Towards mass manufacturable Terabit transceivers for the datacentre

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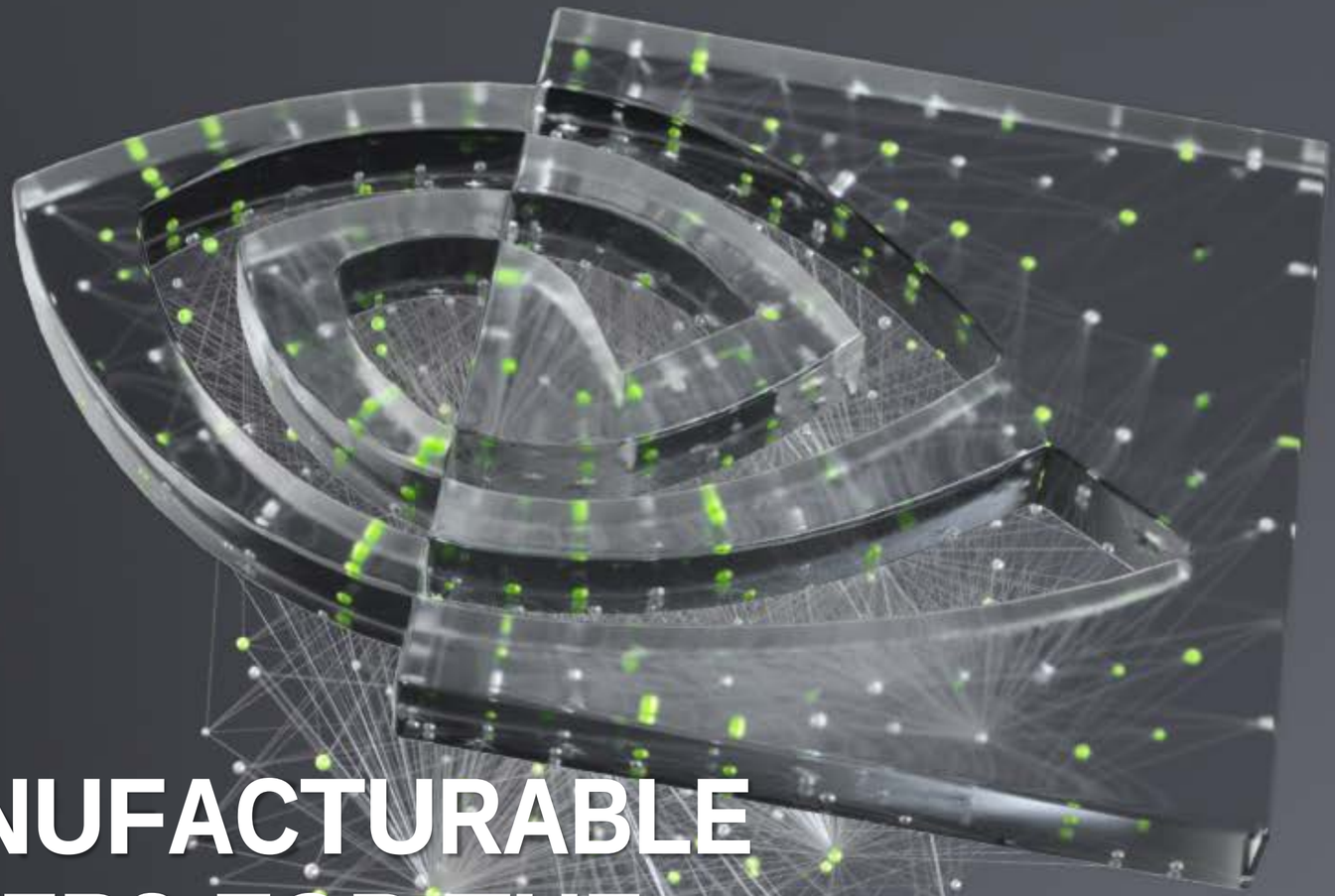
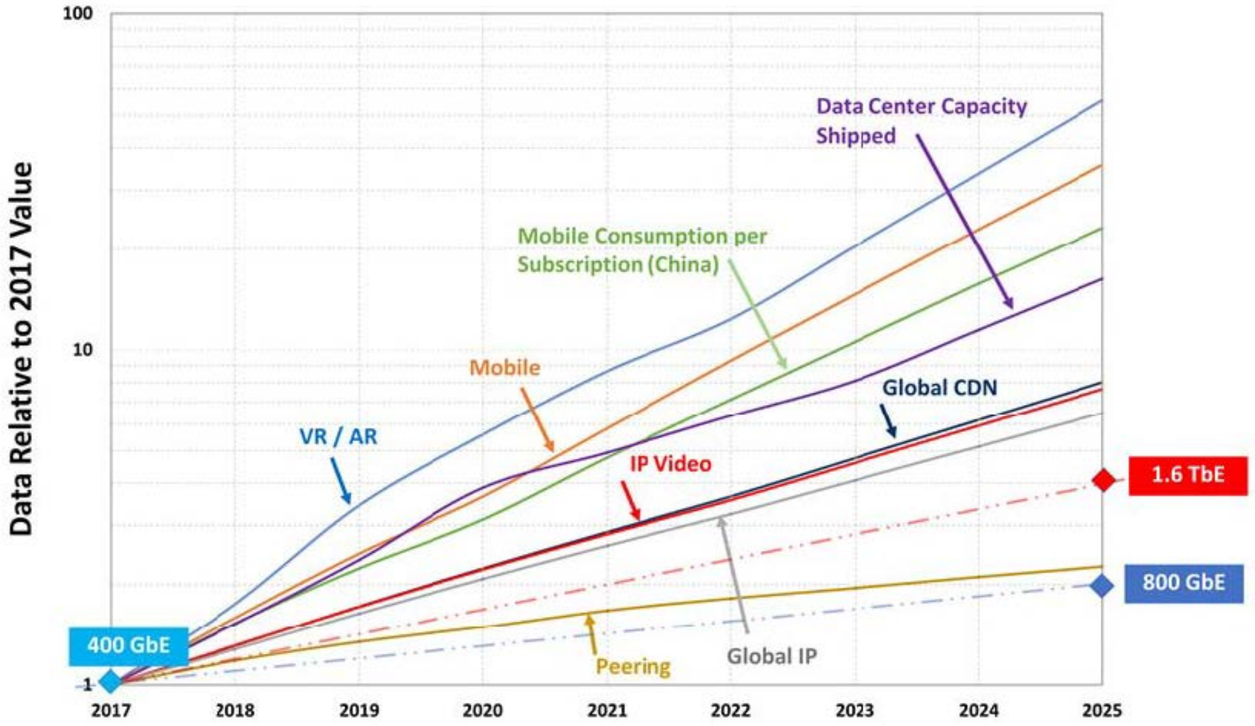
online / October 6th 2020 / 4 – 7pm

