Proposal for a PMD for 100GBASE-SR10 and 40GBASE-SR4 and Related Specifications

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Outline

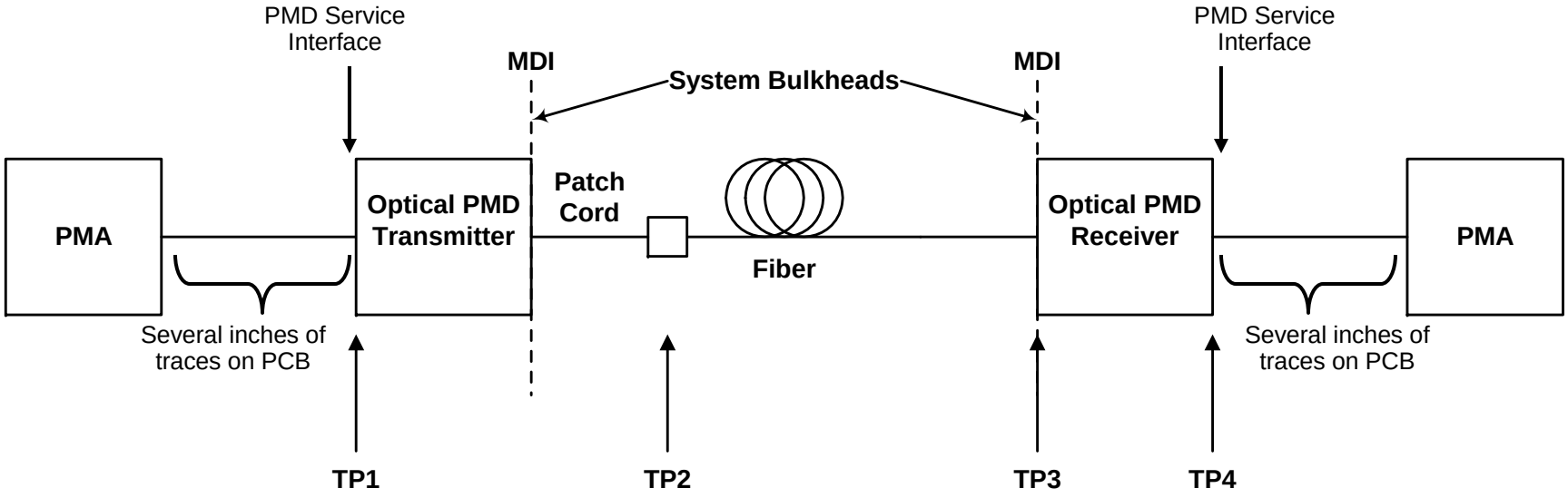
- Proposal of a PMD to address 802.3ba objectives to reach 100m over OM3 at 100 Gb/s and 40 Gb/s
  - 10 lane parallel, short wavelength based PMD for 100GBASE-SR10
  - 4 lane parallel, short wavelength based PMD for 40GBASE-SR4
- Same per-lane specifications for both 100 Gb/s and 40 Gb/s PMD
- Proposal enables direct connection of limited, non-retimed modules to a host ASIC

Motivation for Non-retimed Limiting Parallel PMD Proposal

- 10 (4) parallel links operating at 10.3125 GBd utilize low cost, high performing 10 Gb/s optics and electronics used today in 10GBASE-S links
  - Limited, un-retimed interface is the highest density, lowest power, lowest cost 100m solution today
  - Uses existing, viable semiconductor technology
  - Uses known specification methods refined in SFP+ and 8GFC
- The 10 (4) optical lanes directly map the 10 (4) electrical lanes, without muxing or translation, retiming or deskewing
  - Works with all proposed striping methods
- This proposal is supported by multiple vendors and users and is economically feasible and competitive with other alternatives

