



H2020 PASSION project technological solutions enabling multi-Tb/s transmission

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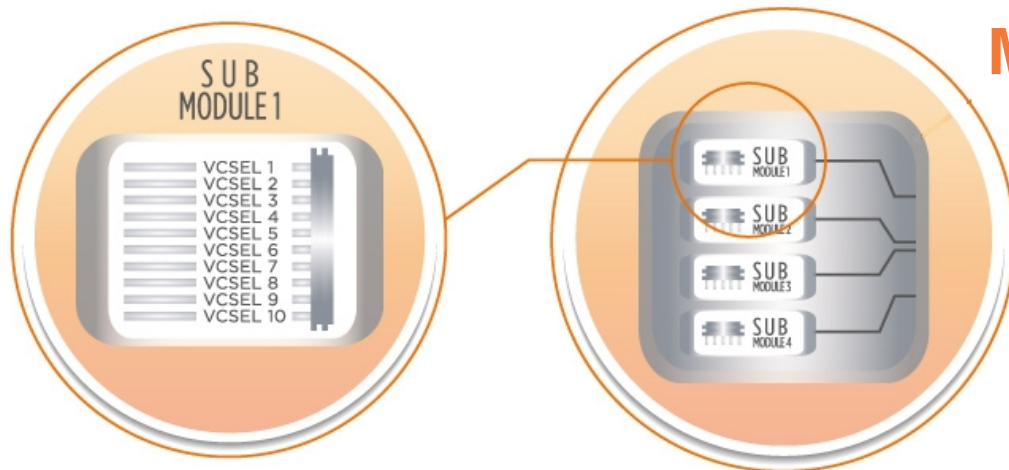


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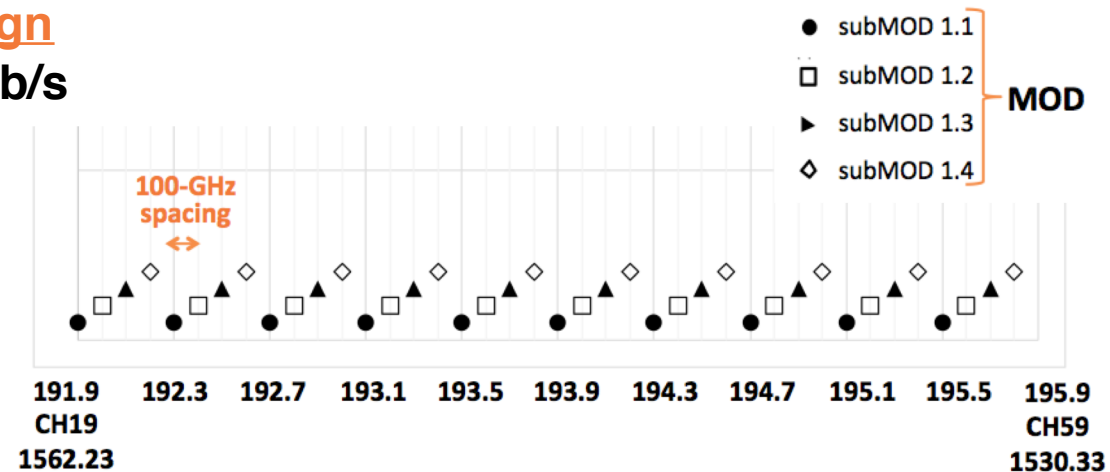
PASSION technological approach

PASSION sliceable bandwidth/bitrate variable transceiver (S-BVT)

- Low-cost energy-efficient directly-modulated sources:
High-bandwidth **InP** long-wavelength **VCSEL** sources
- Direct modulation format:
DMT (or **PAM4**) to achieve at least **50 Gb/s** per VCSEL per **SOP**
- Dense WDM:
100-GHz spaced channels covering the C band
- SiPh platform for massive integration with modular design
40-VCSEL module on SOI chip with aggregated capacity up to **2 Tb/s**

