



Photonics-AI

Powering the shift into photonics connectivity in AI computing

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Today's Presenters



Vickram Vathulya
President & CEO
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Andrew McKee
Co-Founder,
Managing
Director & CTO
Sivers Photonics



**Agilent
Technologies**



Delivering Critical Tech for Secular Trends

AI acceleration

Need: Copper →
Optical Interconnects

mmWave adoption

Need: Higher capacity, Reduced
Latencies @ Lower Power Dissipation

Sivers Semiconductors

High Fidelity Light Sources

90% lower Energy Consumption

Sivers Semiconductors

High Efficiency Beamformers

3-5x Higher Power Efficiency



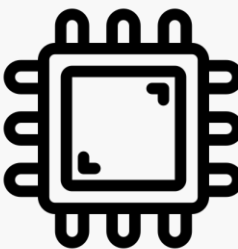
Greener Footprint

Interconnect is the Critical Bottleneck to Delivering AI at Scale



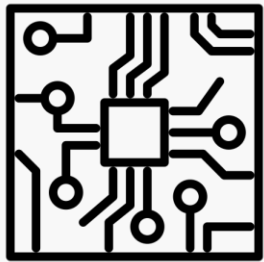
AI

AI models continue to proliferate, grow and increase in technical complexity at an unprecedented pace (e.g., large language models)



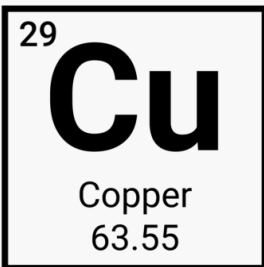
Compute

Compute vendors continue to develop high performance processors to meet the demanding requirements of large-scale AI models



Interconnect

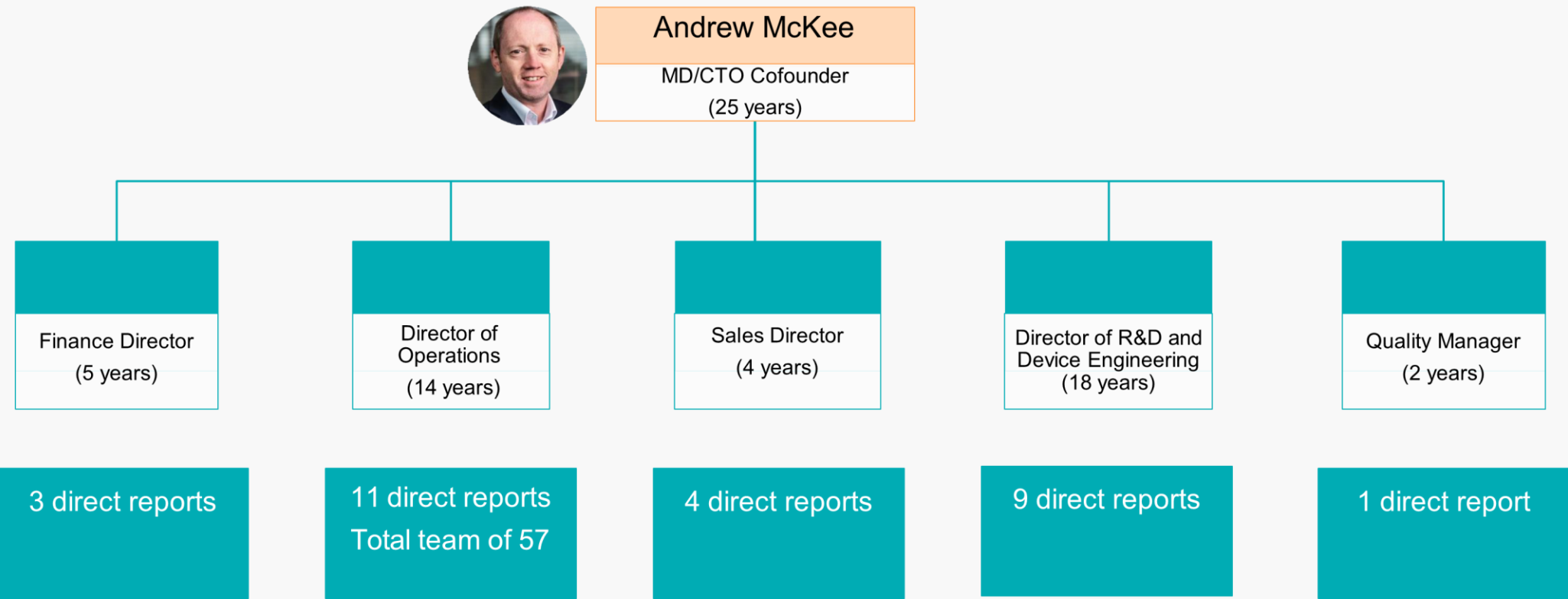
Despite rapid innovations in models and processors, the interconnect technology needed to scale AI infrastructure remains obsolete