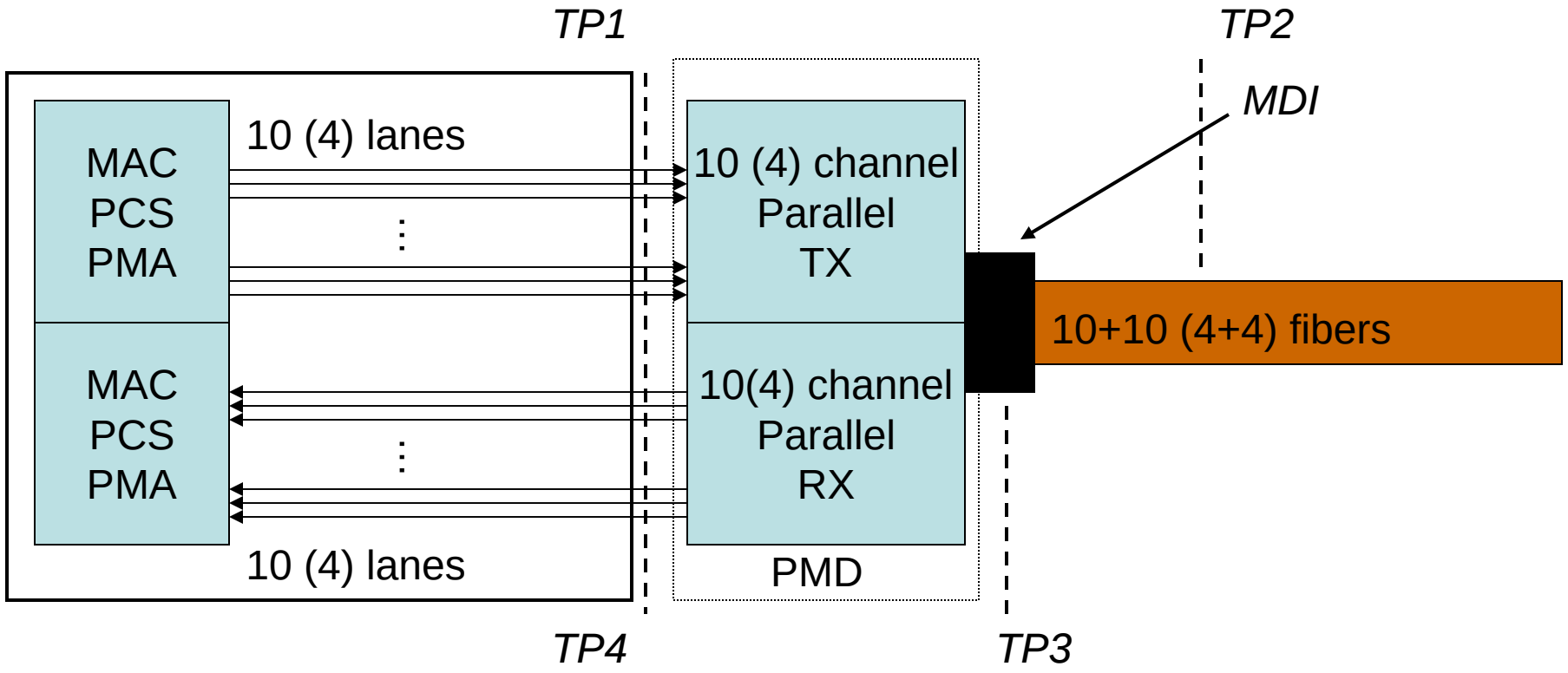
802.3ba PMD Block Diagram

- TP1, TP2, TP3 and TP4 are traditional labels in 802.3 for interfaces of a fiber optics link.
- Two physical interfaces are introduced between the PMA and PMD (TP1 and TP4)
  - PMA may be in the host ASIC, PMD is the optical module
- The block diagram below shows relevant elements and interfaces for a link between two PMAs. The patch cord is included for the definition of TP2.
  - Intermediate fiber connectors are not shown



