

LIGHTCOUNTING

Update to market adoption of Co-Packaged Optics (CPO)

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July 19, 2022

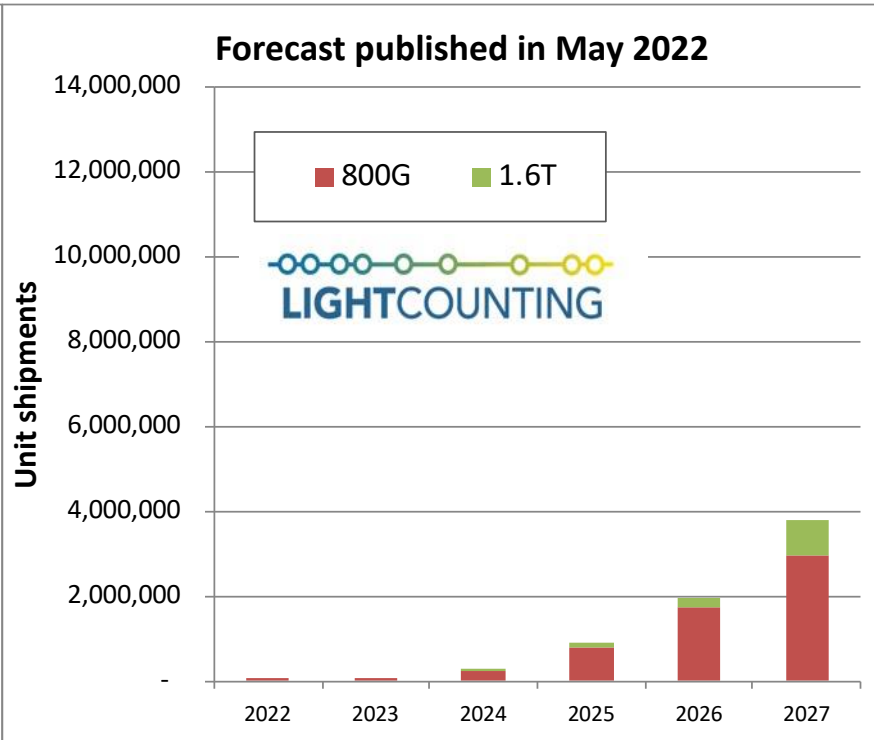
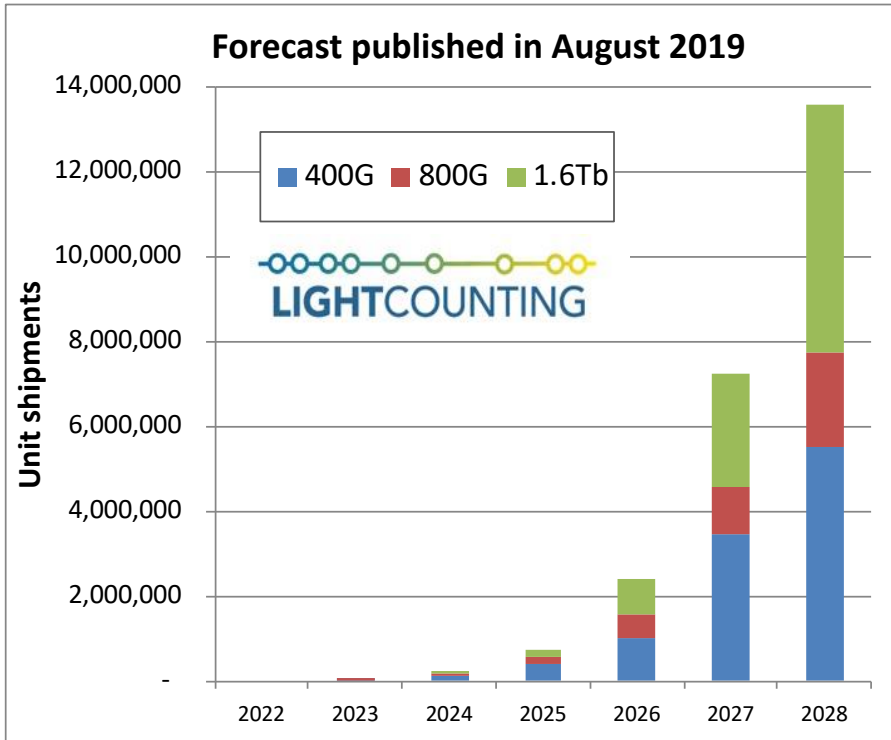