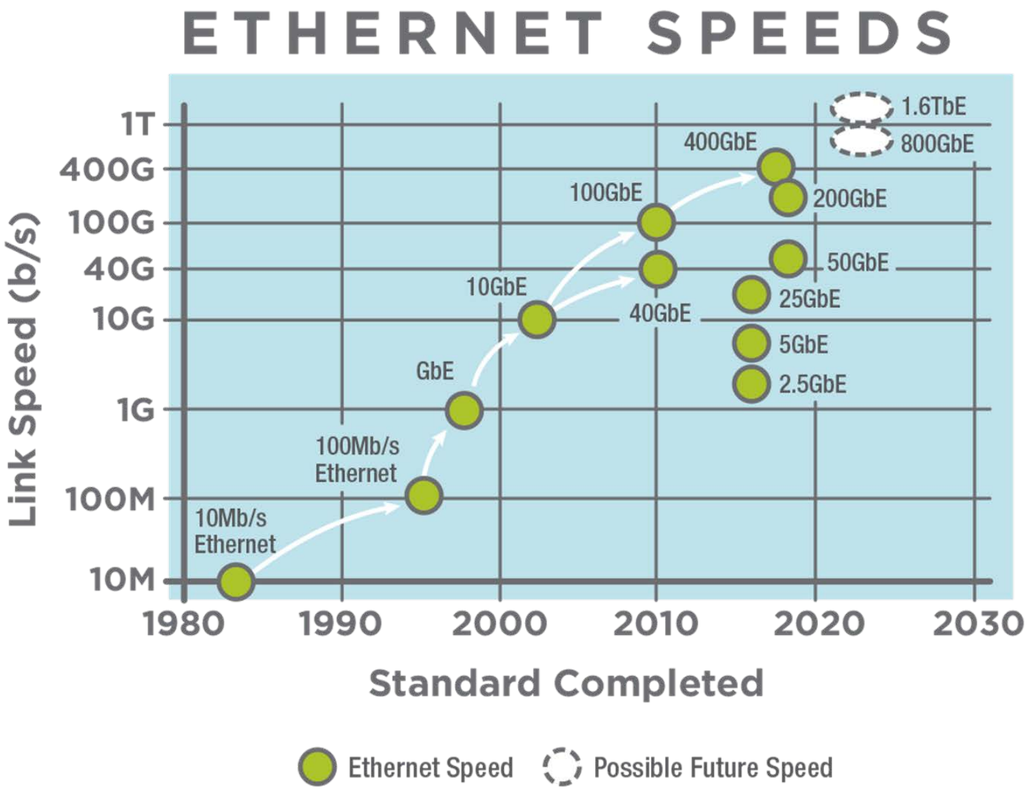


TOWARDS MASS MANUFACTURABLE TERABIT TRANSCEIVERS FOR THE DATACENTRE

Elad Mentovich, 6 October 2020

BANDWIDTH DEMAND IS GROWING





- DC bandwidth demand grows exponentially
- 400G interconnects now ramping up
- 800G and 1.6T standards & MSAs in the pipeline

