

Optics in the Age of AI: A Market Update

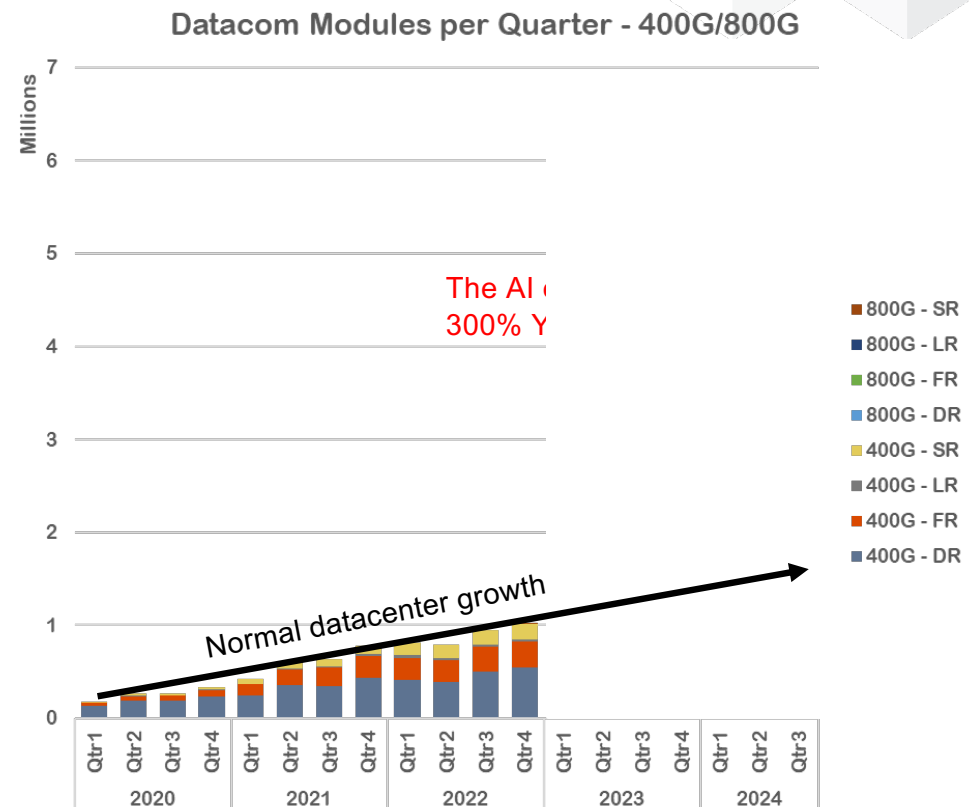
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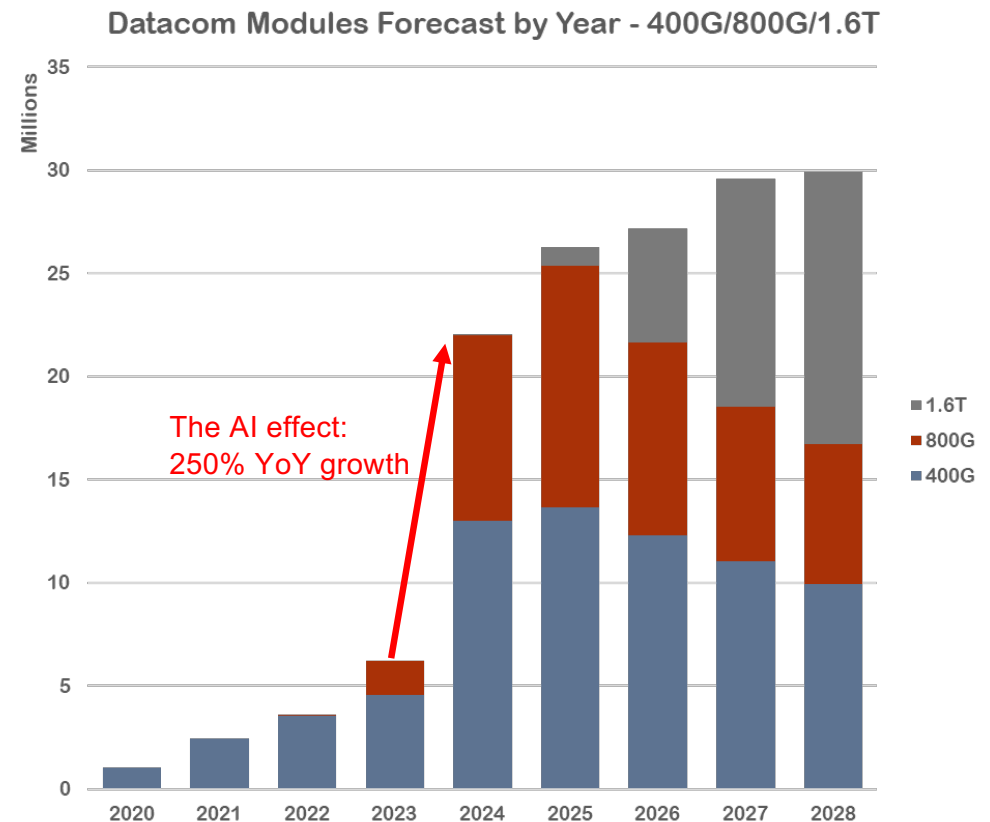
Unprecedented Growth in High Speed Datacenter Optics in 2024