POWER COMPARISON



Changes in Forecast for CPO (by data rate)

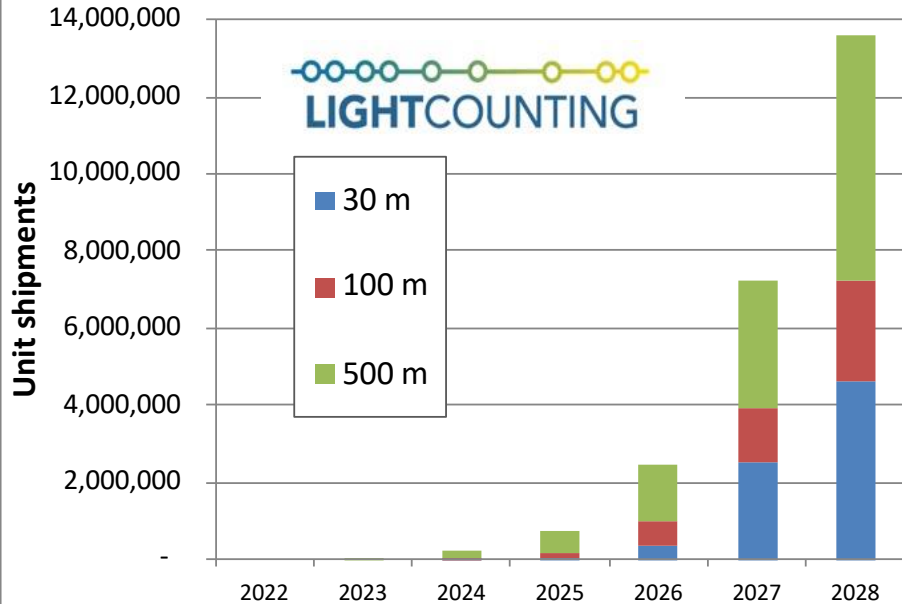
This is why we do not publish forecasts for the next 10 years



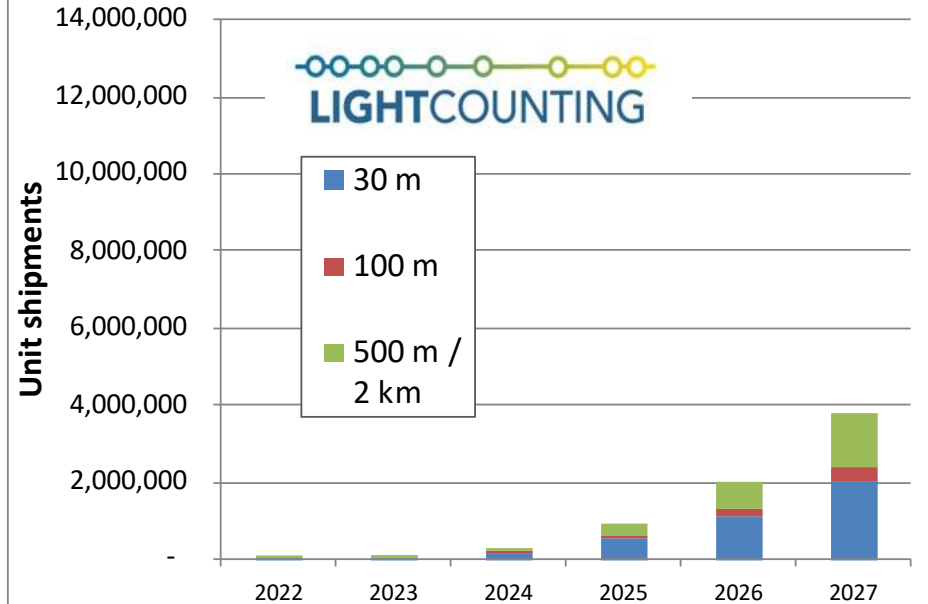
Changes in Forecast for CPO (by reach)

