Photonics-AI

Powering the shift into photonics connectivity in AI computing

Vickram Vathulya

President & CEO

vickram.vathulya@sivers-semiconductors.com

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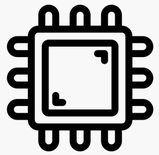
Photonics-AI

Interconnect is the Critical Bottleneck to Delivering AI at Scale

AI

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

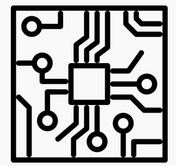
Gemini Meta OpenAI



Compute

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

NVIDIA AMD Grok cerebras



Interconnect

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

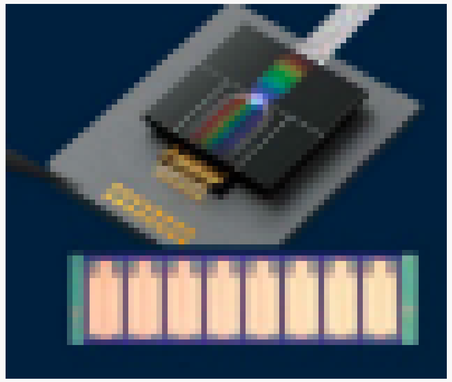
29 Cu Copper 63.55

Sivers Photonics-AI at a Glance

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

- A leading supplier of laser arrays with tuneability and integrated optical power monitors
- Providing the optical power source for:
  - Next generation co-packaged optics (CPO) interconnect architectures for AI networks
  - Non-invasive consumer biometric healthcare applications
- Currently 80 employees
- Presently headquartered in Scotland and with offices in the United States.

Multi Channel Tunable Laser Array



Laser & detector array for consumer biometrics

Photonics-AI Positioned to Exploit Major Secular Trends

Optical High-Speed Connectivity

AI - High Performance Computing and Optical Datacom

2028 TAM $5.7b[1]

Optical Sensing

Consumer Continuous Biometrics

2027 TAM $159m[2]

- Delivering high power and high precision laser sources for new rapidly growing markets
- Strong traction with the leading suppliers in these markets

1: IDC, Worldwide PC, Workstation, and Server Discrete Graphics Processing Unit Market Shares and Market Forecast, June 2024. Further details slide 24

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

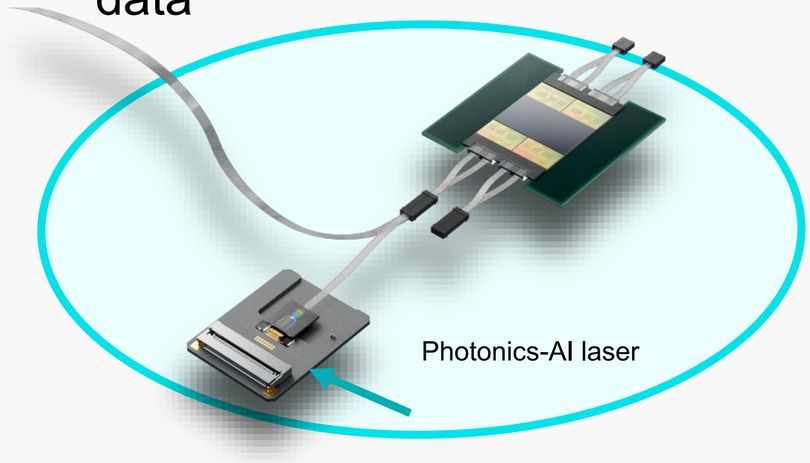
- **800G pluggable limited to 15pJ/bit**

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

Significant Momentum Backed by Marquee Customer Development Contracts

AI Infrastructure

AyarLabs



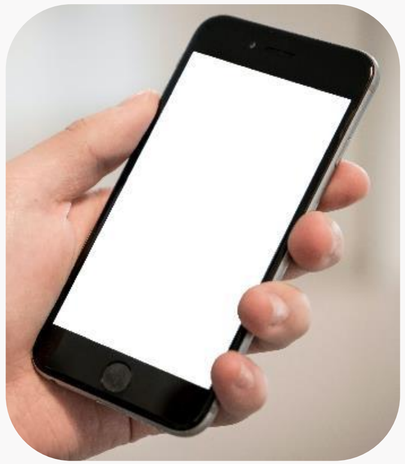
Ayar SuperNova^{TM} multi-port, multi-wavelength light source

