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Bringing your innovation to life

CAN A PDK-BASED INP FOUNDRY RESPOND TO CURRENT MARKET TRENDS?

January 2024

MEGATRENDS AND PIC RELATED TECHNOLOGIES

- Artificial Intelligence
  - Driving force to increase bandwidth
- Network Security
  - Quantum Key Distribution
- Autonomous Driving
  - LiDAR

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COMPLEXITY FROM NETWORK TO OPTICS

- Coherent technology is needed at all distances
- Increasing speed, power budgets

- Addressing Power, Cost, and Form-factor
- Enables entering emerging markets for coherent down to 2km

PICs come to the rescue!

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PICS: POWER, COST, AND FORM-FACTOR

- Enable complex systems

- All required functionalities on a single chip
  - Integrated lasers, amplifiers
  - High speed (IQ) modulators
  - No optical connection losses

- Scale and cost down
  - Yield following semiconductor electronics legacy
  - Lower assembly cost

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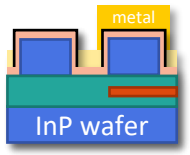
PHOTONIC INTEGRATION PARALLELS ELECTRONICS

1 **Integration drives new applications**

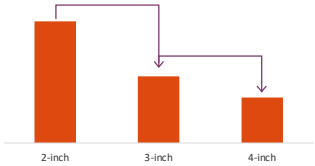

2 **Semiconductor manufacturing process**

Planar process and tool overlap

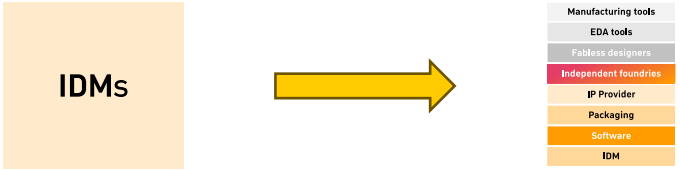
3 **Economies of scale**

Cost reduction drives adoption



4 **Industry structure**

Specialization within value chain



5 **Foundry Technology/Customer flywheel**

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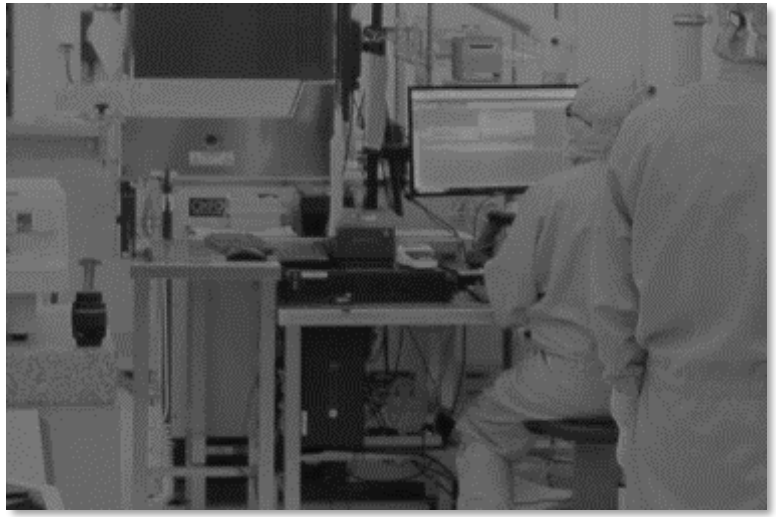
INTRODUCTION SMART PHOTONICS

InP PIC Production Line and PDK

4 inch – High Volume Ready



- **Open Foundry – manufacturing services for InP wafers based on customers' designs**
- **Processes and capacity for supporting customers from prototype to volume**