Proposal

- 10 parallel lanes @ 10.3125 GBd for 100GBASE-SR10 over OM3 fiber
- 4 parallel lanes @ 10.3125 GBd for 40GBASE-SR4 over OM3 fiber
- No glue chip required
  - See also last slide



Operating range

- 0.5-100m over OM3 fiber with 1.5 dB allocated for connector loss
- This is more than sufficient to cover
  - all distances in HPC environment
  - almost 100% of Enterprise Data Center Client-to-Access Channels
  - almost 90% of Enterprise Data Center Access-to-Distribution Links
  - almost 85% of Enterprise Data Center Distribution-to-Core Channels
- See flatman_01_0108, Data Centre Link Survey

Transmitter specifications (each lane)

Description	Value	Unit
Signaling speed (nominal)	10.3125	GBd
Signaling speed variation from nominal (max)	±100	ppm
Center wavelength (range)	840-860	nm
RMS spectral width (max)	0.65	nm
Average Launch Power (max) *(2)*	1 *(1)*	dBm
Launch Power (min) in OMA	-3 *(1), (3)*	dBm
Average launch power of OFF transmitter (max)	-30	dBm
Extinction ratio (min)	3	dB
$RIN_{12}OMA$ (max)	-128 to -132 *(1),(3)*	dB/Hz
Optical Return Loss Tolerance (max)	12	dB
Encircled Flux	> 86% @ 19um, < 30% at 4.5um *(1)*	
Transmitter eye mask definition	TBD	
Aggregate TP2 signal metrics (4)	TBD	TBD
TP1 jitter allocation	0.3 (5)	U.I.

(1) subject to further study
(2) see presentation on eye safety by J. Petrilla at March 2008 meeting
(3) to be made informative if aggregate signal parameter includes the effect
(4) for further study, e.g. TDP, TWDP, etc.
(5) *for further study, intermediate between 10G SFP+ and 8GFC*

Receiver characteristic (each lane)

Description		
Signaling speed (nominal)	10.3125	GBd
Signaling speed variation from nominal (max)	± 100	ppm
Center wavelength (range)	840-860	nm
Average receiver power (max)	1[(1)]	dBm
Average power at receiver input (min)	-7.9[(1),(2)]	dBm
Receiver reflectance (max)	-12	dB
Stressed receiver sensitivity in OMA (max)	TBD	dBm
- Vertical eye closure penalty (target)	TBD	dB
- Stressed eye jitter (target)	TBD	UI pk-pk
TP4 jitter allocation	0.7	UI

(1) For further study

(2) Depends on connector loss

Link and Cable Characteristic

Parameter	Value	Unit
Supported fiber types	50μm OM3	
Effective Modal Bandwidth	2000*	MHz*km
Power Budget	>8.3**	dB
Operating Range	0.5-100	m
Channel insertion loss	1.9***	dB