Sivers Photonics-AI at a Glance

We Design, Manufacture and Sell One of the World's Most Advanced Custom Semiconductor Laser Arrays

- Presently headquartered in Scotland and with offices in the United States.
 - Robust Organization To Support Continued Growth
 - Currently ~85 employees (12 PhDs)
- Strong IP portfolio built over 25+ years
 - Proprietary Know-How and Trade Secrets
 - Fabrication Process Recipes
 - Chip Architectures, Epi wafer designs
 - Laser designs & Testing methodologies
 - 3 Patents granted (in last 3 years)
 - Further 16 Patents pending (in last 2 years)
 - Latest Patent Strategy focused on high-impact concepts around increasing laser array manufacturing yields



Photonics-AI is well-positioned to exploit major secular trends

Engaged with leading suppliers in “momentum” markets

Optical High-Speed Connectivity

AI - High Performance Computing and Optical Datacom



2028 SAM \$1.1b¹

Optical Sensing

Consumer Continuous Biometrics



2027 SAM \$159m²

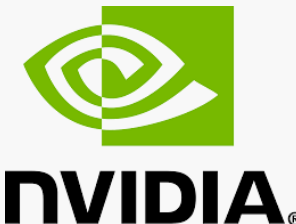
- Addressing Large SAMs in
 - AI Data Center \$1,140m in 2028
 - Non-invasive Biosensing \$159m in 2027

1: The Optical Penetration and SAM are based solely on Company estimates as of August 2023 and are subject to risks and assumptions which could cause actual results to vary from such SAM estimates.

The estimated SAM does not represent a prediction or guarantee of the actual SAM for the Company's products/business. Further information in slide 11.

2: InP 2022, Yole Intelligence, October 2022

Industry Leaders Agree that Optical Interconnect is Critical for the Success of AI



*“Over the past decade, NVIDIA-accelerated computing has delivered a million-X speedup in AI. The next million-X **will require new, advanced technologies like optical I/O** to support the bandwidth, power and scale requirements of future AI and ML workloads and system architectures.”*

Rob Ober
Chief Platform Architect for Data Center Products
NVIDIA



“The biggest companies in the world are hitting an energy power wall and experiencing massive challenges with AI scalability. Traditional chips push the boundaries of what’s possible to cool, and data centers produce increasingly large energy footprints. AI advances will slow significantly unless we deploy a new solution in data centers

Nick Harris
CEO and founder
Lightmatter



“Interconnect bandwidth during scale-out is critical to preventing the accelerators from stalling while waiting on network transfers for either data or gradients.”

Christopher Berner
Head of Compute
OpenAI



*“...As an analogy, **replacing electrical I/O with optical I/O** in CPUs and GPUs to transfer data is like going from using horse-drawn carriages to distribute goods, limited in capacity and range, to using cars and trucks that can deliver much larger quantities of goods over much longer distances...”*

Press release June 2024; “Intel Demonstrates First Fully Integrated Optical I/O Chiplet”

Optical I/O is the Solution for the Generative AI Era

Existing Copper Interconnect Technology



AI models are extremely energy intensive
 Datacenters are on track to be 20-50% of global electricity production by 2030



	Power Consumption	Latency	Cost	Network Size Scalability
Copper	50pJ/bit	100ns	\$X	10 meters
Photonics	5pJ/bit*	5ns	\$0.1X	2,000 meters
Comparison	10X lower ¹	Faster learning	90% reduction	Larger clusters