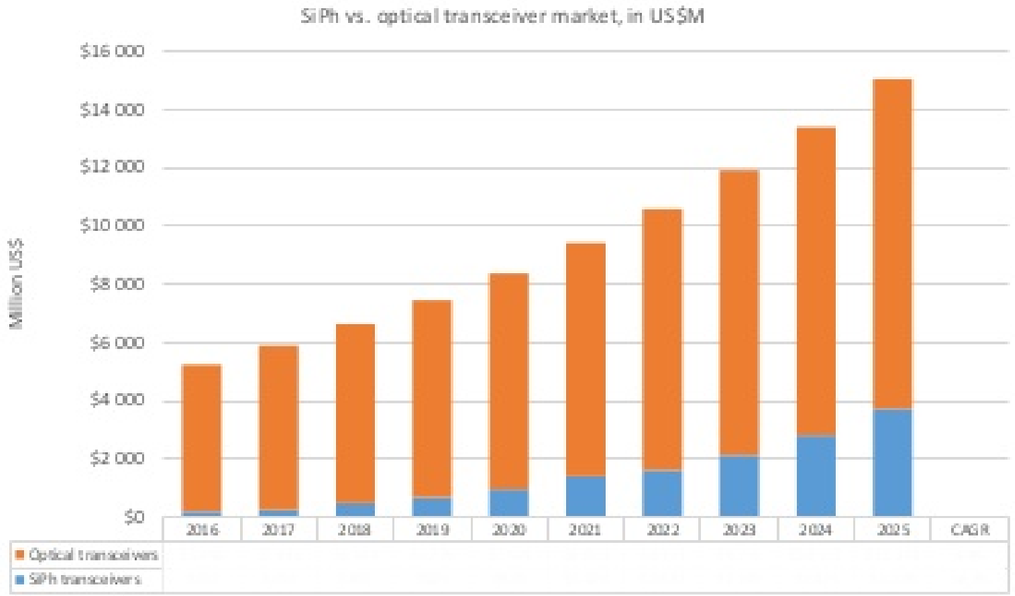
NEXT ETHERNET ERA
ethernet alliance

NVIDIA

MASS MARKET? MASS MANUFACTURING

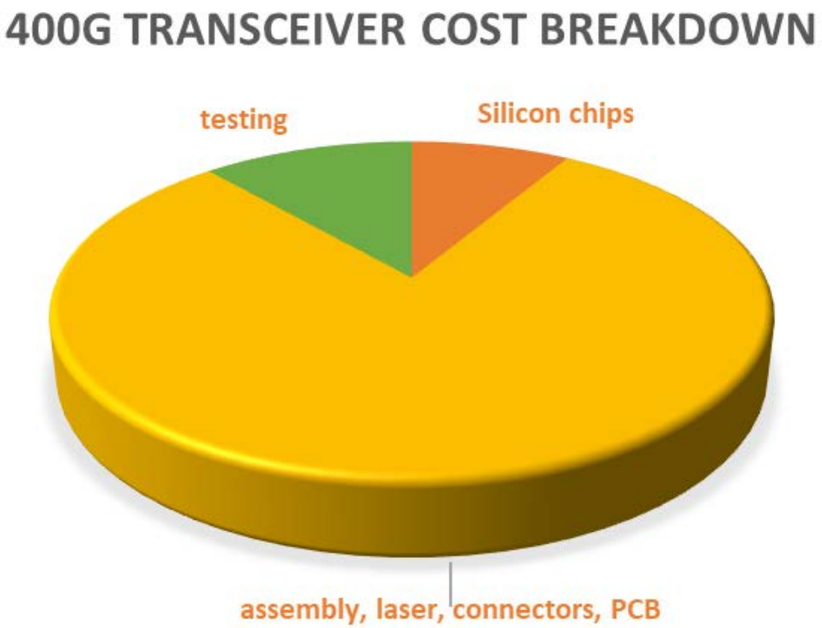
SI PHOTONICS VS. LEGACY OPTICAL TRANSCEIVER FORECAST, IN VALUE

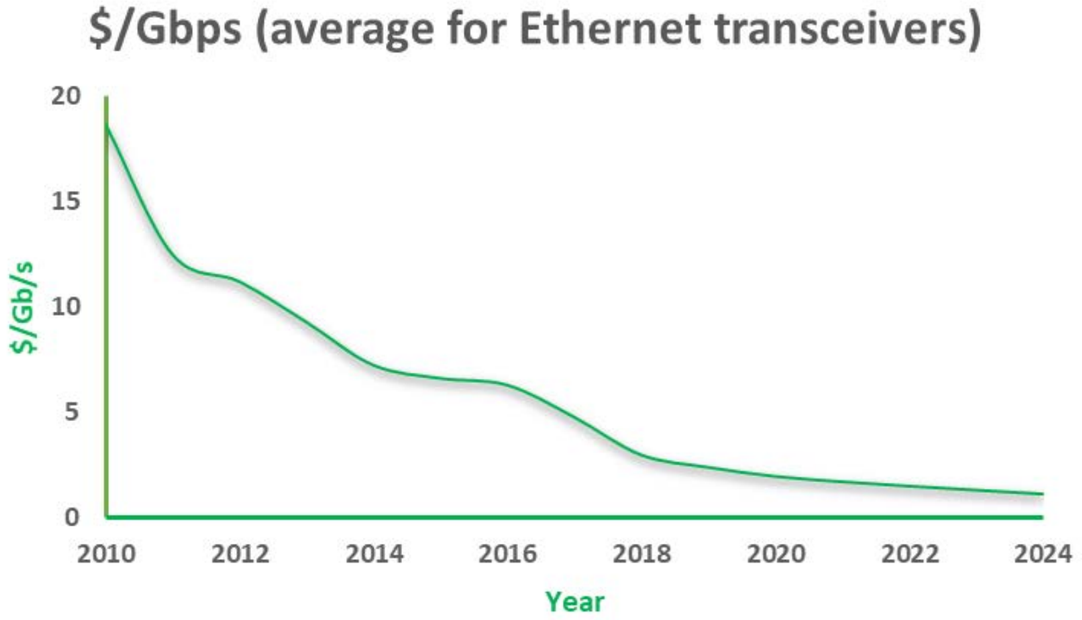
The Si photonics transceiver market is growing faster than the total optical transceiver market