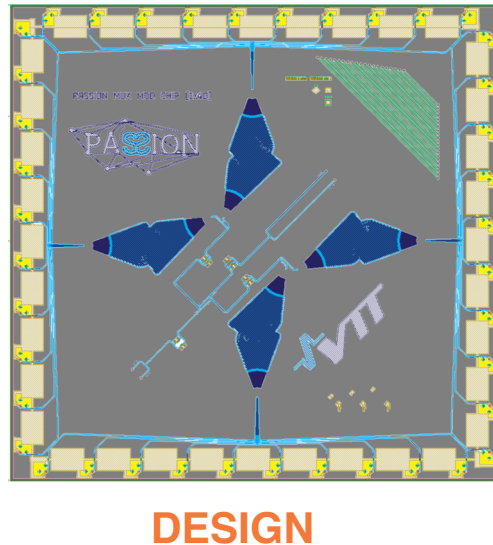
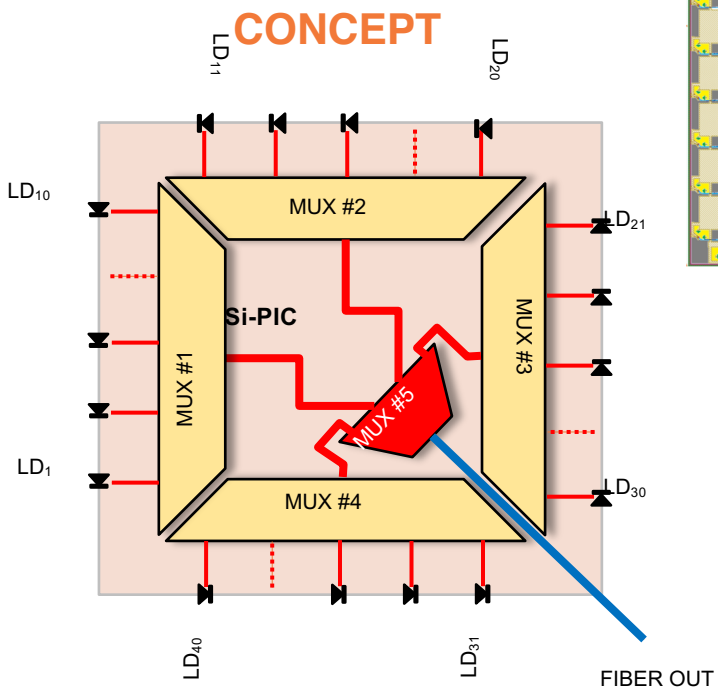


MODULE
enabling
up to
2 Tb/s



SiPh PASSION TX module development

- 1 x SOI PIC embedding 40 100-GHz spaced channels and λ multiplexers
- 40 long-wavelength VCSELs
- 40 linear driver chips