** - depends on launch conditions*
*** - for further study*
**** - connector loss under study*

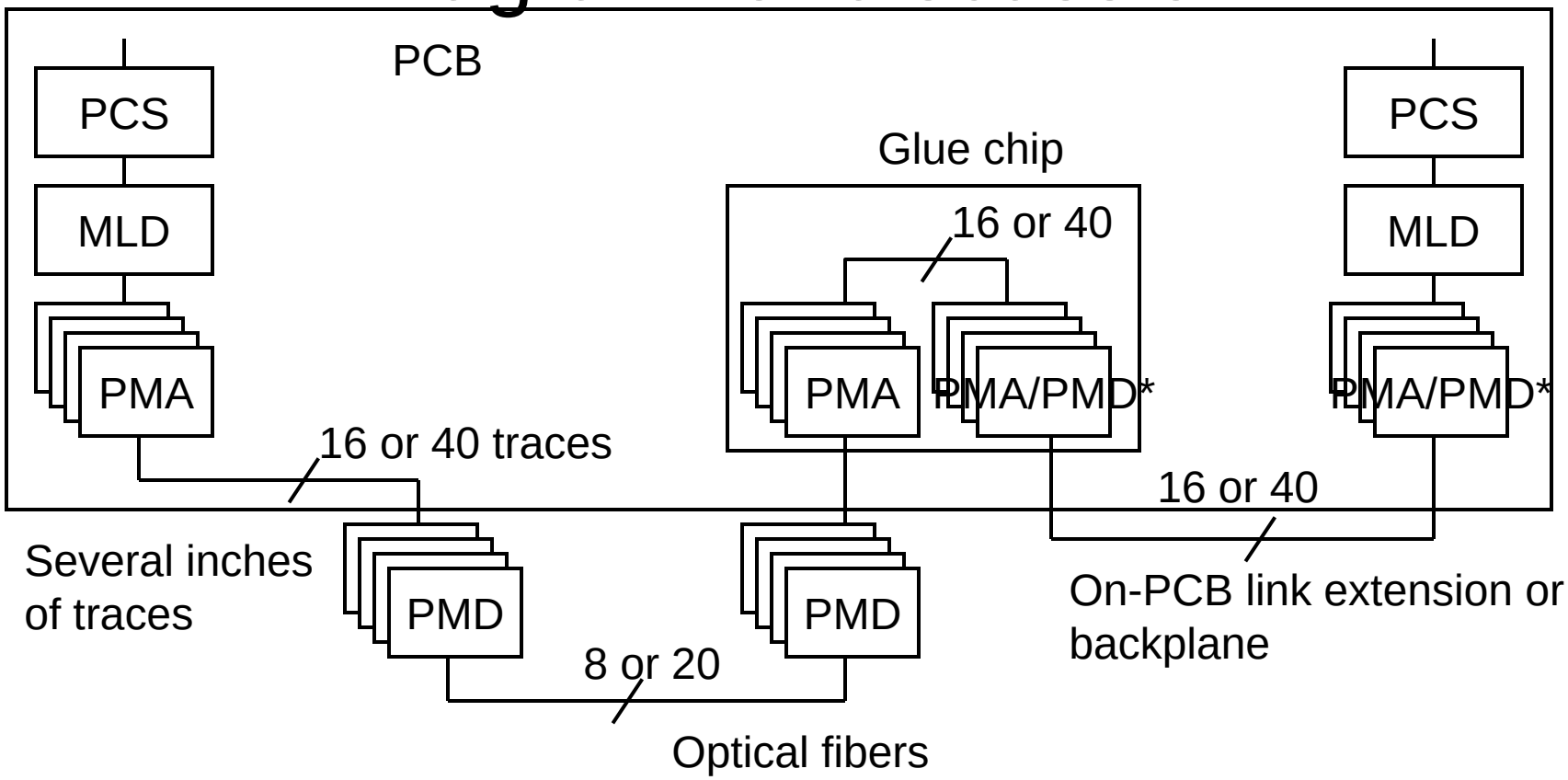
Further Work

- Jitter –> supporting presentation(s) at this meeting
  - Further work to investigate crosstalk
- Connector loss -> supporting presentation at this meeting
- Fine tune parameters/eliminate TBDs
  - Some TBDs may be present in first draft
- Compliance/testing simplification
  - Eg. Aggregate TP2 signal metrics
- Study impact of Encircled Flux specs on link performance -> data to be presented at next meeting

Conclusion

- We propose 10 (4) lane parallel short wavelength based PMD supporting limited non-retimed interface operating at 10.3125 GBd for 100GBASE-SR10 (40GBASE-SR4)
- This proposal is the highest density, lowest power consumption and lowest cost 100m solution today that satisfies the 100m distance objective over OM3 fiber
- This proposal uses viable, proven semiconductor technology
- It plans using known specification methodologies refined in other standards
- It has broad support from multiple vendors and users

Compatible with in-box link extenders Diagram for discussion



PMA is a CDR, possibly with simple EDC

* 10GBASE-KR PMA/PMD is different