This is why we do not publish forecasts for the next 10 years

Forecast published in August 2019

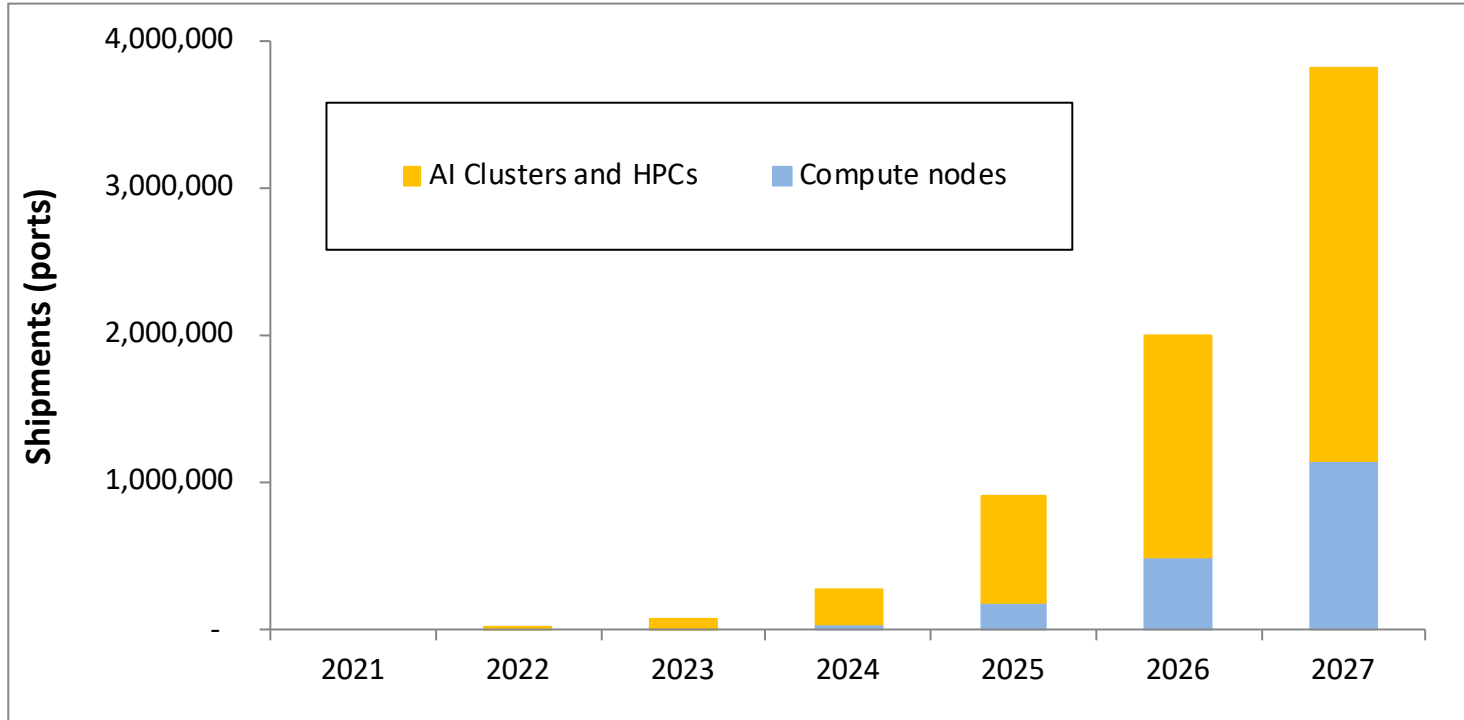


Forecast published in May 2022

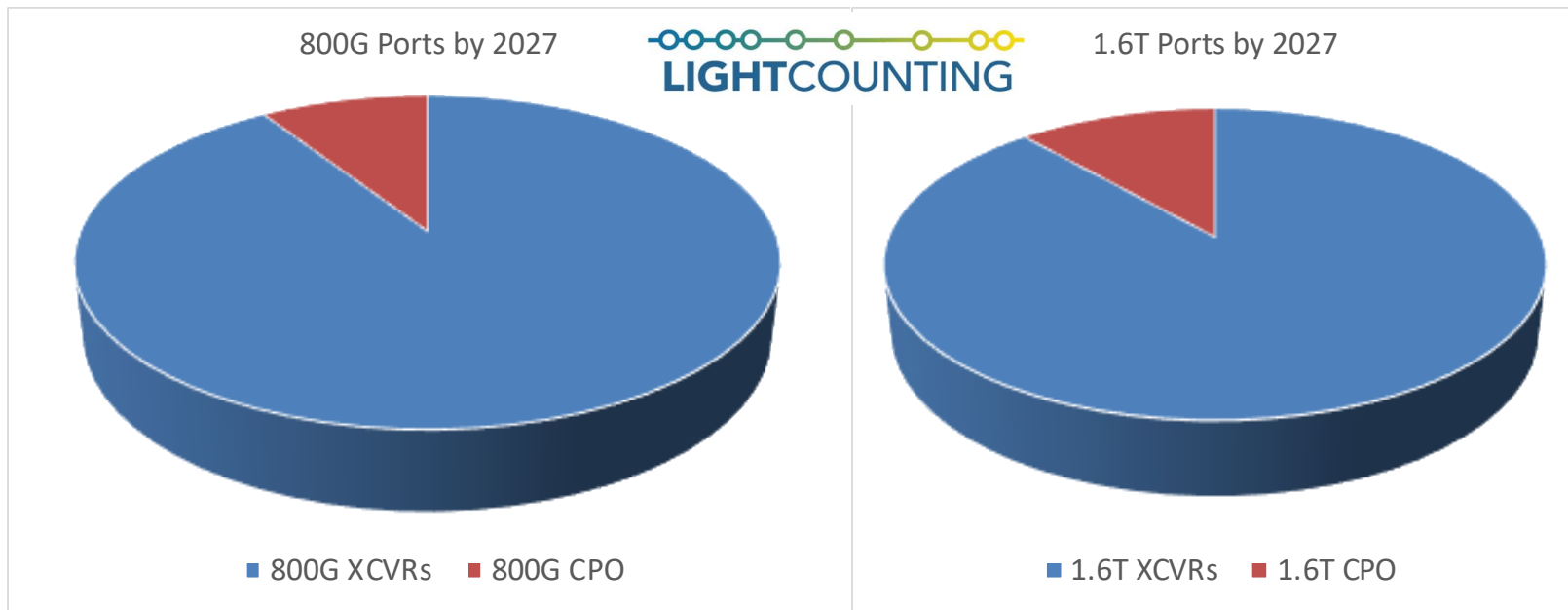


CPO Forecast by Application

AI Clusters and HPCs are more open to adoption of new technologies



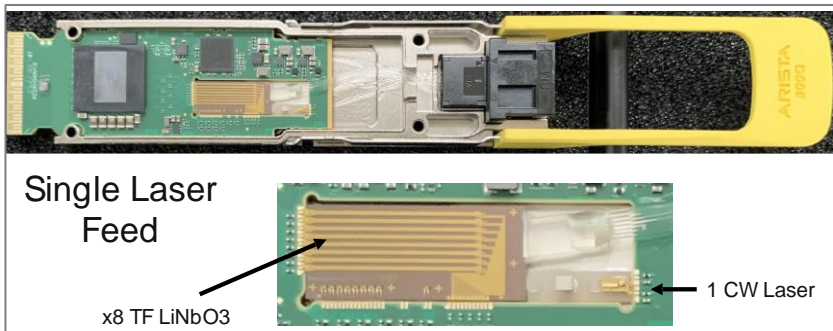
CPO will make a minor impact on the market even by 2027, but pluggable transceivers will need more E/O integration



