In support of a 100m objective(s) for 100 Gb/s wavelengths over MMF

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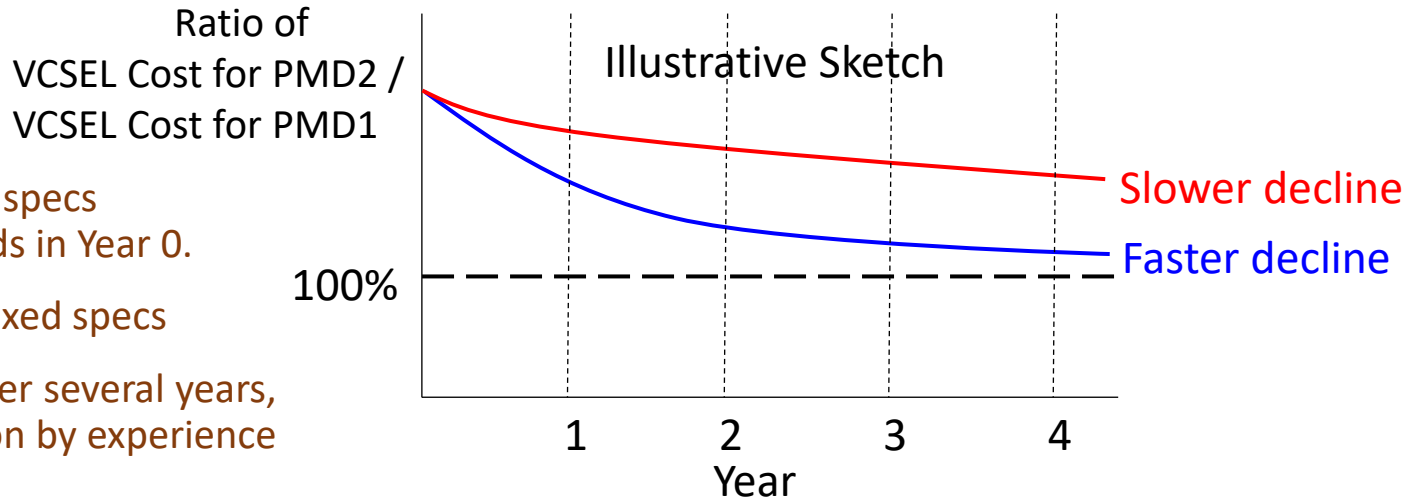
There are both early adopters & later adopters among the likely users of 100G wavelengths over MMF, with different reach needs

Time Horizon	Likely Application	Reach Requirement	Need	
Early Adopter	Hyperscale fiber-to-machine, server attachment, Remote TOR configs	30 to 50m	Tx specs which promote higher yield & low cost in Year One (These end-users drive R&D spend)	Existing 50m reach aka "PMD1"
Medium and Longer Term	Big Cloud in China switch links	80 to 100m	Cost effectiveness	Proposed 100m reach aka "PMD2"
	Large Enterprise DCs, Tier 2 Cloud, Telco central office	100m	Meet traditional reach targets used in brownfield cable infrastructures	

- The early adopter applications require specs promoting lower cost, higher part yields in Year 0.
- PMD 1 need to be born with more relaxed specs
- Volume need for PMD2 will grow in over several years, coincident with the usual cost reduction by experience



The TF has seen presentations describing needs of large end users in hyperscale DCs in North America & China

- Zuowei Shen, Google

shen_3db_01a_110520.pdf

Success Metrics

- Reach: 30m OM3, 50m OM4 for fiber to machines
- Cost effective and multiple VCSEL sources
  - 100m reach adds more stringent requirement on VCSEL BW, spectral width, RIN
- Low power consumption required by thermal requirement in various server/storage/accelerator trays
  - Avoid overdesign of Rx serdes and Tx nonlinear compensation.