**Photonics-AI
is the solution**



Photonics-AI Creates Significant Power Efficiencies Using Light – deployed in Remote Laser Sources powering Co-Packaged Optics

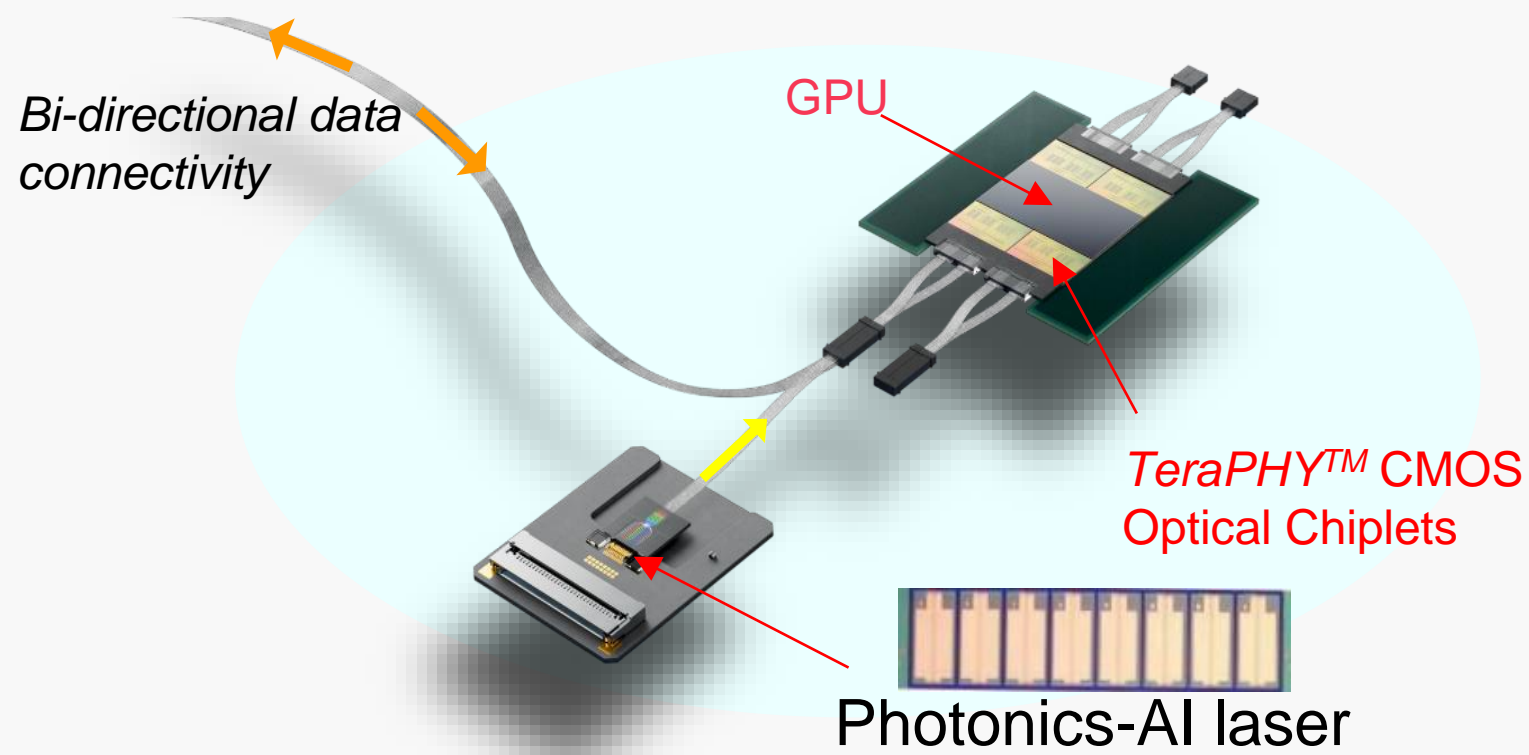


- 800G pluggable limited to 15pJ/bit

1. Source: <https://ayarlabs.com/>

Significant Momentum Backed by Marquee Customer Development Contracts

AI Infrastructure



Ayar SuperNova™ multi-port, multi-wavelength light source

Ayar Labs Investors



Consumer

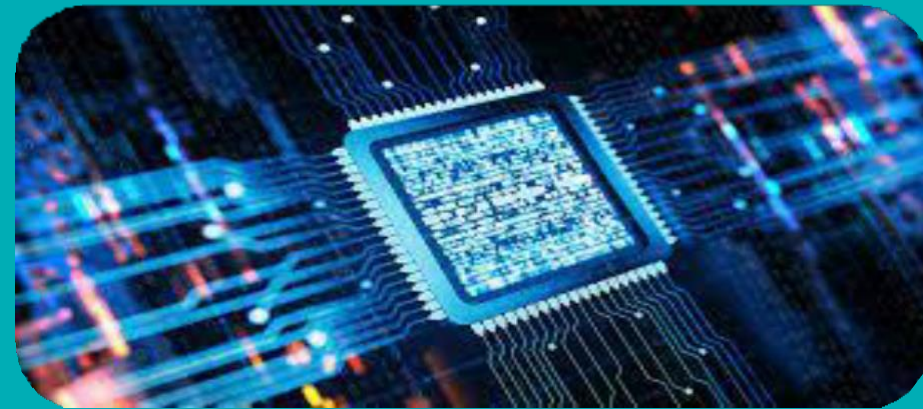
F100's Advanced Platform for Biometric Sensing



- ~\$18 m USD continued multi year NRE
- More than 30,000 chips shipped

Photonics-AI's Differentiation Moat

Advanced Performance



Highly scalable integrated platform.
A leading supplier offering Tunable Laser Arrays with Integrated Optical Power Monitors

Powering advanced co-packaged optics interconnect technologies delivering 10x higher bandwidth at 90% lower power

Customer Benefit:

- ✓ High channel density allowing more efficient use of available spectrum.
- ✓ Greater bandwidth scalability.