Source: *High-Speed Ethernet Optics report - March 2022*

It will not be all Silicon Photonics

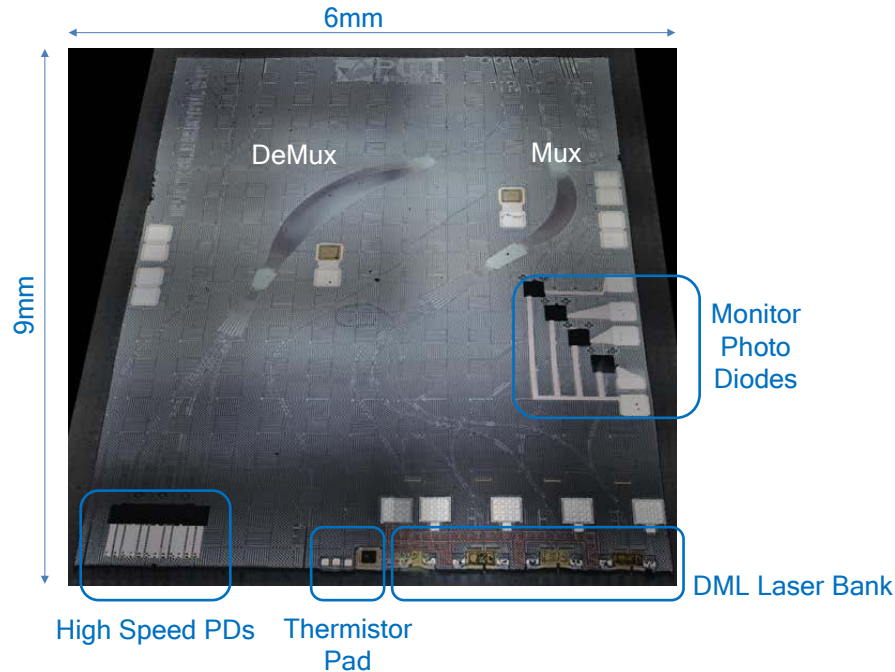
Selected demos at OFC 2022



Source: Arista, Eoptolink and Hyperlight

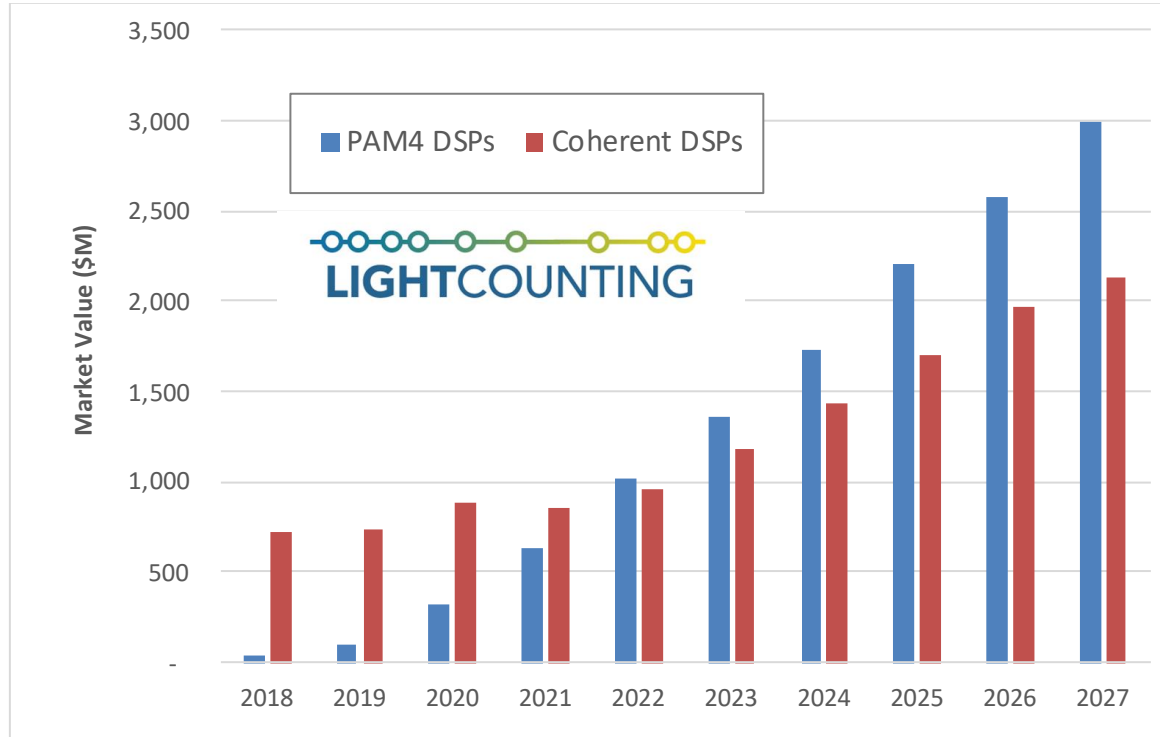
- 800G DR8 based on thin film LiNbO₃ modulators, enabling lower power (12.8W)
- Fully integrated optical engine with planar Mux/DeMux filters based on SiN designed to reduce power consumption of 100/400G transceivers

Source: POET Technologies



Electro-optic integration will be the key

More digital signal processing at higher speeds.



Vendors need to have DSPs and the optics made in house to innovate.

