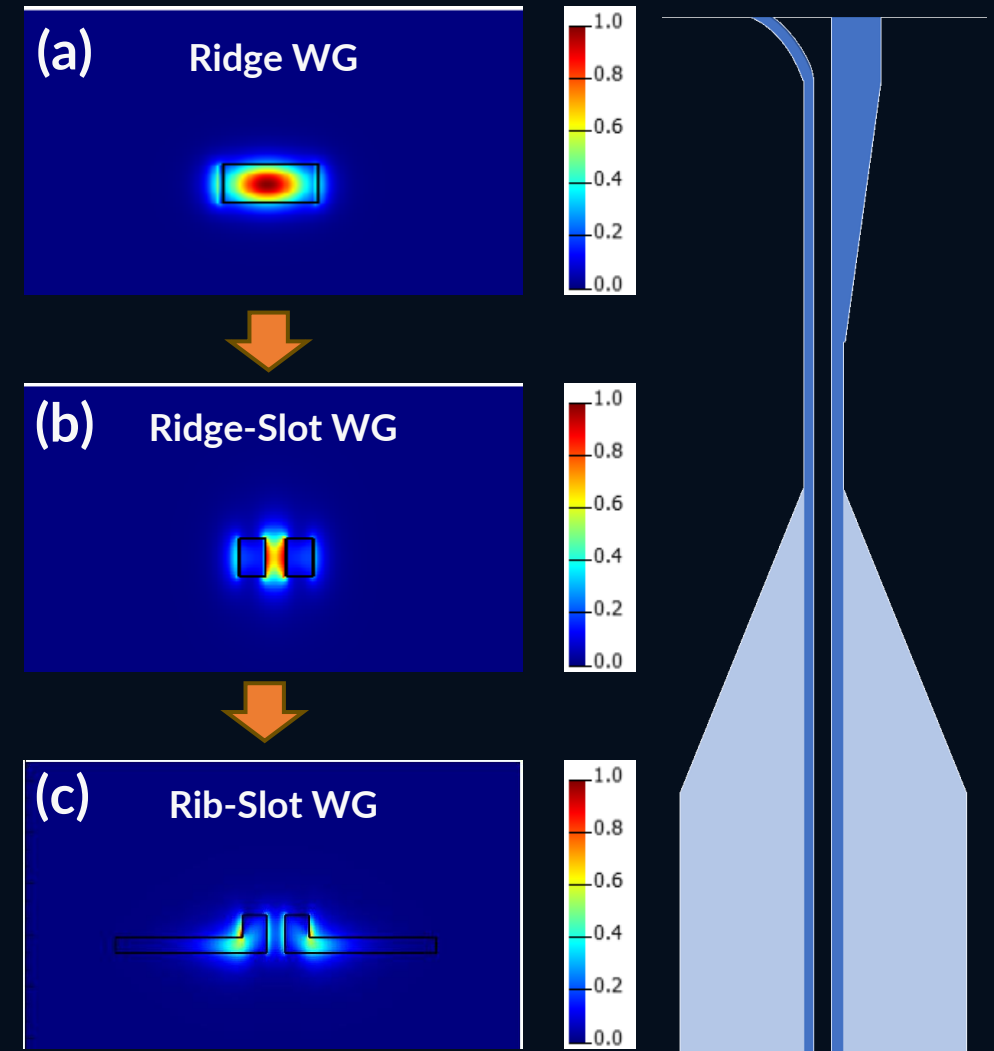
Optimization targets for the transitions from
(a) Ridge WG to (b) Ridge-Slot WG to (c) Rib-Slot WG

Maximize the power in the slot

- Higher power in the slot results in lower radiation and scattering from fab non-ideal Si roughness
- Higher EO interaction