- High speed datacom module shipments more than tripling YoY
- Over 6.5 million high speed datacenter optics shipped in 3Q24 – 22 million forecast for 2024
- Growth driven almost entirely by AI deployments at hyperscale operators



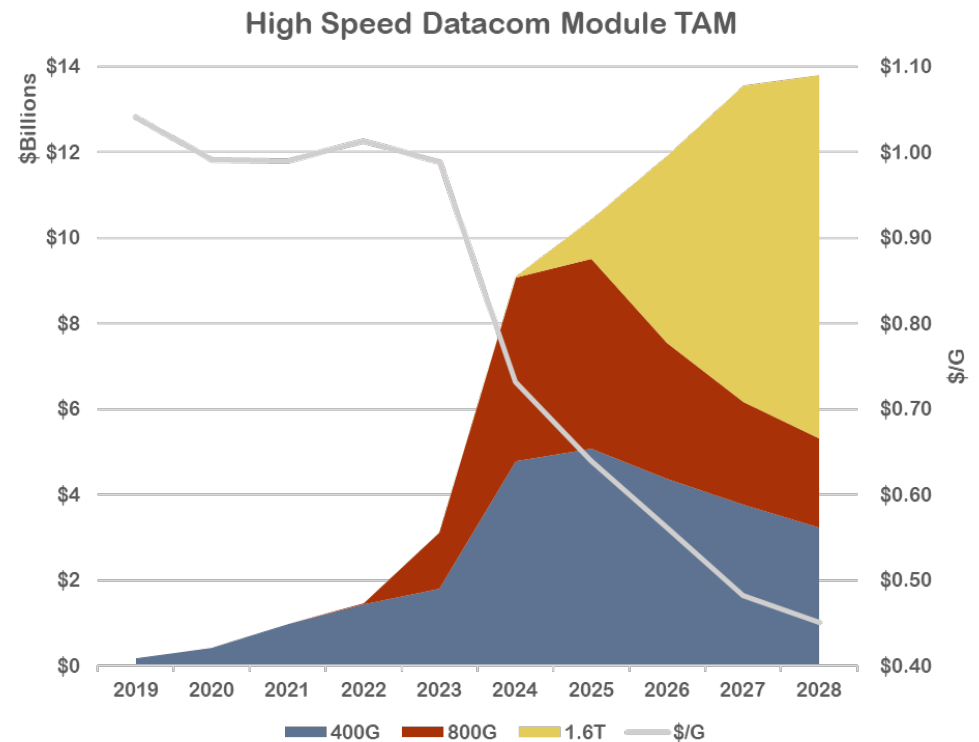
Growth Forecast through 2028

- Almost 30 million modules forecast to ship in 2028
- AI shifts to the highest bandwidth modules available
- 1.6T cannot come fast enough and will take over quickly
- Total bandwidth continues to grow 2026-2028, but number of ports flattens at a very high number
- Forecast risk: 1.6T growth is faster (and 800G dropoff is faster)



