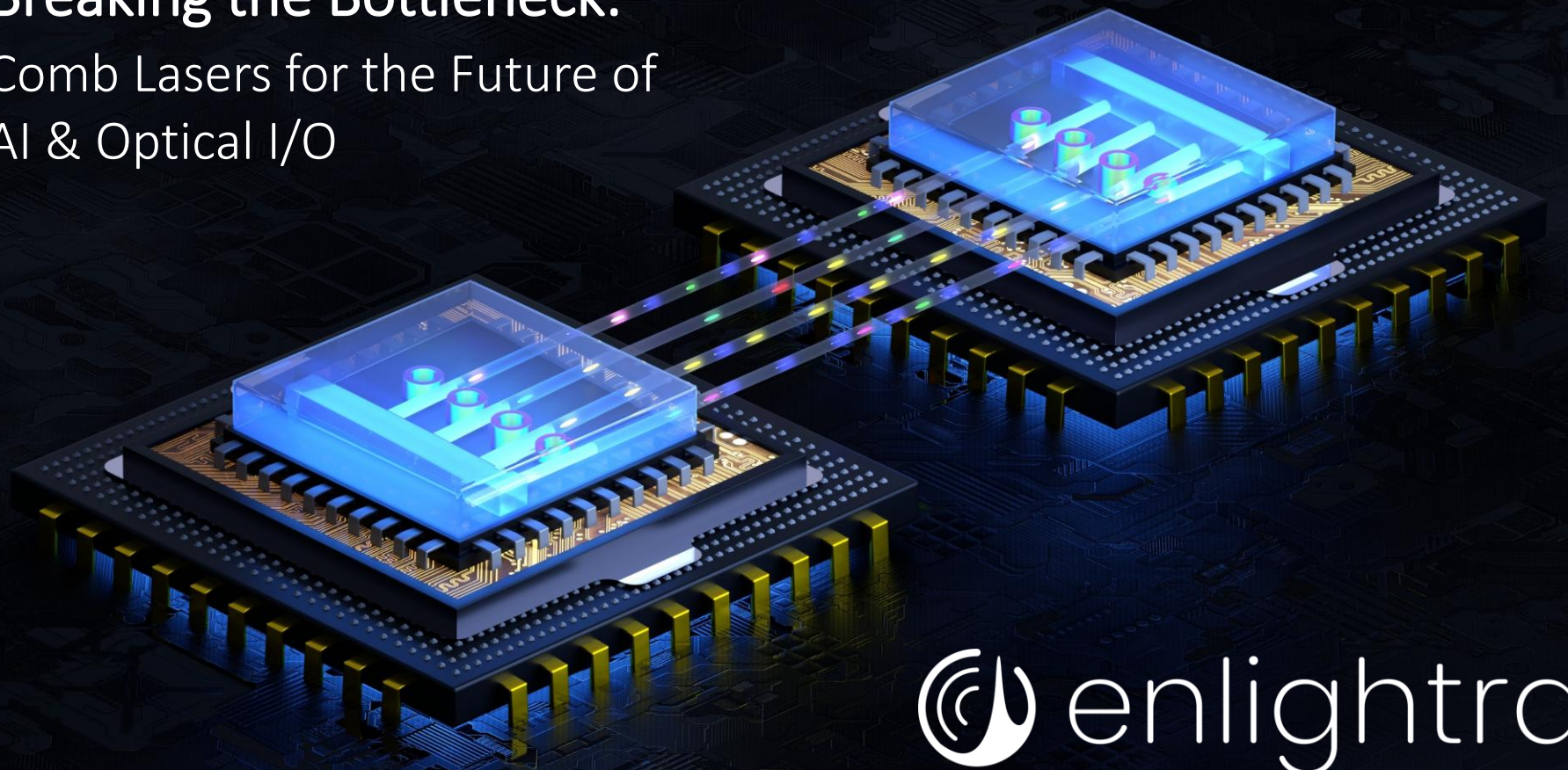
Breaking the Bottleneck:

Comb Lasers for the Future of AI & Optical I/O



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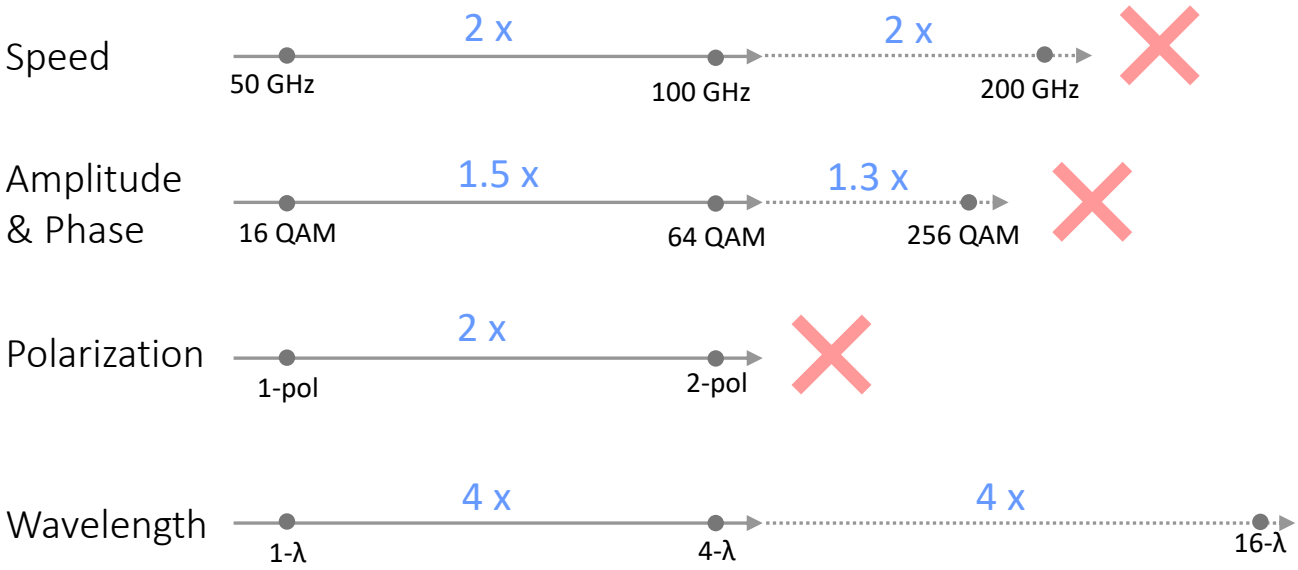
John Jost - john.jost@enlightra.com

The Need

More Bandwidth & Fewer Cables

How to Scale Bandwidth with Lasers



Adapted from a talk by NVIDIA's Ben Lee "Photonic Circuits for Accelerated Computing", ECOC 2022