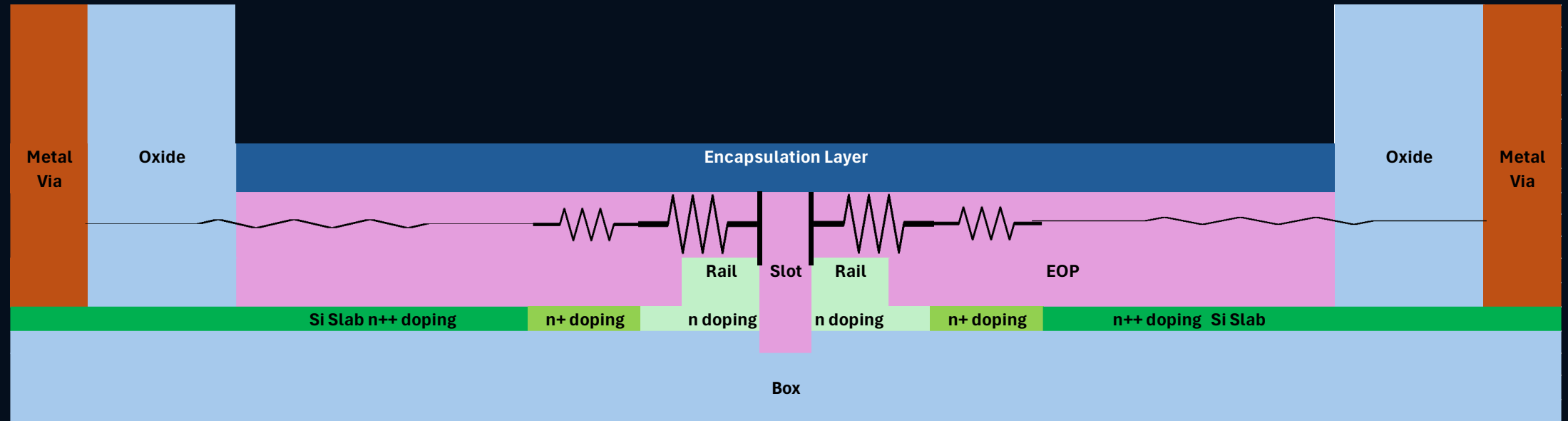
Minimize the insertion loss

- Smooth transitions
- Avoid multi-mode couplings
- Minimizing abrupt changes in the mode evolution



Optimization of Converter Design is Critical to Ensure Adiabatic Mode Transition

Phase Modulation Section Design: Trade-off's



$$V_{\pi}L = \frac{1}{2} \frac{\lambda \text{ Slot } w}{n_{eop}^3 r_{33eop} \Gamma}$$