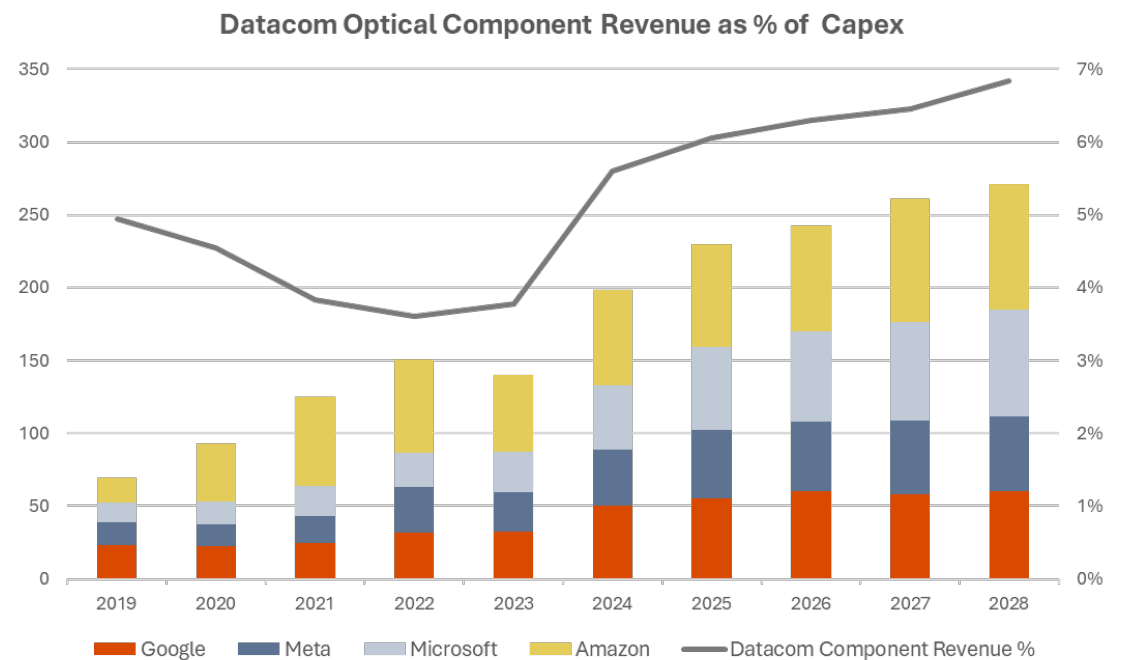
Datacom Optics Revenue Continues to Grow while \$/G Drops

- Module revenue growth slows, but continues to increase as speeds migrate
- Total datacom optical component revenue forecast to approach \$14 Billion by 2028
- \$/G drops dramatically with volume, moderately with speed, reaching the \$0.50/G goal by 2027 (blended total)