- Transceivers are turning into a multi-Bn market
- Reaching critical mass to leverage cost savings of silicon photonics (10s M units)

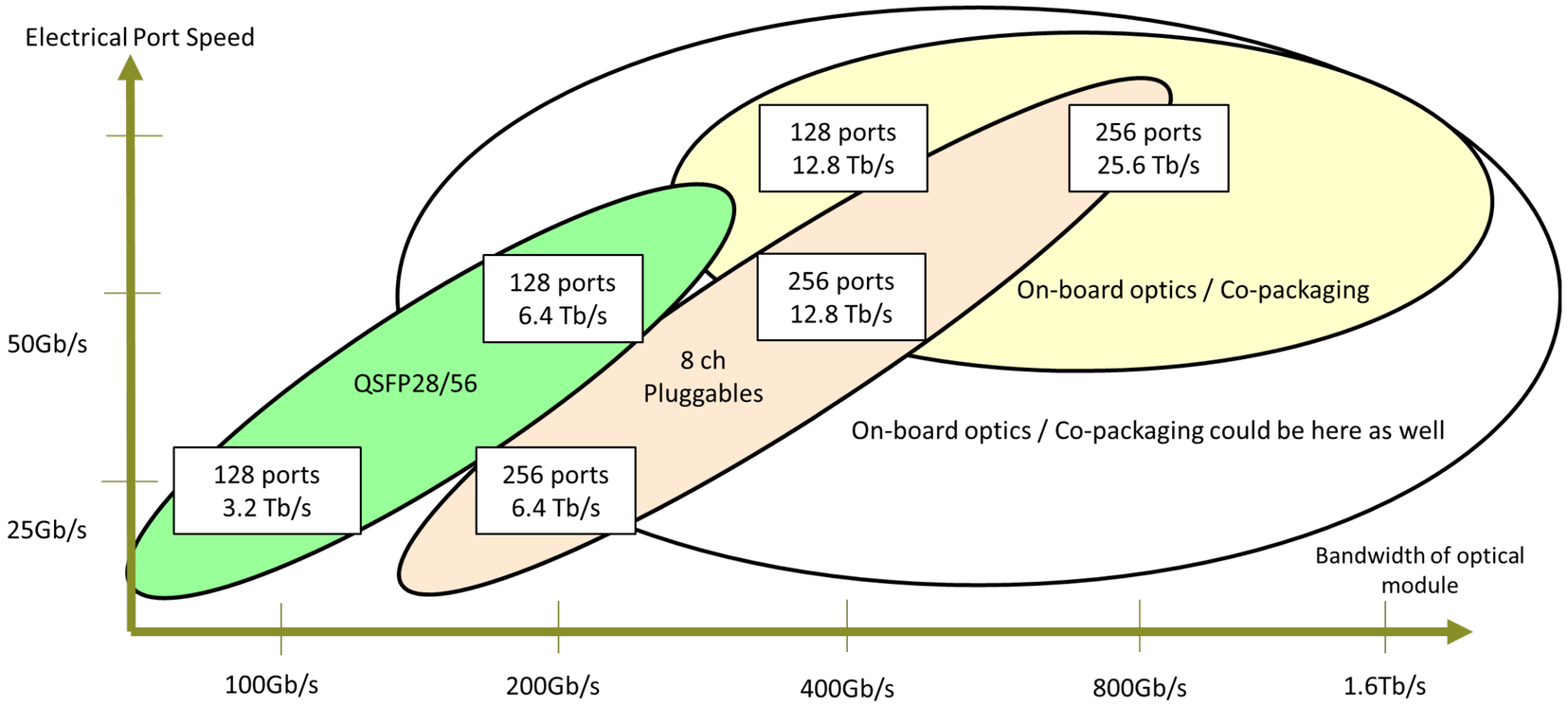
THE PACKAGING CHALLENGE





- Transceiver costs are dwarfed by assembly & packaging costs
- Cost/bit drops to enable deployment of new generation transceivers
- Existing scaling model relies on low-wage production
- Current approach reaching its limits

THE ROAD TO TERABIT/S TRANSCEIVERS



- 100G/lane optics now ramping up
- 100G electrical ports introduced (100G SERDES)
- Speed evolution paradigm:
  - increase #lanes with existing optics
  - move to higher speed/less lanes
- 800G modules (25.6T switches) will use pluggables
- Terabit modules will migrate to new form factors

NEXT-GEN TRANSCEIVER WISHLIST

...addressed by MASSTART project

- Integration density
- High temperature operation
- High channel count
- Mass manufacturability

MASSTART 300mm Silicon Photonic platform

- Compatibility with advanced assembly techniques

MASSTART SiPh TSV capability

- Low-loss/high count optical I/Os

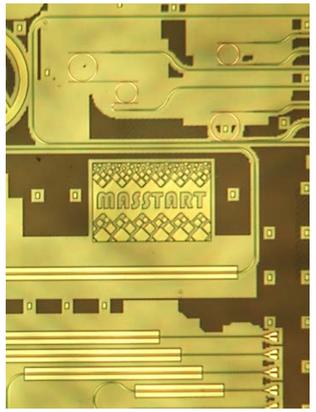
SiPh in-plane & vertical couplers, dense WAFT fanouts