Confinement $\uparrow$ Thinner Slab
Confinement $\uparrow$ Narrower Slot

Optical Loss

Loss $\downarrow$ Lower doping

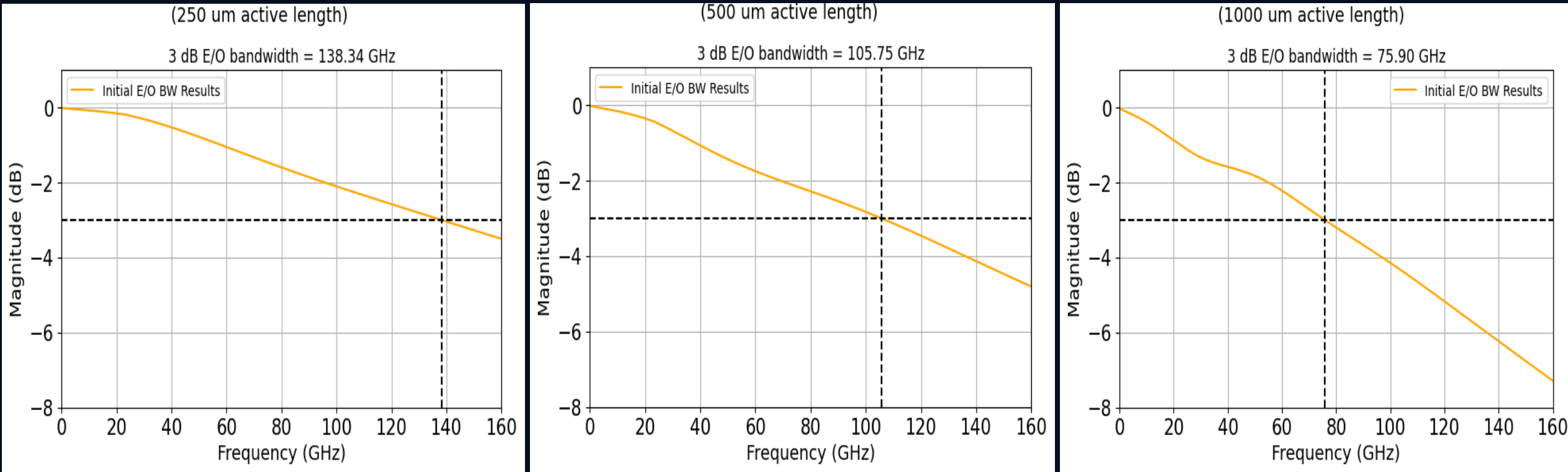
$$f(BW) = 1/(2\pi RC)$$

$R \downarrow$ Higher doping
 $C \downarrow$ Wider Slot

Critical Design Parameters: Slot and Rail Widths, Slab Thickness, and Doping Distribution

RF Performance Optimization: Slots, Slabs and Doping

EOBW RF Sims for EO Polymer SOH devices w/ optimized: Slot Widths, Slab Thickness, Doping Profile and Concentrations

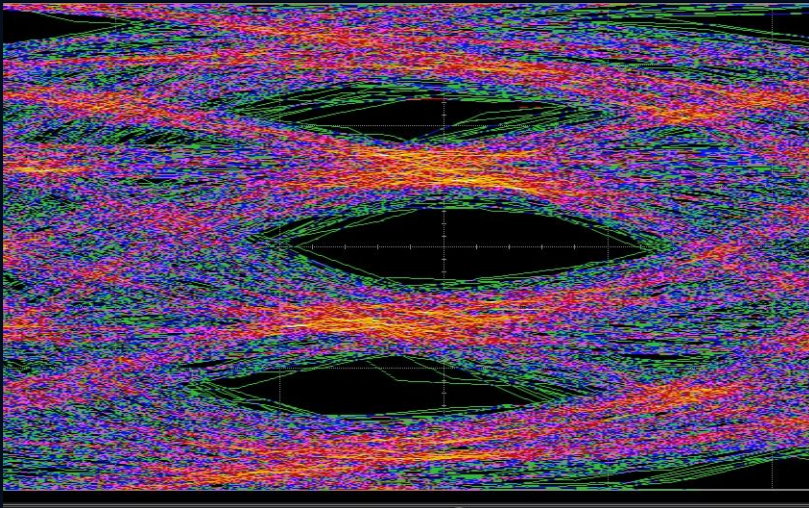


Certain foundries have optimum geometries and doping profile capabilities available in their PDK today.
Others are running short loops to catch up.