NVIDIA’s NVL72

Photo: www.nvidia.com

NVIDIA's NVL72

Connecting 72 GPUs

- > 5,000 Cables
- 200 Gb/s with **~1m reach**
- 1 Pb/s

Photo: www.nvidia.com

NVIDIA's NVL72

Connecting 72 GPUs with Light

100m **reach**

10 Pb/s **of bandwidth**

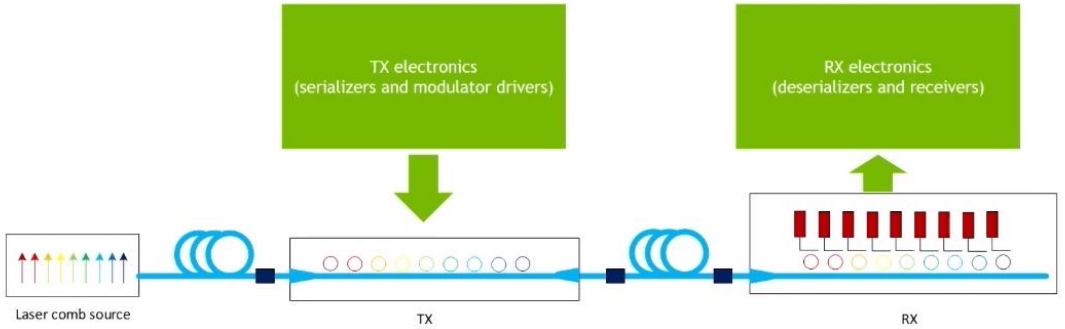
Photo: www.nvidia.com

BILL DALLY

NVIDIA, Chief Scientist & SVP Research

GPU/SWITCH DWDM ARCHITECTURE

Dense Wave Division Multiplexing



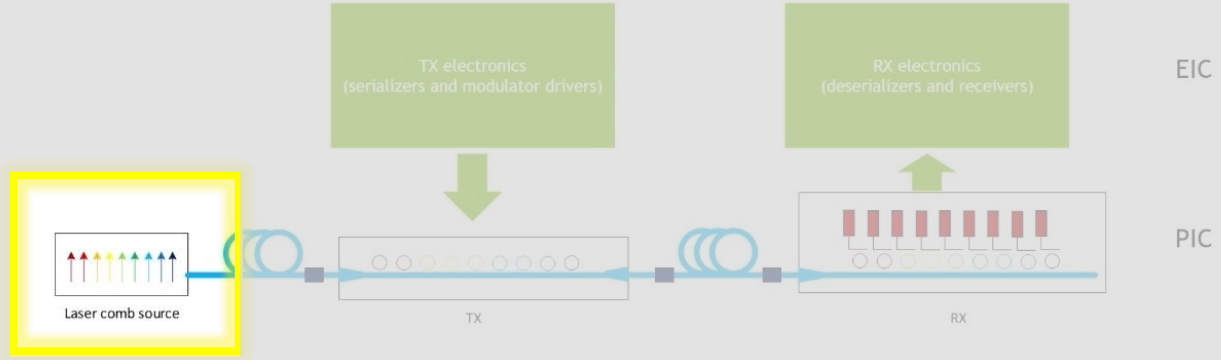
NVIDIA GTC 21

BILL DALLY

NVIDIA, Chief Scientist & SVP Research

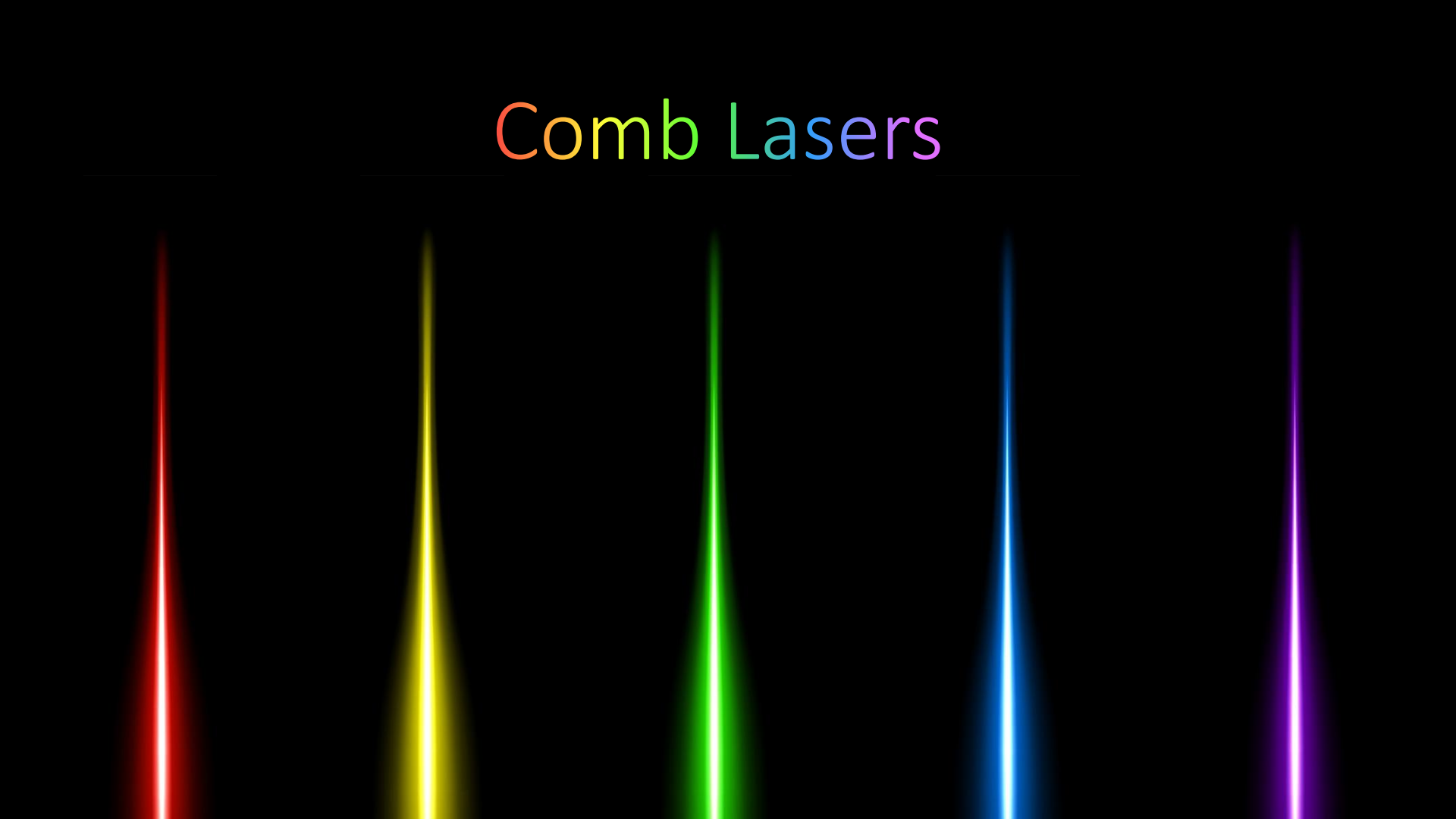
GPU/SWITCH DWDM ARCHITECTURE

Dense Wave Division Multiplexing



NVIDIA GTC 21

Comb Lasers