Ayar Labs Investors

NVIDIA, hp, intel, LOCKHEED MARTIN

Consumer

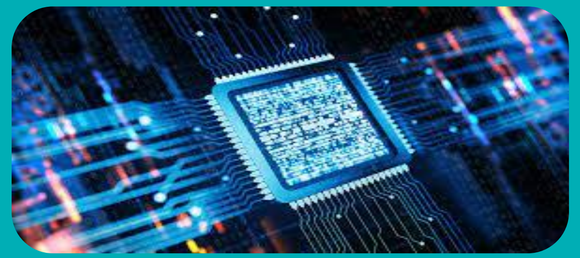
F100's Advanced Platform for Biometric Sensing



- ~$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

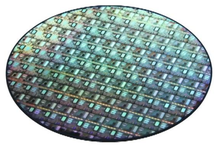
Customer Intimacy

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.

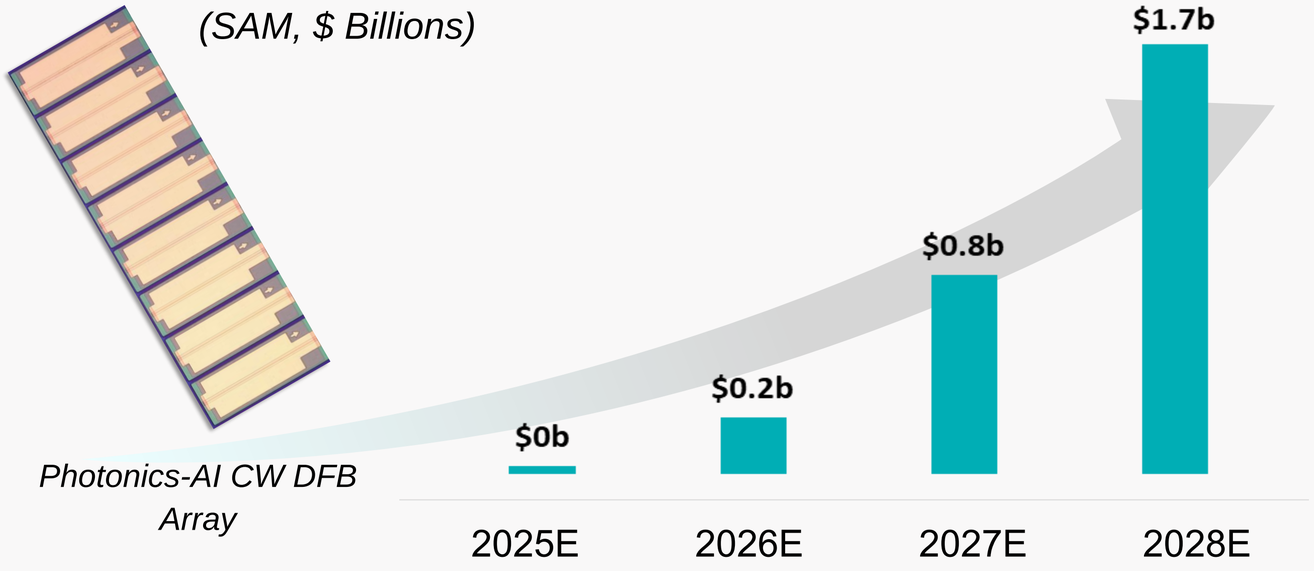
Customers

- *Unique integrated capability for laser design and fabrication.*
- *$17M Capex investment expanding wafer fab capable of $150M/yr revenue[1]*
- *External foundry engagement underway for higher volumes*