Co-optimization is the Key to SOH Design to Meet Performance Metrics

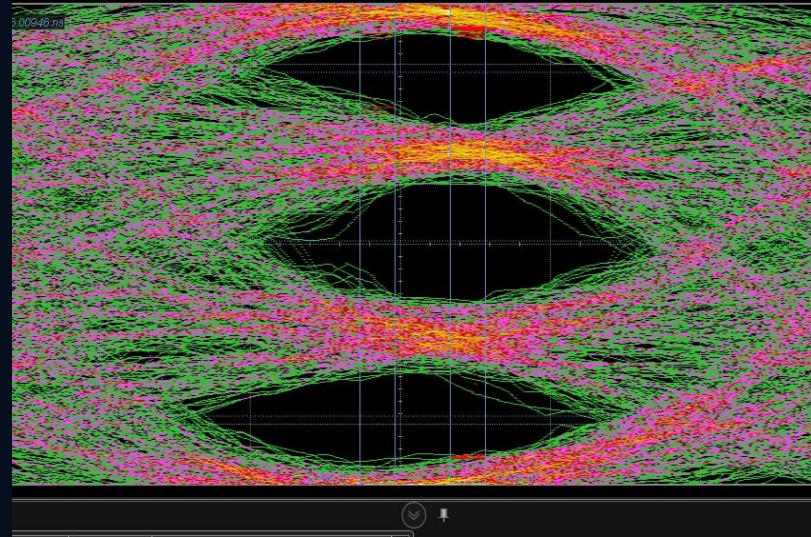
Initial 240 Gbps Eye from New Foundry Tapeout

Raw Electrical Eye



Direct BERT data output signal
(electrical eye with no device)
240 Gbps, 0.9 V amplitude