Demonstrated Skillset



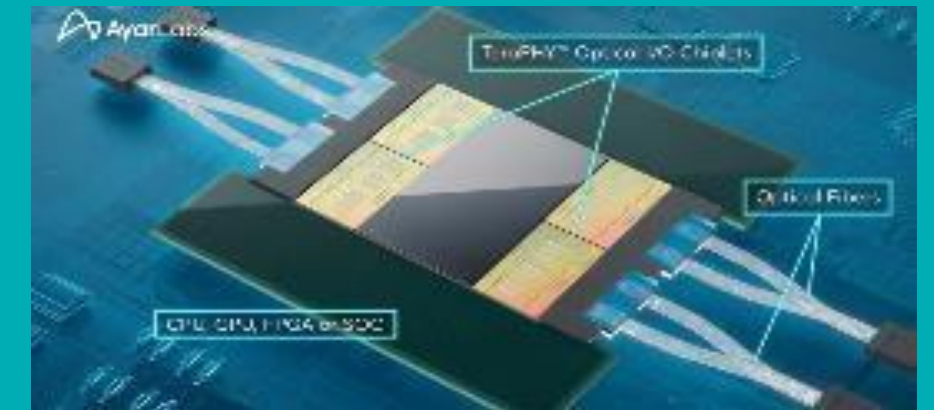
Trade secrets developed over 25 years and custom in-house design software deliver unmatched customizability for customers

Strong design IP and patent portfolio to deliver industry leading test yields and strong gross margins

Customer Benefit:

- ✓ Fastest time to market
- ✓ Higher capacity and lower cost

Customer Intimacy



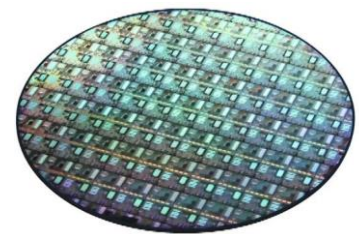
Photonics-AI has an established track-record of working closely with tech companies to deliver **Custom Photonics Solutions** (e.g. Ayar Labs and F100 customer)

Customer Benefit:

- ✓ Enabling differentiation for our customers
- ✓ Greater support, resources and expertise

Photonics-AI's Flexible Competitive and Asset-Light Manufacturing Strategy

Photonics-AI



Photonics-AI

Highly Scalable Infrastructure
Limited investment required to add significant capacity



Foundry for high volume

Photonics-AI Fab

Stage 1

Laser Design

Semiconductor laser chip designs are created for either specific or general product usage.