- High-TRL laser assembly

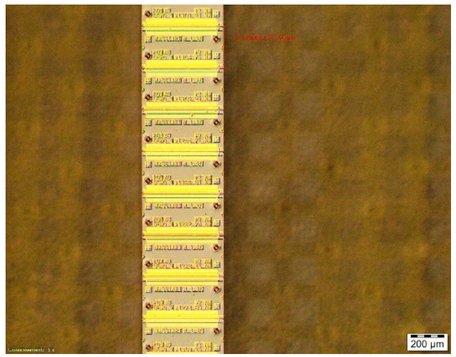
Silicon bench and assembly process with tight alignment tolerances

MASSTART OVERVIEW

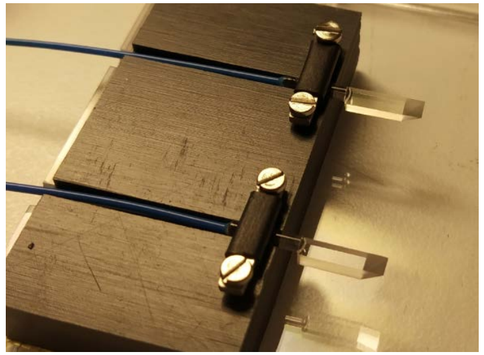
innovation across the value chain



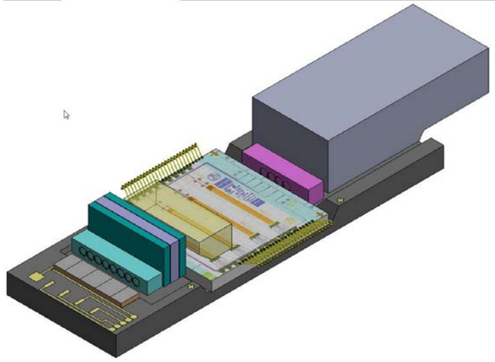
CEA-Leti 50 Gbaud Silicon Photonics



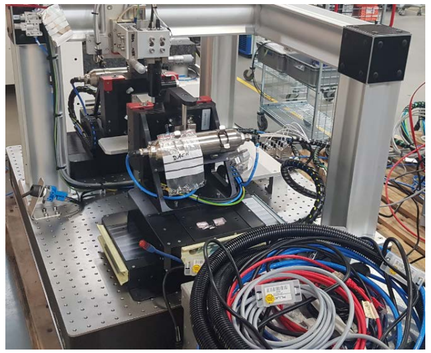
ALMAE laser arrays



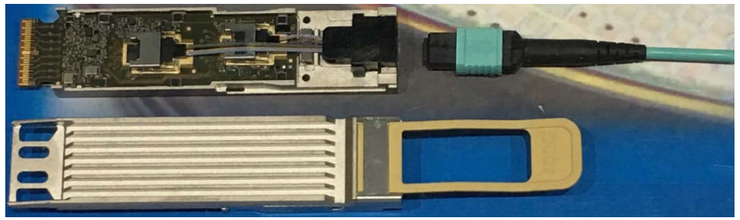
TEEM WAFT



DUST silicon bench



FICONTEC & Tektronix automation



NVIDIA Networking integration

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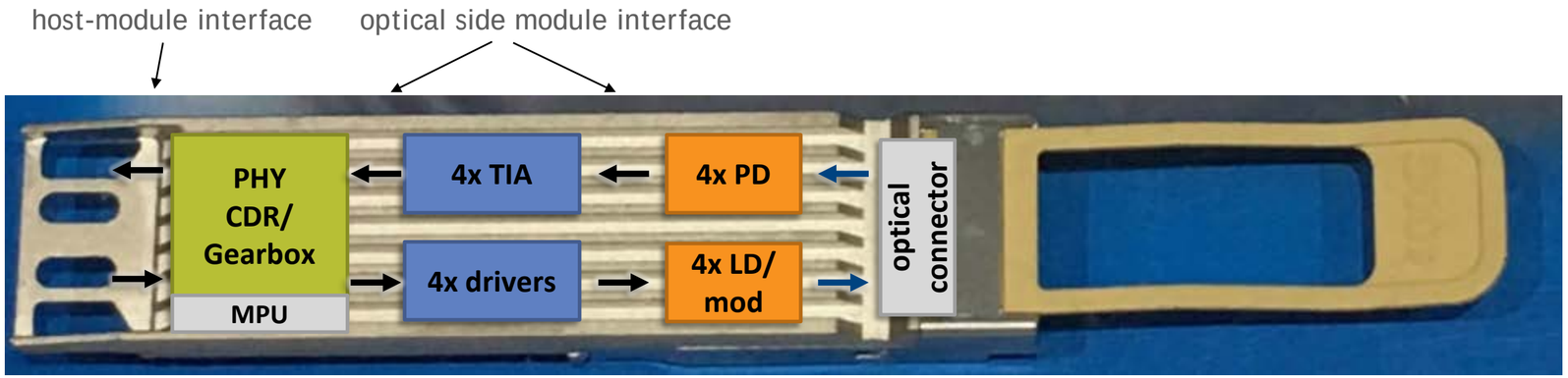
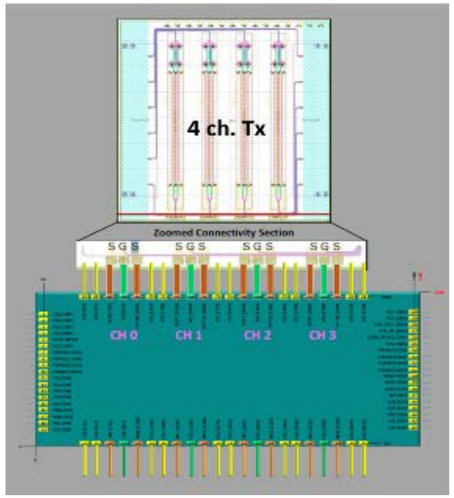
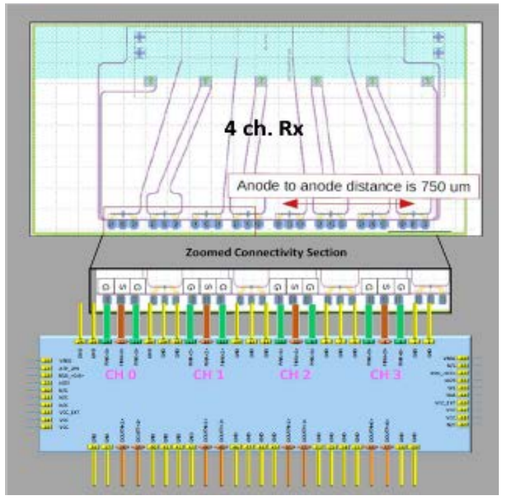
MASSTART PROTOTYPE 1