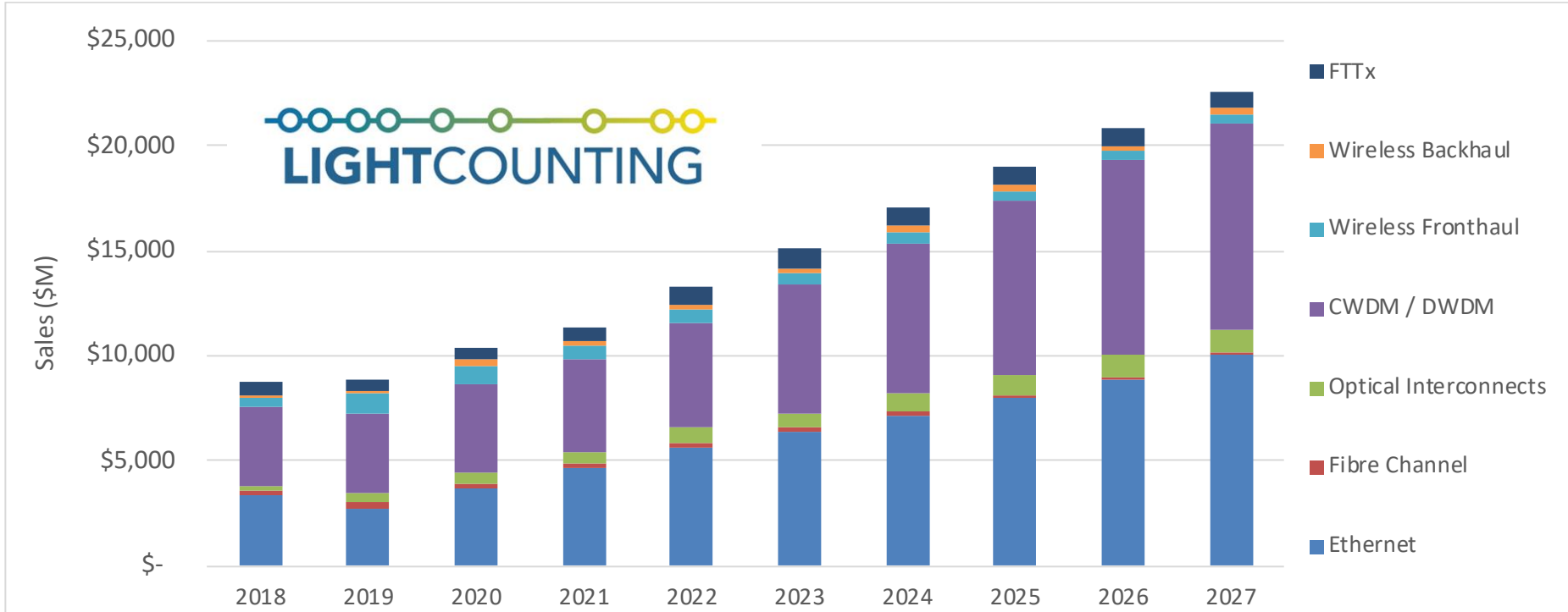
Only very large companies will be able to afford it:

Broadcom, Cisco, Ciena, Huawei, Intel, Infinera, Juniper, Marvell, Nokia, ZTE

Source: PAM4 and Coherent DSPs, February 2022

Market forecast for Optical Transceivers

Global economic slowdown is a concern for H2 2022 and 2023



Source: *Market Forecast Report, April 2022*

Questions for the new ARPA-E project



Just starting to work on it now

Drivers (what is the motivation to move to more integrated modules? What are the benefits for customers? Why change?)

Transition to Disaggregated Architectures in AI Clusters and HPCs

Increasing speed and power consumption of optical and copper interconnects

Limits to power dissipation of ICs integrated into a SiP, driven by inability to cool them.

Success factors (what factors are required for a broad-based movement to on-board and co-packed optics?)

Barriers (what are some of the reasons CPO may not be adopted?)

Recommendations on how to overcome the barriers

Technology and business barriers for development of a robust and broad-based market for CPO.

Market entry strategies

Role of startups, incumbents and standards bodies.

Other questions

Coherent optics vs. Direct Detect for short reach applications?

Can the use of APDs resolve some of the power consumption issues?

Can narrow linewidth laser and frequency stability enable lower power interconnects and/or new switching technologies?

Copper vs. Optics for short reach interconnects? What is the view of Amphenol and Molex?

What is the view of test equipment suppliers on timing of 200G/lane signaling?

Opportunity size for products related to its scope

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