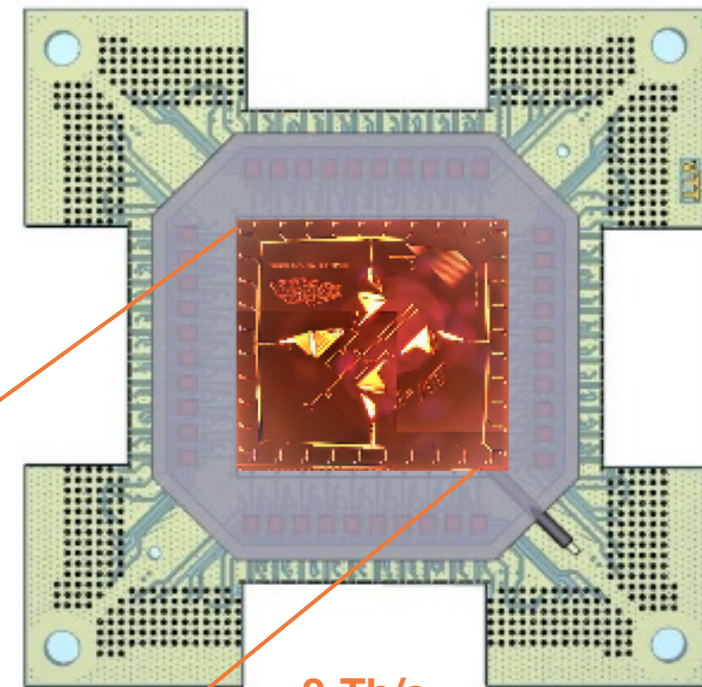


VTT

SiPh CHIP



- Chip size: **4 cm²** for **2-Tb/s capacity**



**2-Tb/s
MODULE**

- Optical chip power consumption around **5 pJ/bit**



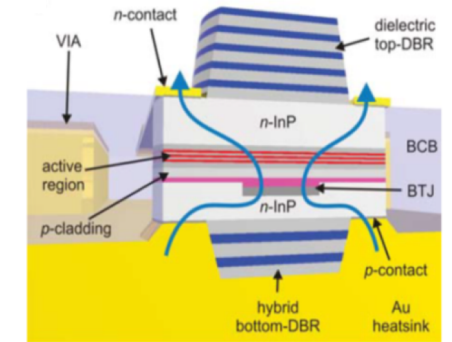
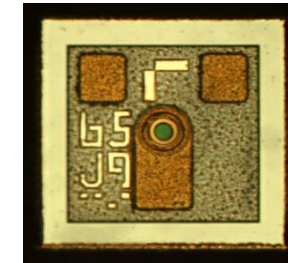
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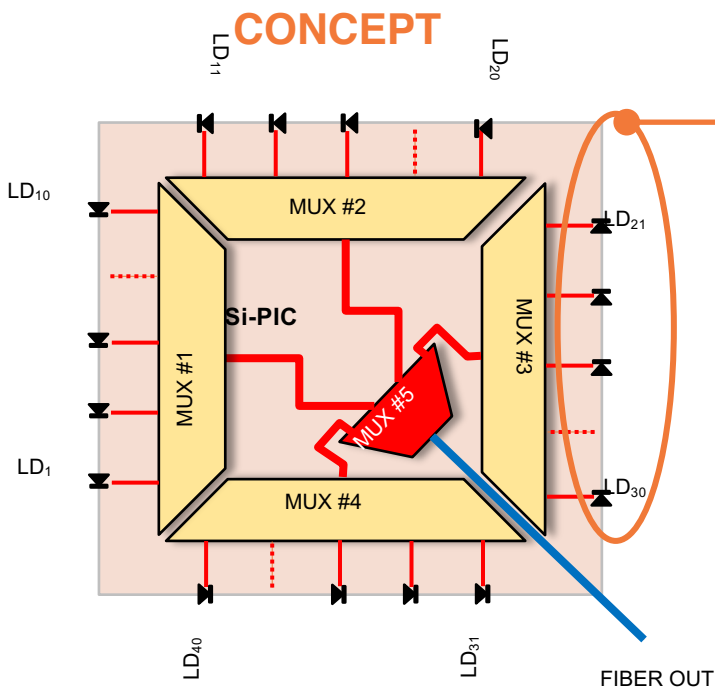
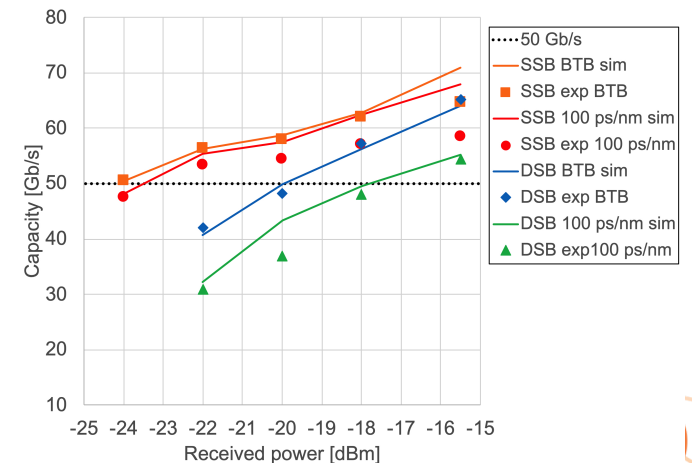


10 InP VCSELs on each side

- single-mode operation
- C-band emission
- high bandwidth (target ≈ 20 GHz)
- optical output power (≈ 4 mW)
- power consumption (< 35 mW)
- layout optimized for flip chip bonding
- wavelength tuning capability (3-4 nm)



demonstrated **beyond 50 Gb/s**
overall capacity per VCSEL
at **< 30 -mW consumption**
thanks to **DMT**



PASSION technological approach

MODULARITY:

➤ 2-Tb/s 40-VCSEL MODULE tuning

λ tuning by temperature in a range of 0-75 GHz

➤ Aggregation of the outputs of 4 identical tuned MODULES with external inter-leavers

160-channel SUPER-MODULE in the C-band with **25-GHz** spacing assuring up to **8-Tb/s** capacity per **SOP**