Stage 2

Wafer & Chip Manufacturing

Semiconductor wafers are processed through a complex and extensive series of manufacturing steps including test and singulation.

Stage 3

Assembly and Packaging

Laser chips are assembled into packages to form the electronic components that can be mounted onto circuit boards.

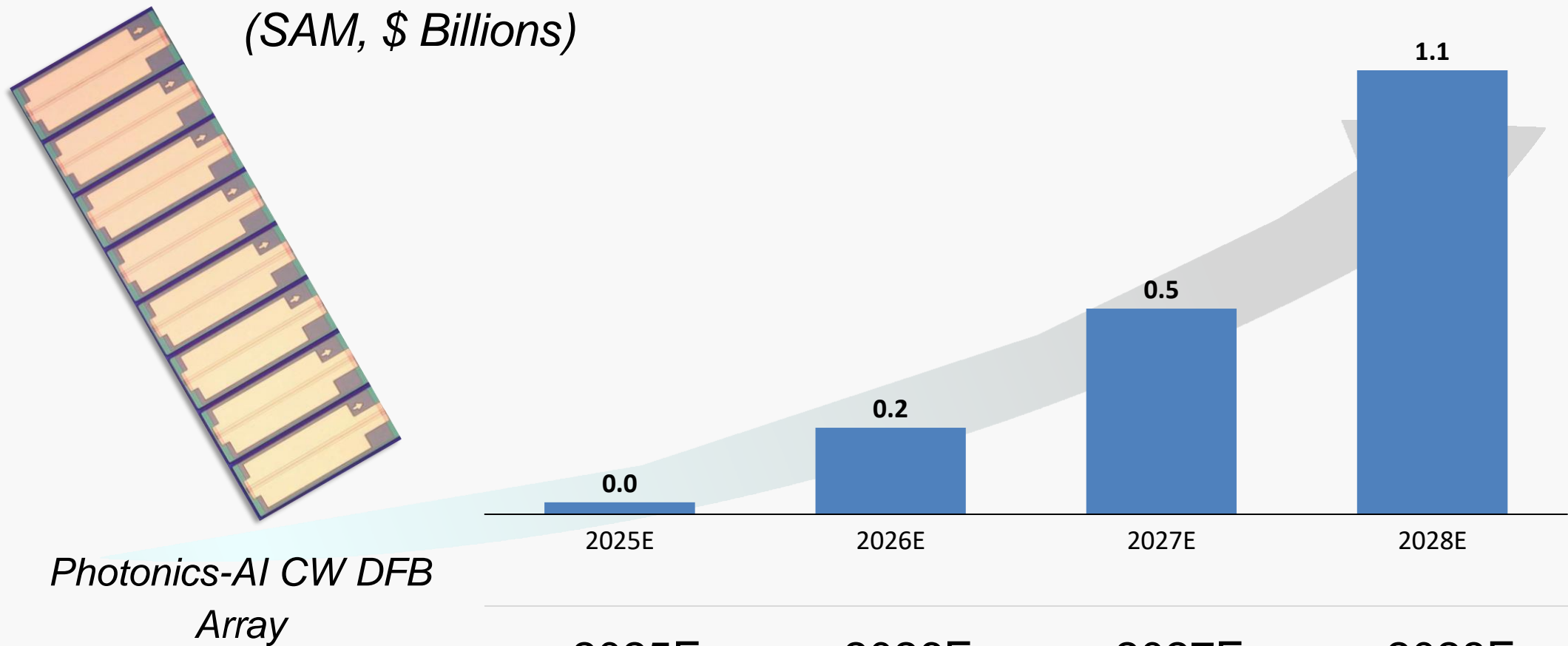
- *Unique integrated capability for laser design and fabrication.*
- *\$17M Capex investment expanding wafer fab capable of \$150M/yr revenue¹*
- *External foundry engagement underway for higher volumes*

Customers

1. Based solely on Company estimate as of August 2024 and is subject to assumptions and uncertainties which could cause actual results to vary from the estimate and such estimates are not guarantees or predictions of actual performance.