✓ ***Volume Production***

✓ ***Validated PDKs***

✓ ***EU based***

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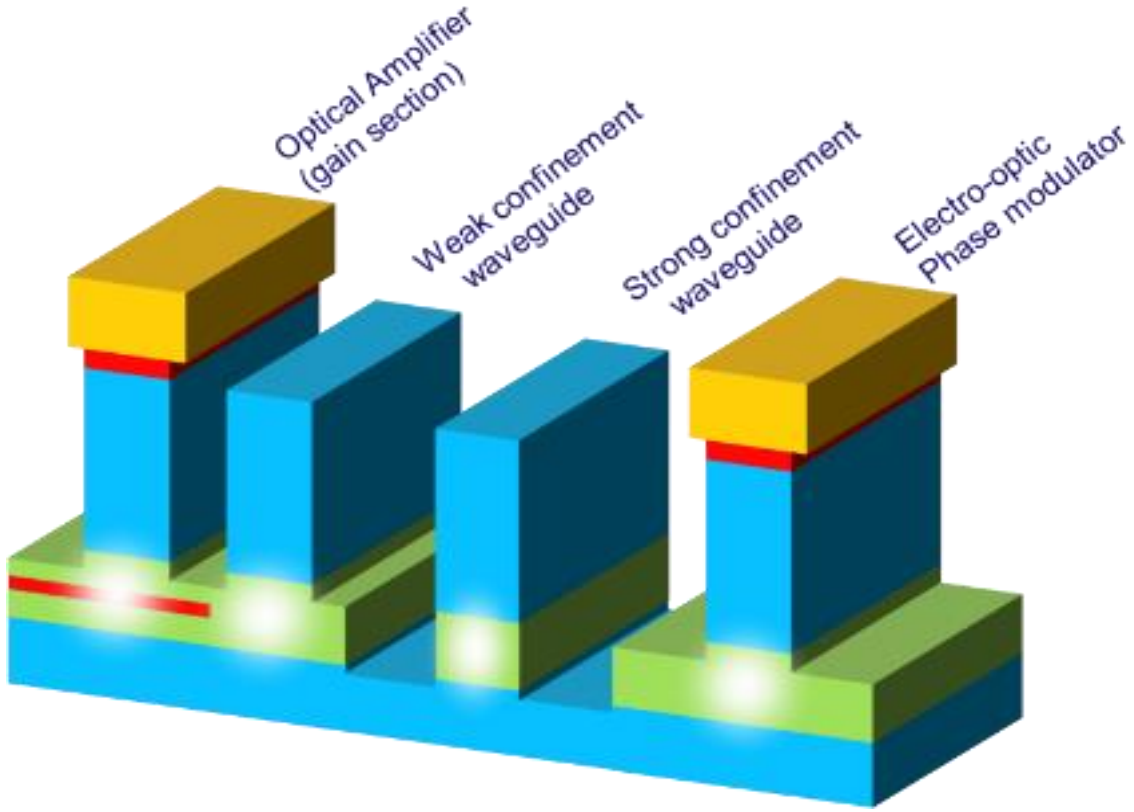
InP IS KEY TO HIGH LEVEL INTEGRATION

- **Only material** suited for **lasers** and **amplifiers**
- Monolithic integration, no compromise between active and passive
- High performance modulators
- Full on-wafer electrical testing

- High level integration on InP drives down system costs!



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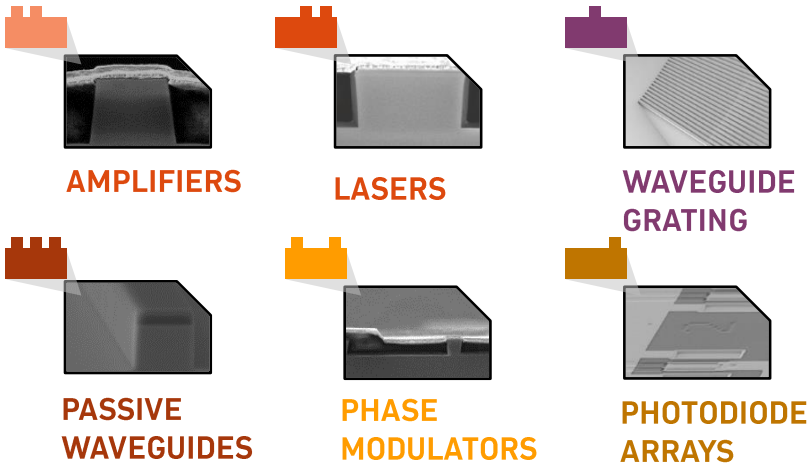
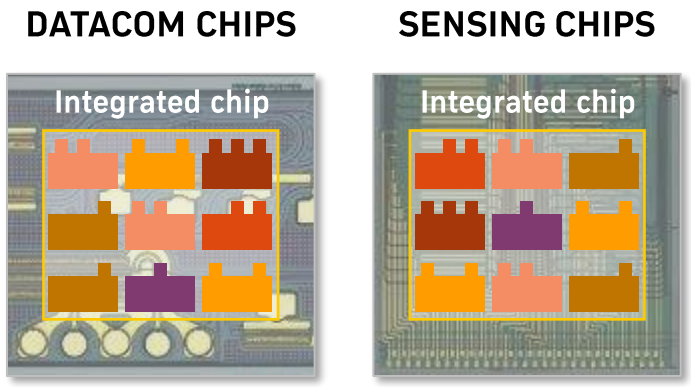
SIMPLIFYING DESIGN COMPLEXITY: PDK