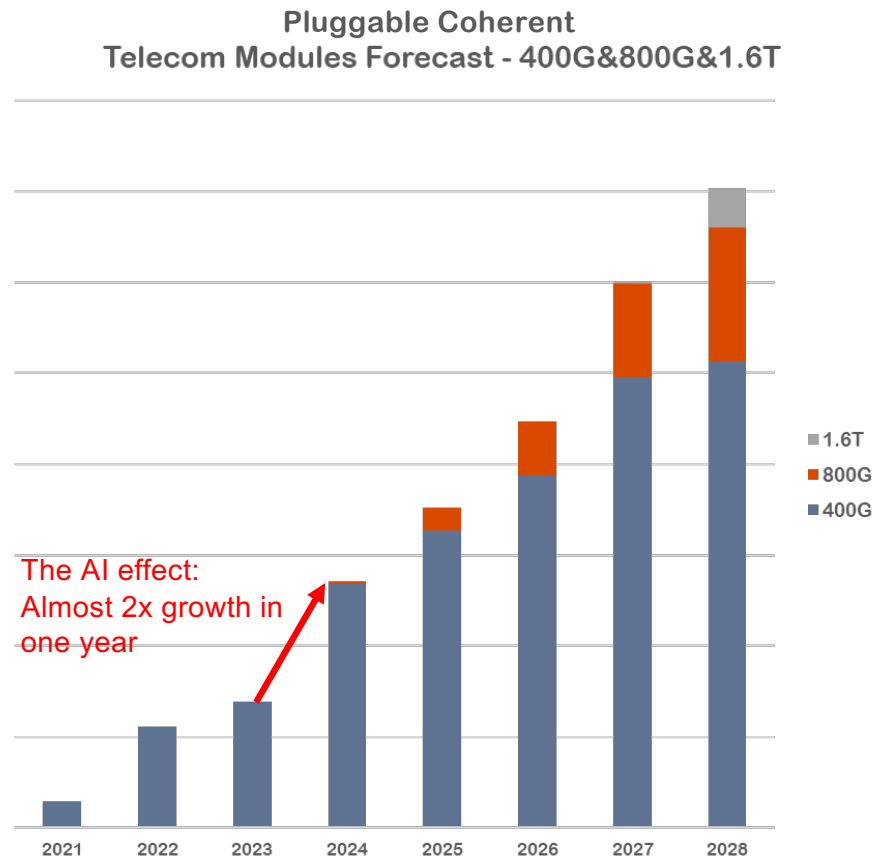
Hyperscale Capex Growth = Datacom Optics Revenue Growth

- Growth from 3.5% of hyperscale Capex to more than 6% of hyperscale Capex
- Faster growth will require Capex increases



AI Impact on Datacenter Interconnect







- As AI pushes datacenters to the maximum power and size, more datacenters are required
- Pluggable coherent – the most popular coherent format of all time – is growing as a result
- 400ZR, driven largely by datacenter disaggregation, is exploding
- 800ZR growth will be smaller (fewer participants), but respectable
- 1600ZR should be very popular starting in 2028



Alternative Technologies for Datacenter Optics: LPO

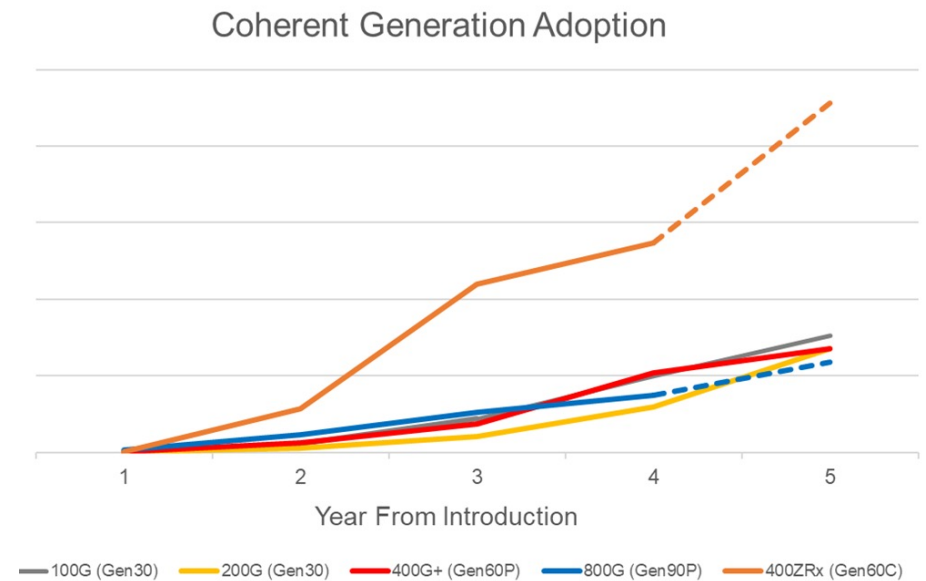
- Compelling power savings in the optics, but optics do not dominate power in the AI datacenter
- Multiple areas of concern
- Efforts continue to find solutions
 - Standards work
 - LRO is promising, especially at 1.6T
- But no committed hyperscale operators yet