Photonics-AI's Serviceable Addressable Market Reaching \$1.1B+ by 2028

Serviceable Addressable Market for Photonics-AI



	2025E	2026E	2027E	2028E
Data Center GPU Units Sold (Millions)¹	10.2	14.8	17.6	19.0
Laser Arrays per GPU²	10	10	10	10
Illustrative Optical Penetration	0.4%	2%	6%	12%
Serviceable Addressable Market³	\$31M	\$222M	\$528M	\$1,140

Key Drivers

Number of server GPU units shipped to grow from 4.7m in 2023 to 19.0m in 2028 (CAGR 32%)

Support for large GPU clusters
Size: 5-50k GPUs per cluster

- 16Tb/s bi-directional connectivity per GPU-GPU link,
- Ten laser arrays required per GPU

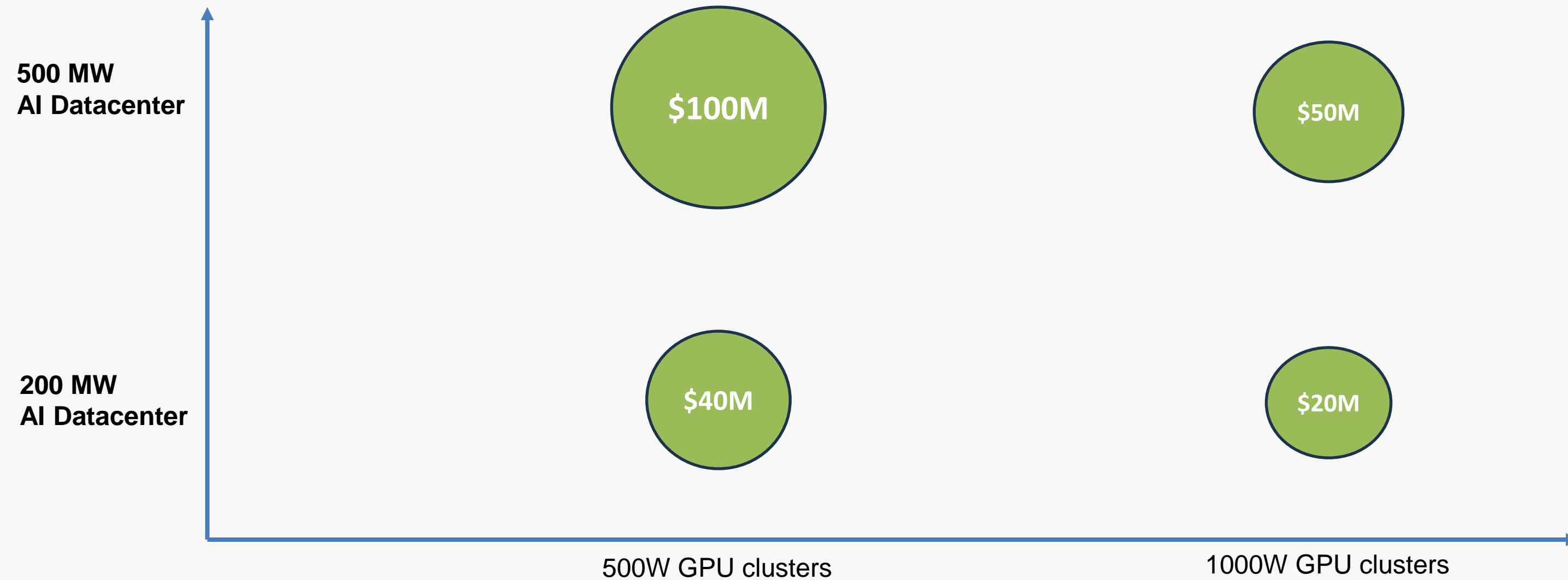
Optical penetration: adoption rate based on assumptions driven by bottleneck factors in previous slide - increase in model size and pressure to reduce energy consumption

1. Source: IDC, Worldwide PC, Workstation, and Server Discrete Graphics Processing Unit Market Shares and Market Forecast, June 2024.