PROCESS DESIGN KIT: TOOLBOX





- Proven reliability and performance
- Leverage experience

- Leverage infrastructure
- Reduce time to market

Specific PDKs for C-band and O-band

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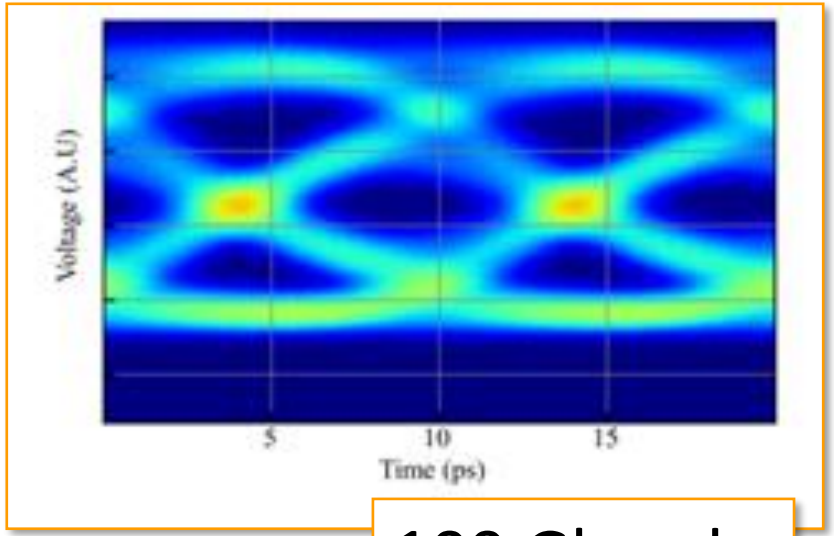
MODULATOR

- Integrated modulator
- Monolithically Integratable with ITLA, SOA in the same process