Pre-alpha 400GBASE-DR4 transceiver



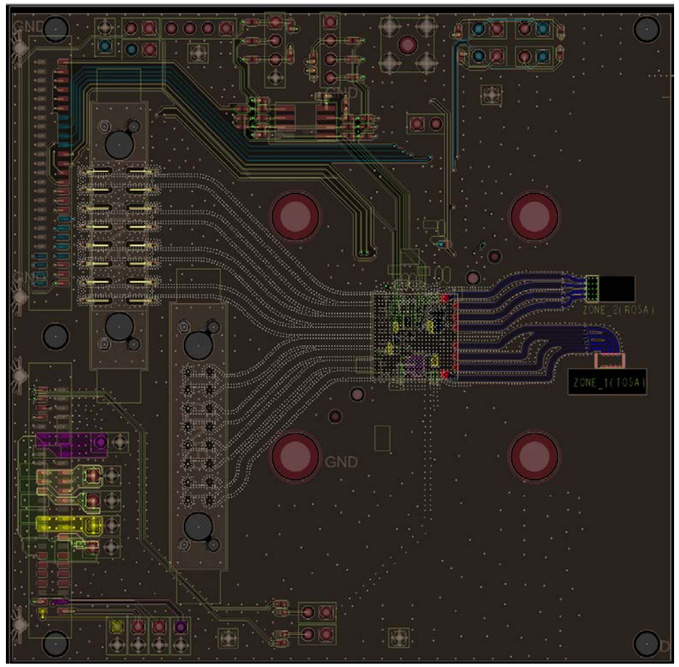
- 8x 50 Gb/s PAM4 electrical interfaces
- 4x 100 Gb/s PAM4 optical lanes
- “grey” optics (no WDM)
- commercial electronics (showcase industrial relevance)





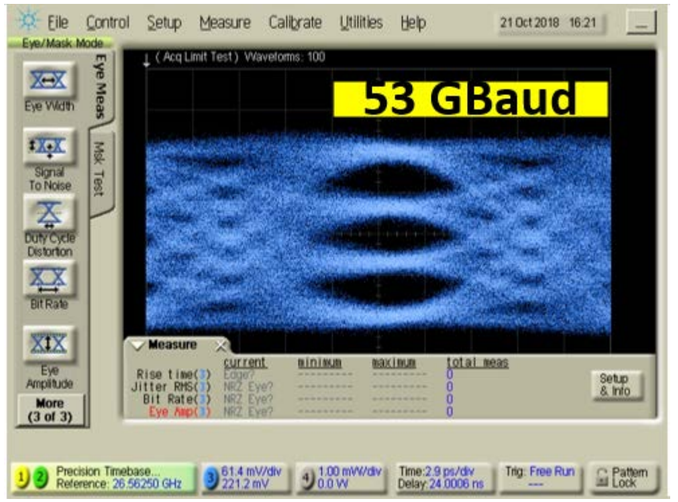
MASSTART PROTOTYPE 1

Pre-alpha 400GBASE-DR4 transceiver - progress



EVB platform layout

- Floorplans designed for QSFP-DD and OSFP form factor
- Layout for an open platform EVB designed
- DSP platform tested and modelled
- SiPh chips in fab, assembly starting Q1 2021