2. https://www.linkedin.com/posts/ayar-labs_ahwedgaisummit-edgeai-aihardware-activity-7237978927896412161-PDLR?utm_source=share&utm_medium=member_desktop

3. The Optical Penetration and SAM are based solely on Company estimates as of August 2024 and are subject to risks and assumptions which could cause actual results to vary from such SAM estimates. The estimated SAM does not represent a prediction or guarantee of the actual SAM for the Company's products/business

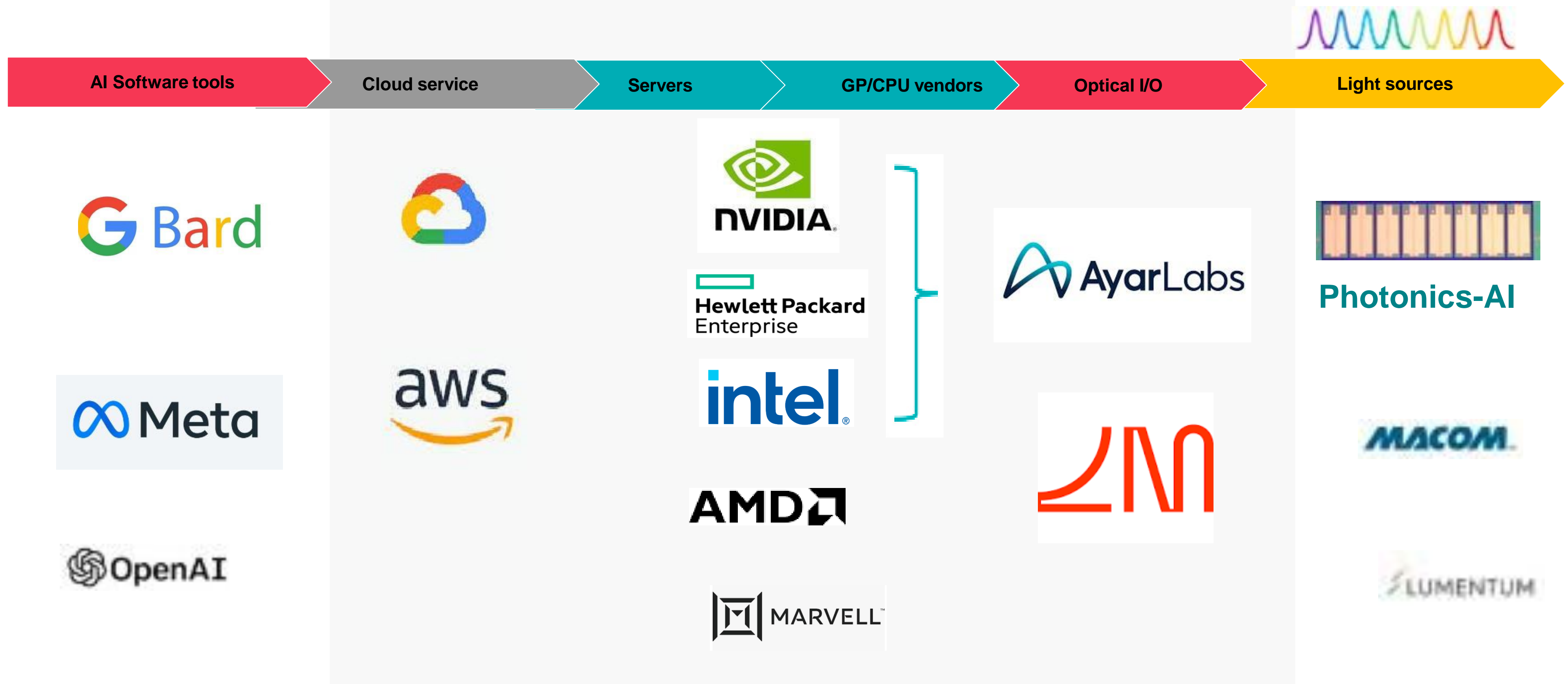
AI Datacenter deployment: Socket Opportunity for Photonics-AI