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 $1.7B+ per Year

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 GPU[2]	10	10	10	10
Illustrative Optical Penetration	0.4%	2%	6%	12%
Serviceable Addressable Market[3]	**$31M**	**$222M**	**$791M**	**$1,706**

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_aihwedgeaisummit-edgeai-aihardware-activity-7237978927896412161-PDLR?utm_source=share&utm_medium=member_desktop
3. The Optical Penetration is 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 Eco-system from Chat GPT to light source (Photonics-AI)

Bard

Meta

OpenAI

aws

NVIDIA

Hewlett Packard Enterprise

intel

AMD

MARVELL

AyarLabs

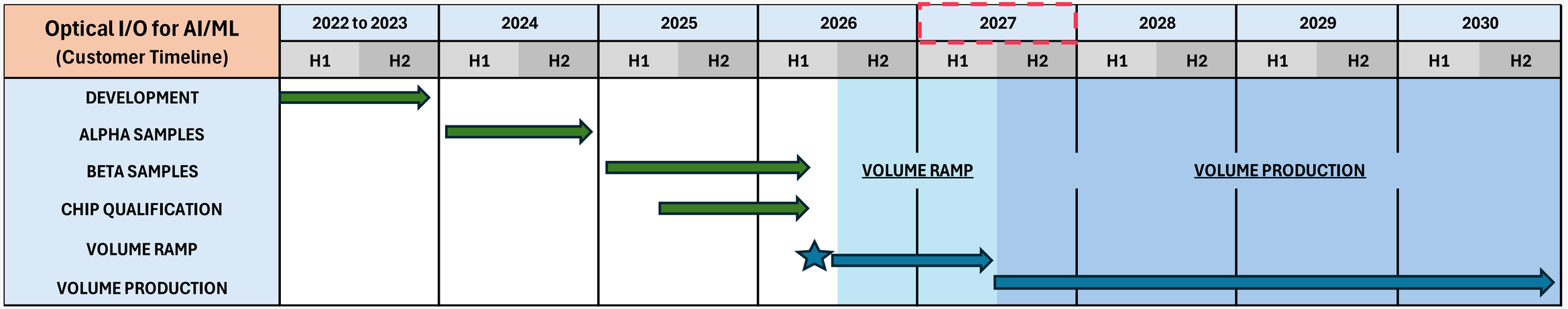
Photonics-AI

MACOM

LUMENTUM

Illustrated is a sample of the AI Eco-system

Leading Photonics Timeline Reaching Volume Production in 2027[1]



- 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

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

Robust Organization To Support Continued Growth In Place

Total HC	PhDs
80	12

Andrew McKee
MD/CTO Cofounder
(25 years)

Finance Director (5 years)	Director of Operations (14 years)	Sales Director (4 years)	Director of R&D and Device Engineering (18 years)	Quality Manager (2 years)
3 direct reports	11 direct reports Total team of 57	4 direct reports	9 direct reports	1 direct report

Significant IP Advantage Empowers Sustainable Differentiation

- IP Strategy based on 25 years of 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 to increase production capacity and profitability

Significant Funding and Valuations Throughout AI Photonics Ecosystem

Key AI Photonics Fundraising Activity

Ayar Labs

Total Funds Raised To-Date: $219M, $25M Series C in February 2023, $500M Post-Money Valuation

- 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

Hewlett Packard Enterprise, intel, Lockheed Martin, NVIDIA

celestial AI

Total Funds Raised To-Date : $339M, $175M Series C in March 2024, $1.2B Post-Money Valuation

- 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

BROADCOM, KOCH, SAMSUNG

LIGHTMATTER

Total Funds Raised To-Date : $421M, $155M Series C in December 2023, $1.2B Post-Money Valuation

- 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

Google, NVIDIA

LIGHTMATTER

Announced a $400M Series D at a $4.4B valuation today (up from $1.2B in December 2023!) October 16, 2024

Source: Pitchbook, Company websites.

Thank you