		Coherent Mod.	IMDD	C - band	O – Band	Linewidth	Temp. Sensitivity	Power-Per line	Line Spacing	Line Spacing Stability	Wall Plug Efficiency
Comb Lasers	Microcombs										
	Quantum Dot Lasers										
	Mode Locked Lasers										
	Gain Switched Lasers										
	Electro Optic Combs										
Laser Arrays	DFBs										

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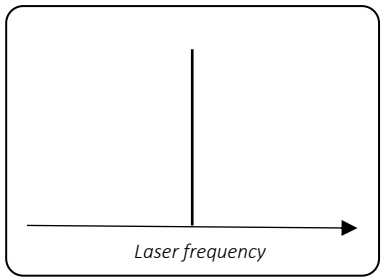
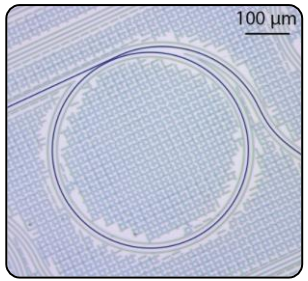
How it Works

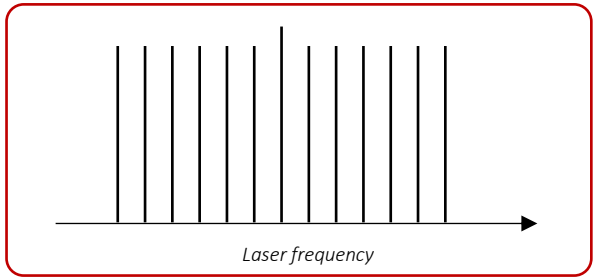
Our technology, ***microcombs***, is based on the light conversion in microresonators. Nonlinear process called four-wave mixing generates hundreds of laser channels from a single input laser:



single-frequency laser



microresonator



microcomb

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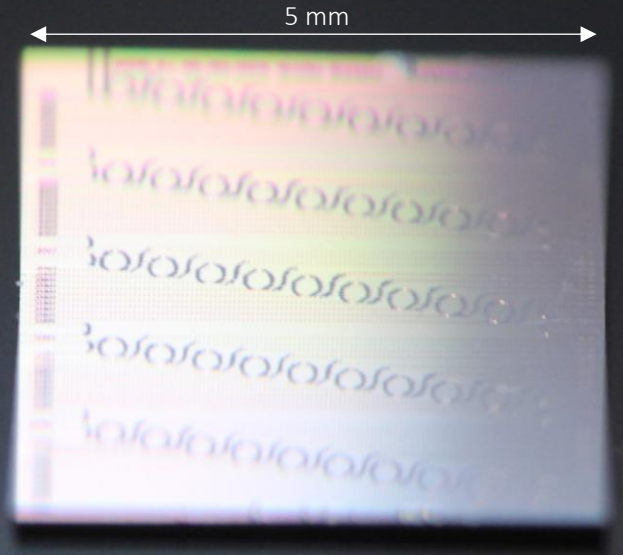
Comb Laser Platform

CW Laser



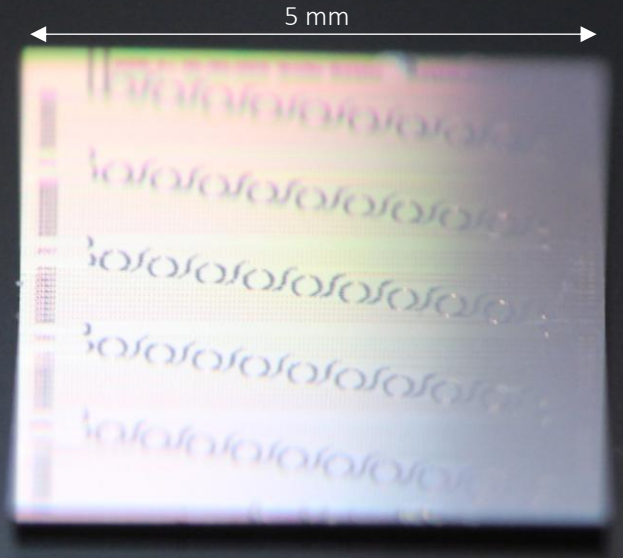
Photonic chip with microrings

- **O band – C band**
- Equal spacing **10 - 1000 GHz**
- Phase-coherent comb lines
- Common mode drift of all the lines

Confidentiel

Comb Laser Platform

CW Laser



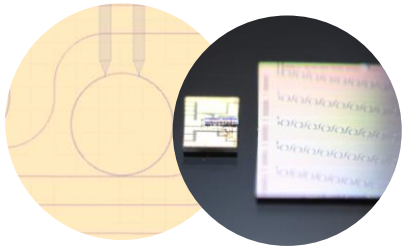
Photonic chip with microrings

- **O band – C band**
- Equal spacing **10 - 1000 GHz**
- Phase-coherent comb lines
- Common mode drift of all the lines
- **Shipping Demos Now!**

Confidentiel

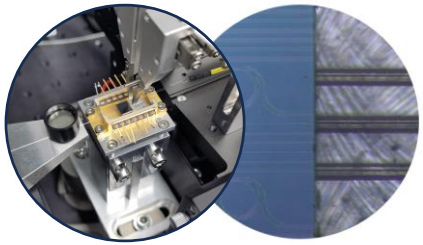
Enlightra’s tech stack

PIC – Design &Testing



- Integrated photonic portfolio - verified designed blocks
- FEM/FTDT simulations
- Broadband PIC characterization (O- and C-band)

Photonic packaging



- Proprietary PIC packaging process
- Excellent power and T° handling
- Thermal cycling and aging testing with thermal chamber

System integration

- PICs system integration into turnkey device
- Complex system-on-a-chip development with multiple photonic platforms.

Confidentiel

enlightra

- Grew from 3 to 22 employees since 2022
- Developed the first-ever commercial microcomb
- Prior business and industrial experience of the team and our advisors

intel. imec SAMSUNG EFFECT PHOTONICS

- Strong partnerships and state-of-the-art photonics

European Commission | Horizon 2020 European Union funding for Research & Innovation

Innosuisse

DARPA GRYPHON esa European Space Agency QSIT Quantum Science and Technology National Centre of Competence in Research

- Supported and baked by

Y Combinator intel ignite

John Jost - john.jost@enlightra.com