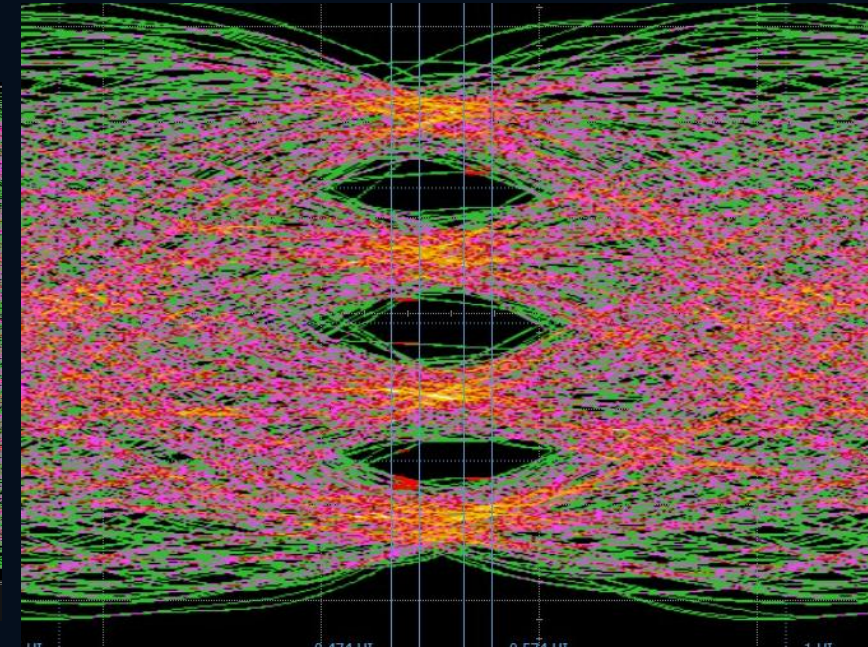
Equalized Electrical Eye



TDECQ = 2.35 dB

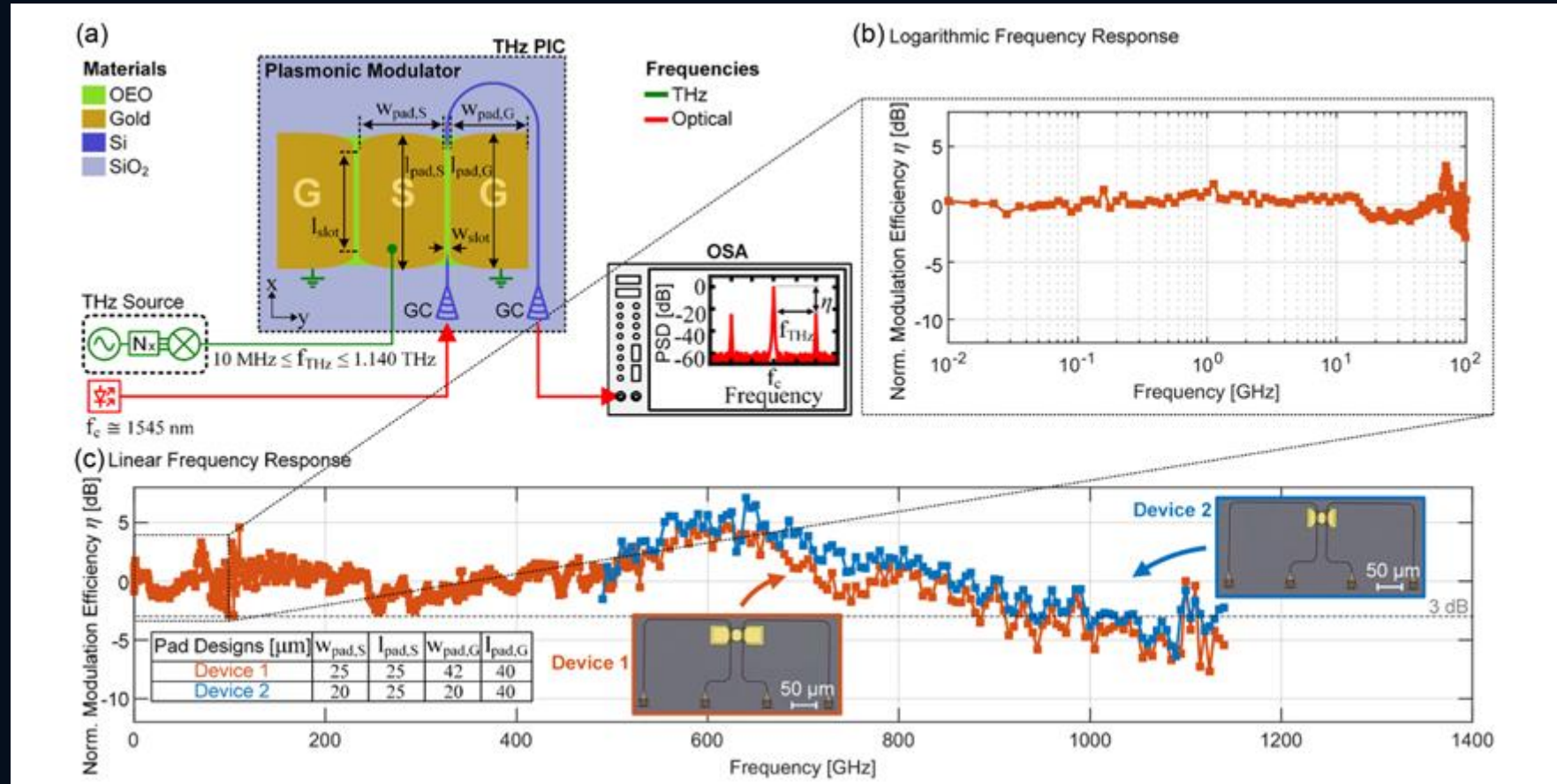
- 9-tap equalization
- 0.9V drive voltage with no pre-distortion

Output device optical eye



TDECQ = 2.87 dB

>400 Gb/s with EO Polymer based Plasmonic Modulators



A.H.: Y. Horst et al., Optica, vol12(3):325-8 (2025)

Polariton packaged products with Lightwave Logic EO polymer engine

Conclusion

Summary

- LWLG has developed EO polymer, BEOL and SOH modulator device technology
- 200G designs have shown high bandwidth and low drive voltage
- EO Polymer material and encapsulation achieved Telcordia reliability performance at thin film level. Additional reliability studies underway for various reference devices
- 200G and 400G devices designed and in Fab at multiple foundries with multiple PDKs

Key Takeaway

- Co-optimization with foundries for slots, slabs, rails, doping, and other fabrication specific parameters is underway for 400G performance in EO polymer-based SOH modulators for both O- and C-band

Thank you!

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