PMD1 was called out

- Chongjin Xie, Alibaba

xie_3db_01_110520.pdf

400G (4 x 100G) Networks

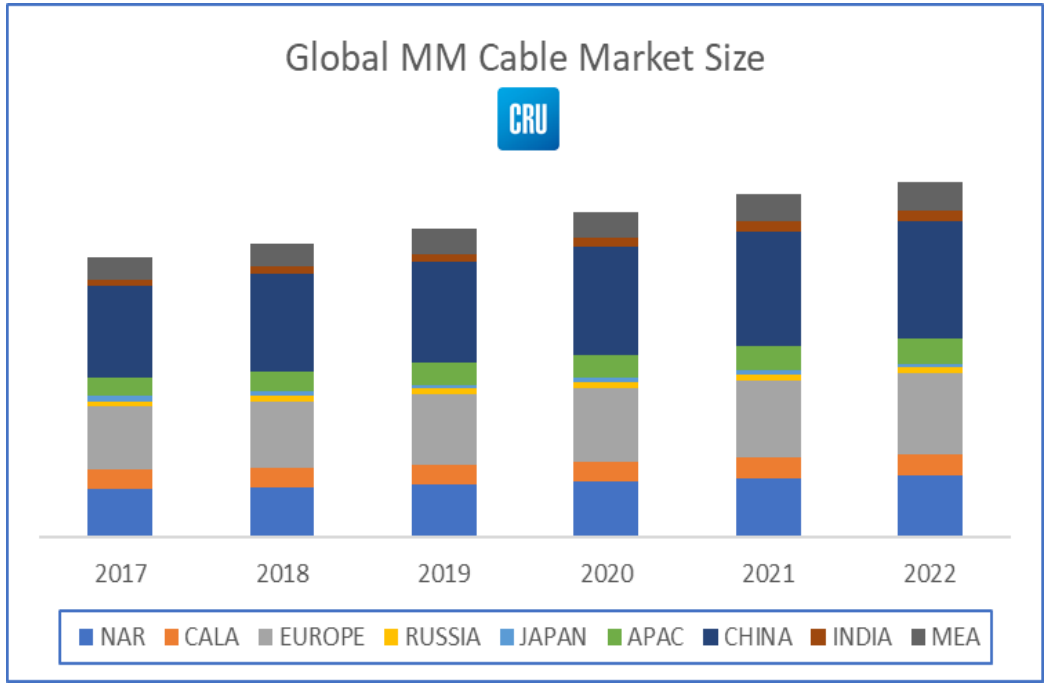
- If MM reaches 30 m
  - Can be used as AOC (server – TOR)
- If MM reaches 50 m
  - Can be used TOR – Aggregation

PMD1 with 50m reach covers ~50% of DC links

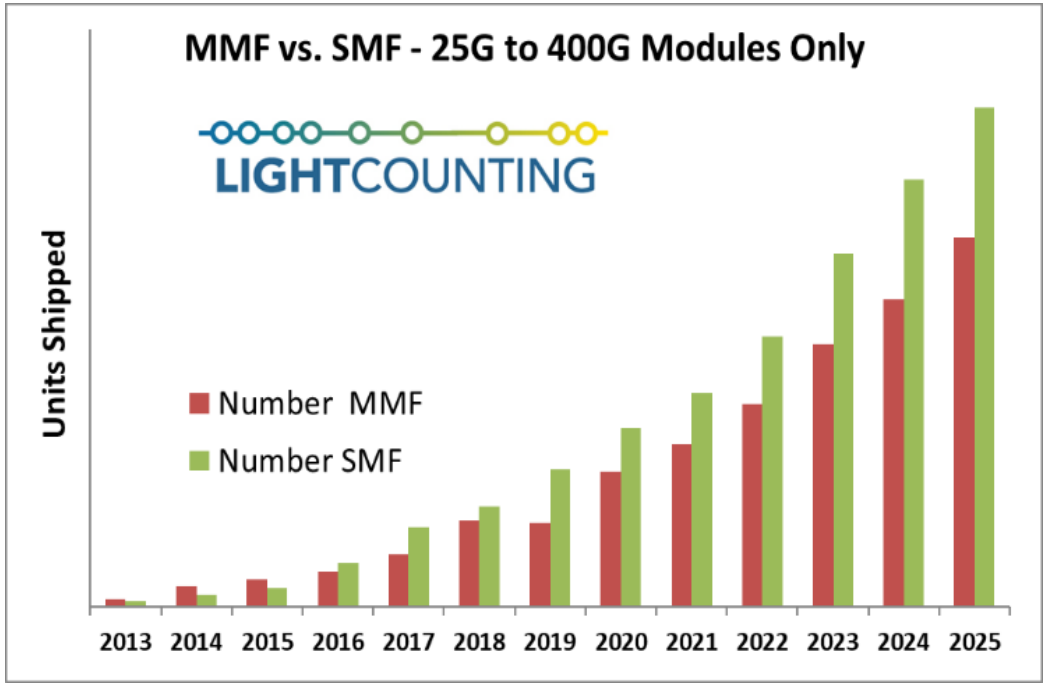
- If reaches 80 m
  - Can be used within a building
- If reaches 100 m
  - Can be used the same way as 100G networks

PMD2 with 100m reach would increase coverage to ~67% of DC links, as is current practice

There is a large installed base of MMF cable worldwide that was deployed, based on a 100m reach for SR & SR4 optics, needing “PMD2”



Source: CRU, February 2020. Used with permission from CRU



Source: LightCounting, September 2020. Used with permission from LightCounting

- MMF deployments worldwide grow about 5% CAGR, and MMF modules will remain > 40% of modules sold
- If Ethernet ignores the Large Enterprise & Tier2 Cloud markets, where cabling was designed around the 100m reach, PMD2 will likely happen in MSA
- Preliminary baseline draft for PMD2 was written in summer, but not yet presented to TF. Differences between PMD1 & PMD2 already highlighted in murty_3db_adhoc_01a_100120.pdf. No schedule impact is anticipated. Supports broadest market potential

Supporters

- Chongjin Xie, Alibaba
- Dale Murray, LightCounting
- Earl Parsons, CommScope
- Jose Castro, Panduit
- Rick Pimpinella, Panduit
- Ramana Murty, Broadcom
- Vipul Bhatt, II-VI
- David Piehler, Dell EMC
- James Young, CommScope