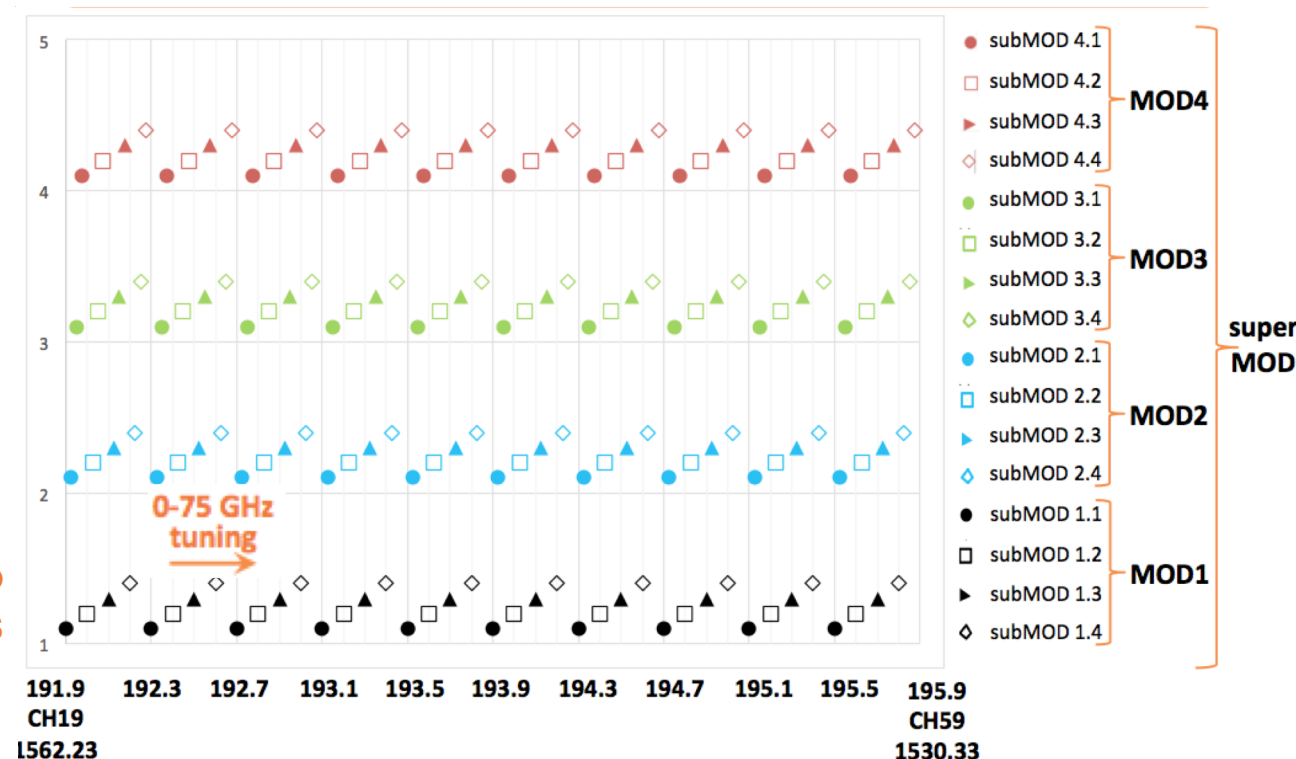
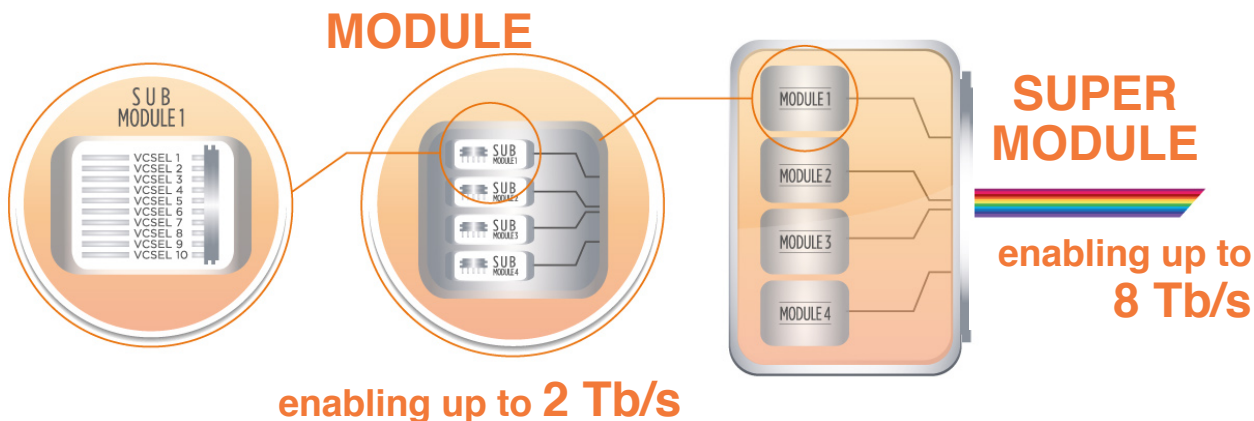
➤ Polarization-division multiplexing exploitation

Up to **16-Tb/s** capacity guaranteed

With **spatial multiplexing** more than **100 Tb/s** per link

➤ Simplified coherent detection

Chromatic dispersion compensation for **hundreds km** reach



PASSION synergy

➤ **PASSION** team is developing innovative photonic technologies sustainable in terms of *cost, energy-consumption and footprint*. These technologies are focused in particular for *metro network*, but they are suitable to be exploited also in other *short and medium reach applications* (i.e. intra/inter-datacenter connections, enterprise networks, LANs, 5G x-haul network), also for architectures targeting the O band.

- **PASSION** team is open to collaborate:
- to test the PASSION components and devices in different kinds of applications and/or field-trials
 - to check in the PASSION test-bed other components and devices useful for the achievement of PASSION approach



<http://www.passion-project.eu/>

Photonic technologies for programmable transmission and switching modular systems based on Scalable Spectrum/space aggregation for future agile high capacity metro Networks

HORIZON 2020

PHOTONICS²¹
PHOTONICS PUBLIC PRIVATE PARTNERSHIP