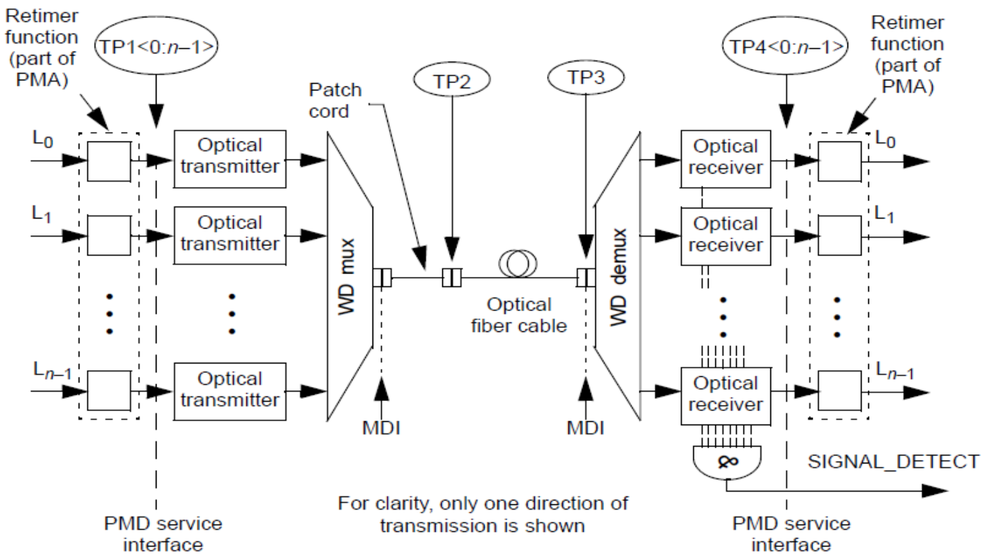


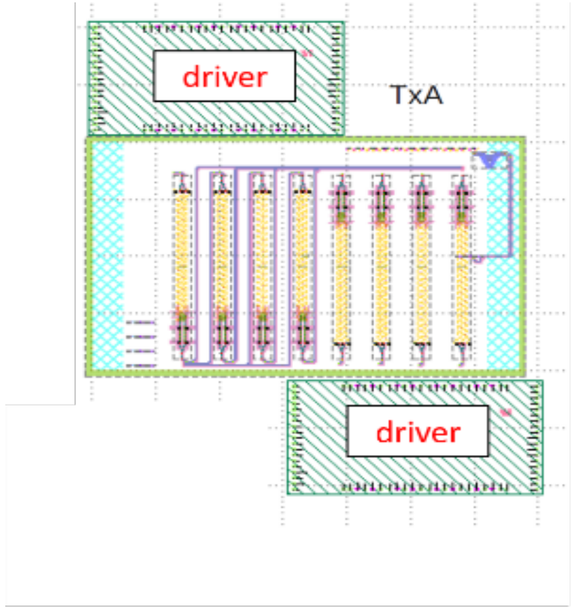
53 Gbaud signal @DSP

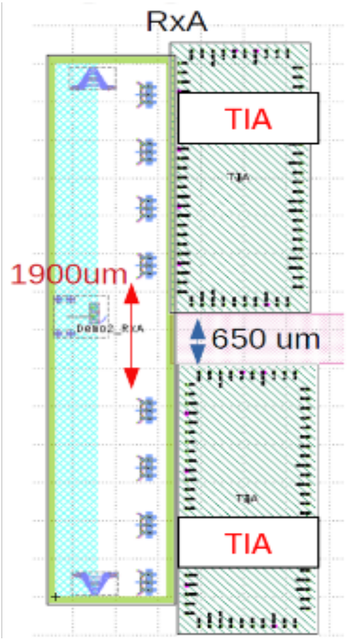
MASSTART PROTOTYPE 2

800G 8-lane transceiver

- 8x 100 Gb/s PAM4 optical lanes
- LAN WDM optics (800 GHz)
- Commercial electronics
- EVB platform targeting pluggable/on-board optics



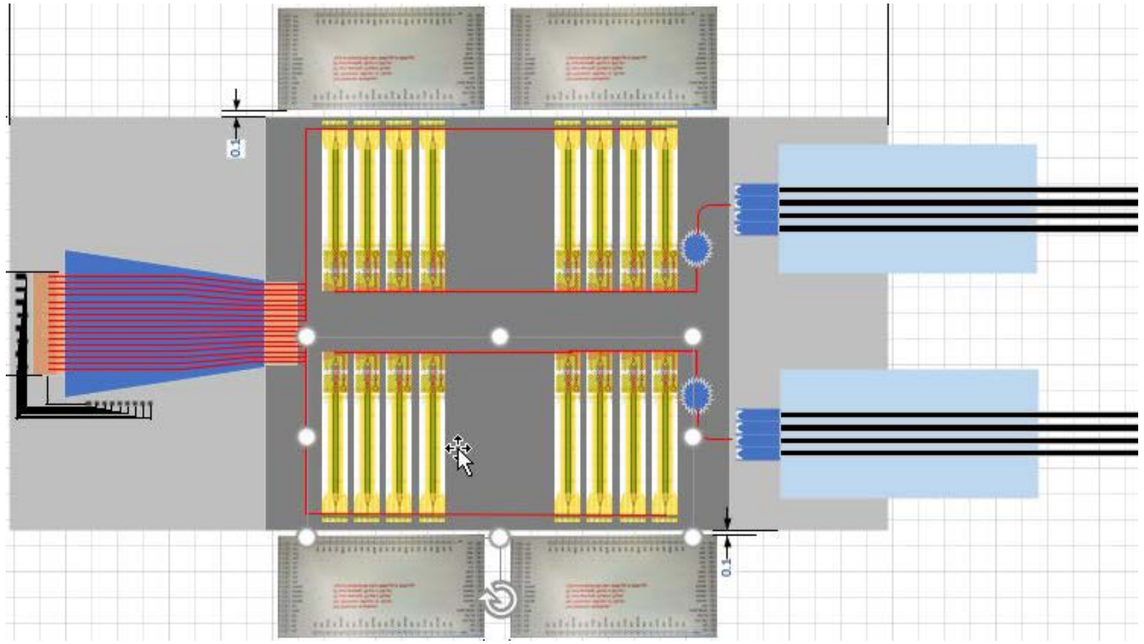




MASSTART PROTOTYPE 3

1.6T 16-lane transceiver

- 16x 100 Gb/s PAM4 optical lanes
- LAN WDM optics (800 GHz): 2x 8λ grid
- Focus on scalability: WAFT interface for dense optical I/Os
- EVB test platform