- EO bandwidth > 70GHz
- MZI configuration tested up to 100Gbit OOK



100 Gbaud

J. A. Hillier et al., OECC, 2023, pp. 1-3, doi: 10.1109/OECC56963.2023.10209945.

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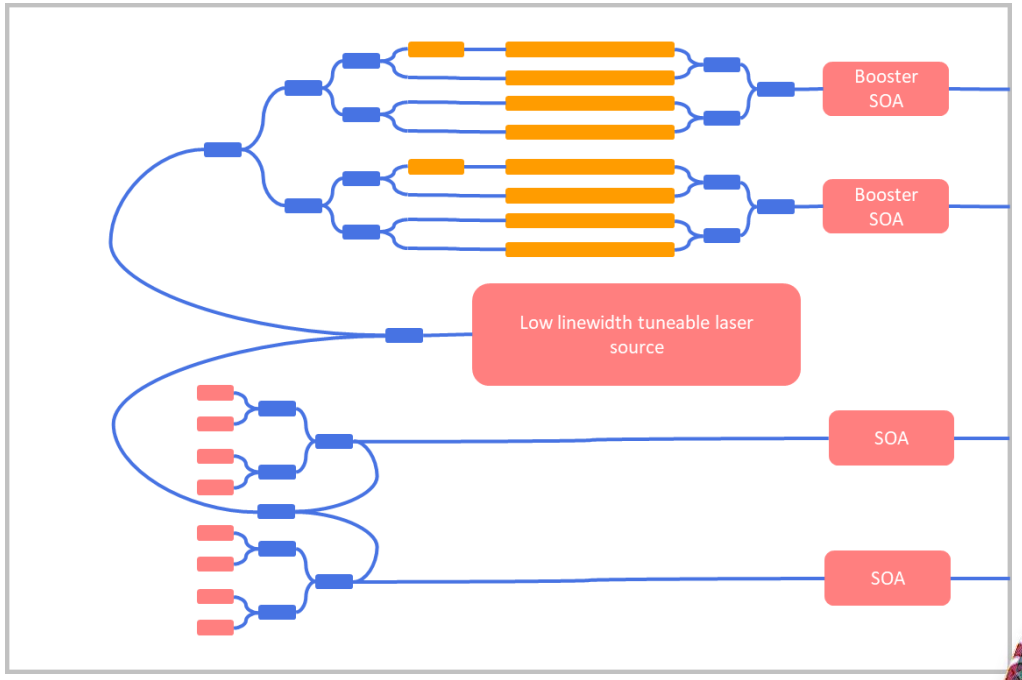
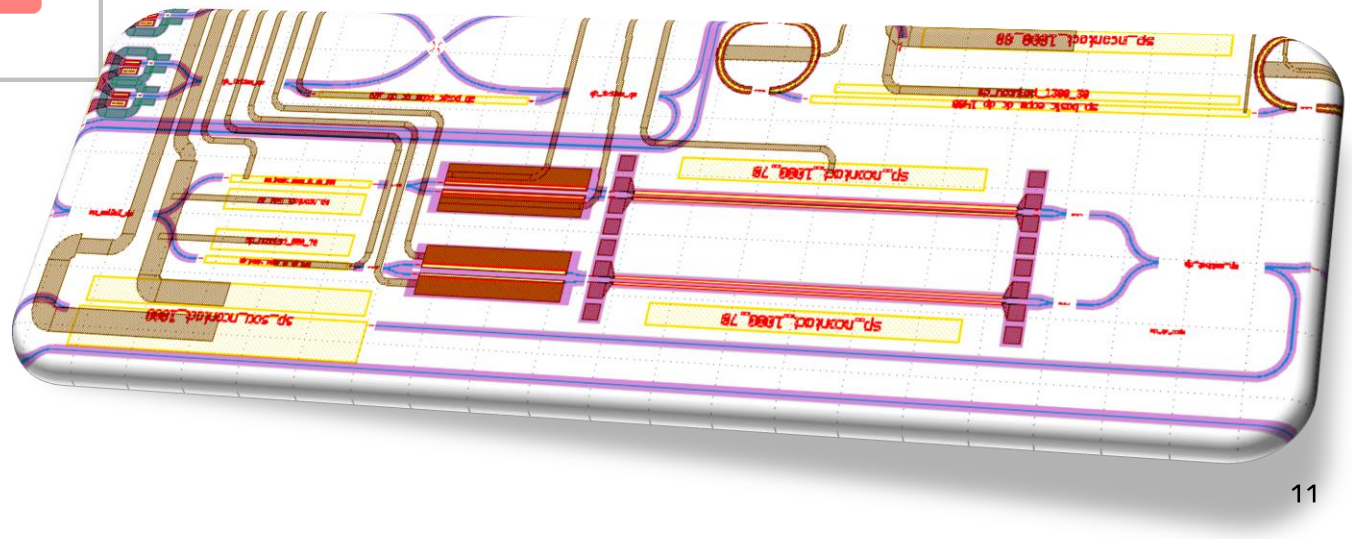
FULL COHERENT TXRX SYSTEM ON CHIP



- High speed IQ modulators
- Monolithically integrated narrow linewidth tuneable laser
- High speed photodiodes
- Integrated amplifiers
- High temperature operation



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CONCLUSIONS

- Coherent technology, QKD and LiDAR require complex PICs
- InP PICs address cost, output power, footprint
- Advanced PDKs offer fast time-to-market

Can a PDK-based InP Foundry respond to current market trends? - yes, but let's find out for you

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Booth 5305

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