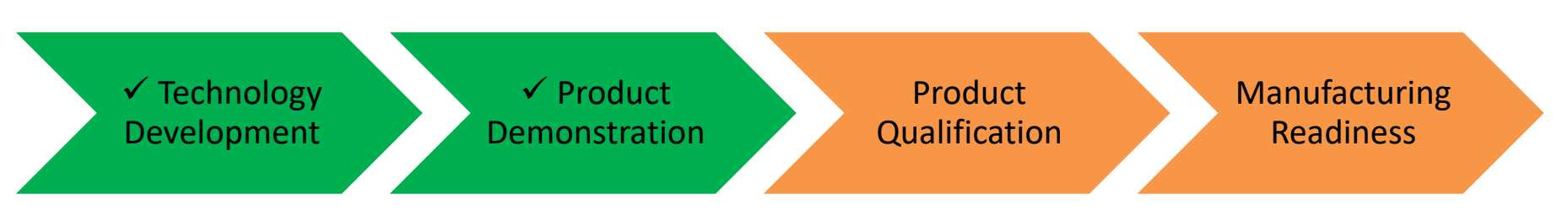
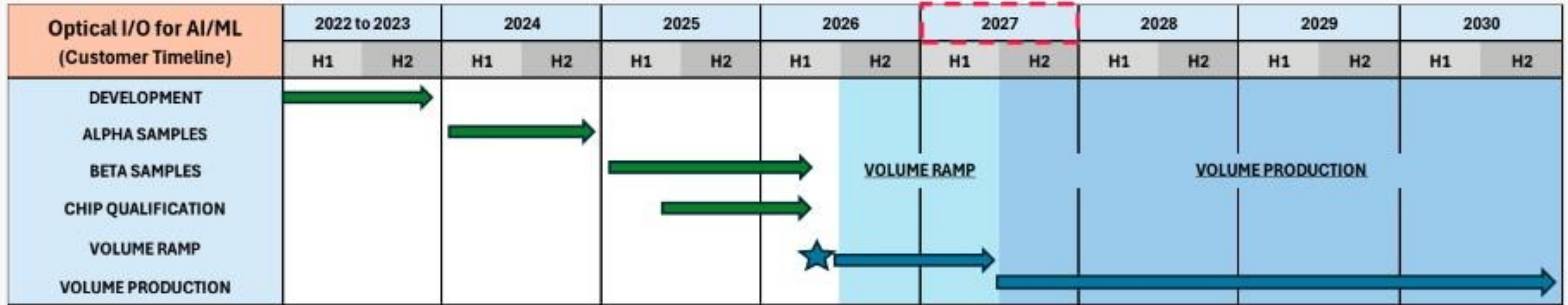
Assumptions:

1. Datacenter Power Utilization Efficiency (PUE) of 1.4
2. 60% of Datacenter IT power consumption by Server GPUs (others: storage, switches, networking etc.)
3. Assume 100% utilization of GPUs with Optical Interconnects and 2 suppliers for lasers at 50% share each
4. 10 Laser Arrays per GPU (actual multiplier will be based on customer configuration of photonics chiplets);

AI Eco-system from Chat GPT to light source (Photonics-AI)



Ecosystem gearing up for Volume Production in 2027¹



- Beta samples - very minor adjustment of chip layout, test spec limits, and preparation of samples for chip qual, module qual and additional pre-production sampling
- Qualification includes 5,000 hours (~7 months) of high temperature reliability testing required for data center deployment
- Production ramp timelines shared by our key customers are the basis for our plans, **reaching volume in 2027**

¹ Estimated timeline only based on Company's expectations as of August 2024. Actual timeline is subject to change.

Significant Funding and Valuations Throughout AI Photonics Ecosystem

Key AI Photonics Fundraising Activity



\$500M

Series C Close

- Developer of optical interconnects intended for data movement within AI systems
- Evolves alongside AI workloads and architectures, enabling customers to maximize the computing efficiency and performance of AI infrastructure while reducing costs, latency, and power consumption

Notable Partnerships



\$1.2B

Series C Close

- Data center and AI computing platform intended to serve deep learning and machine learning applications
- Combines the advantages of photonics, mixed-signal ASICs, and packaging to offer a sustainable improvement in computing performance

Notable Partnerships



\$4.4B

Series D Close

- Integrated optical technology to create efficient processors and accelerates critical operations in neural networks using an array of programmable photonic elements fabricated alongside transistors in conventional CMOS processes

Notable Partnerships





Thank you