CONCLUSIONS

- Silicon photonics becoming increasingly relevant for short-reach low-cost transceivers
- Dramatic reductions in assembly and packaging cost needed to meet targets
- MASSTART is developing an end-to-end solution for mass-manufacturable SiPh transceivers
- MASSTART demonstrators validate the technology in broad deployment scenarios
  - 400G pluggable transceiver
  - 800G EVB for pluggable / on-board optics
  - 1.6T EVB for on-board / co-packaged optics

ACKNOWLEDGEMENTS

https://masstart.eu/

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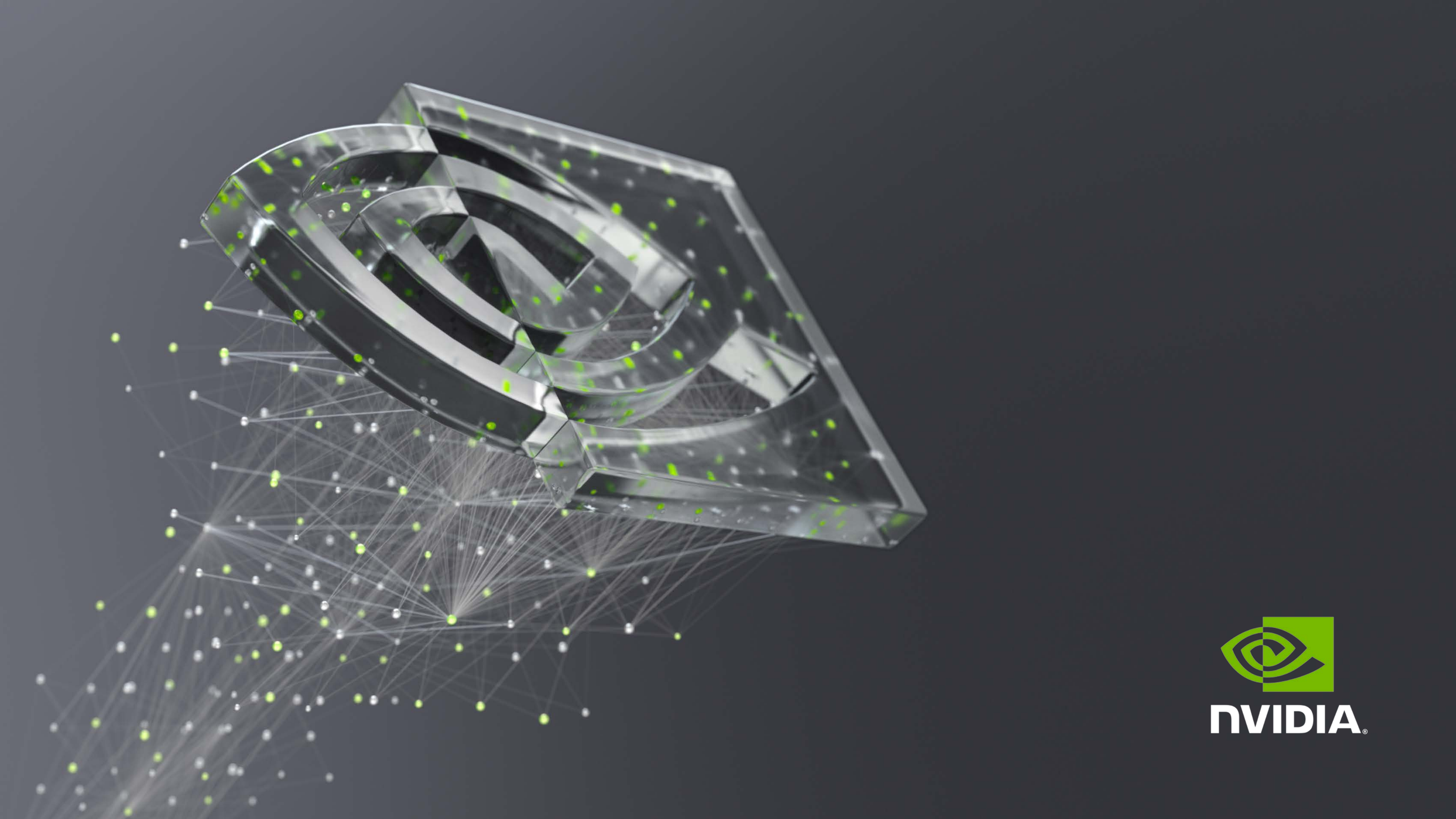
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MASSTART project is an initiative of the **Photonics Public Private Partnership** www.photonics21.org

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