Application	Linear Drive Applicability
Homogeneous Hyperscale Datacenter	
Heterogeneous Hyperscale Datacenter	
Service Provider	
Enterprise	
Active Optical Cable	
AI Node	

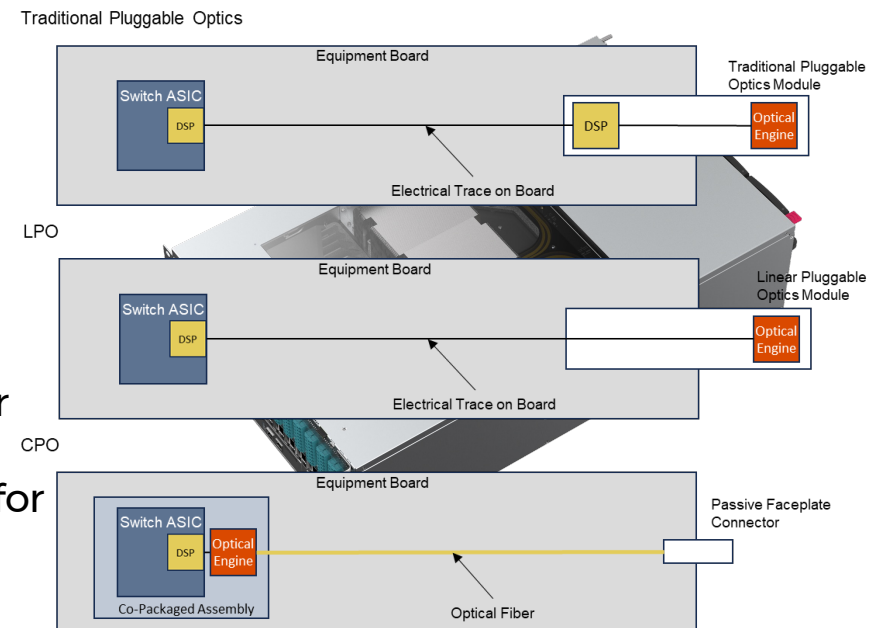
Alternative Technologies for Datacenter Optics: Coherent

- The popularity of 400ZR has opened the door to coherent connections in the datacenter – for DCI
- So long as IM-DD can meet the need, it will beat coherent INSIDE the datacenter
- 200G PAM4 optics can reach 10km
 - No coherent inside at 1.6T (excludes “campus” optics)
 - Likely no coherent inside at 3.2T
- IM-DD for datacenter optics will be a great business for a long time



Alternative Technologies for Datacenter Optics: CPO

- The ultimate power reduction option – remove pluggable optics altogether
- Deployment uncertain: Many hyperscalers investigating, none committed
- Single-source is a concern
- Pluggable optics still work well
- Positive signs
 - A standard developed for high power external laser sources (OIF)
 - Lumentum reports interest from multiple vendors for its external laser source
 - TSMC recently started an industry group to study SiPho integration
 - Nvidia investigating CPO for back-end networking



Conclusions

- AI is driving unprecedented growth in high-speed datacenter optics shipments and revenue
- Growth is across all speeds, but mostly in 800GbE right now
- 1.6T can't come fast enough
- Bandwidth and revenue will continue to increase, even as the number of modules shipped levels off
- AI will push bandwidth to grow outside the datacenter as well
- For the next few years, traditional standard IM-DD pluggable optics will dominate shipments



Thank You

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