

MMF ad hoc report

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MMF ad hoc activity since Phoenix meeting

- Three MMF ad hoc calls: Feb 28th, March 7th and 14th
 - Meeting minutes and presented materials are available on the 40G & 100G FOTF website: <http://www.ieee802.org/3/bm/public/mmfadhoc/index.html>
- Highlights:
 - Actively studying a KR4 FEC supported and un-retimed PMD for >20 m reach on MMF.
 - Reviewed presentations on link modeling results, Tx and Rx spec proposals, and working towards an agreed a strawman link budget and baseline proposal for 20 m reach over MMF.
 - Tracking tables created (maintained by ad hoc chair) to follow proposed Tx and Rx parameter values, electrical spec's, and to record the MMF ad hoc consensus for proposed spec's.

Presentations reviewed and discussion points

- **Jitter budget and metrics for an un-retimed FEC supported PMD**
 - **Jitter Budget for unretimed MMF PMD (revised)**, Piers Dawe (Feb 28th, 2013)
 - Proposed jitter budget and metrics for a KR4 FEC supported link, addressing the 20 m reach objective.
 - The merits of J2, J4 and/or J5 measurements were discussed, as were the proposed values for the jitter budget. A need for several contributions was recognized - to support jitter budget viability, the interoperability of unretimed and retimed PMDs, and unretimed PMD optical specs
- **Tracker tables for proposed Optical Tx and Rx values and electrical interfaces** **MMF-TxRx-param-20m-post** (Mar 14th, 2013)
 - **Working document** to track consensus proposed specs (updated each MMF ad hoc meeting), referencing **dawe_01a_0113**, **dawe_01a_0213**, **king_02_0113** (the 100m baseline proposal), and **XLPPi** specs.
 - The MMF ad hoc is discussing optical Tx, Rx, link, and electrical parameter values to go into a proposed strawman spec column, and which will form part of a **draft baseline proposal** for the 20 m reach PMD. Some progress has been made....
- **100G MMF 20m and 100m link model comparison**
 - **Petrilla_01_0313_optx**, John Petrilla (March 14th, 2013)
 - Compares link model jitter budgets for the 100m retimed PMD, and an unretimed link over 20 m OM3 with similar optical specs, which shows that using the same 100 m baseline optical specs for the 20 m unretimed PMD leaves a tight jitter budget.

MMF ad hoc looking forward

- Further work:
 - Continue work on optical and electrical, power and jitter budgets, and metrics, for an un-retimed FEC supported 20 m reach PMD
 - For the 100 m MMF reach PMD:
 - Fine tune parameters / eliminate TBDs, and items for further study
 - Compliance tests development
 - Reach for OM3
- Continue building consensus on the proposals targeting our MMF objectives.
- Next meetings: yes...tbc

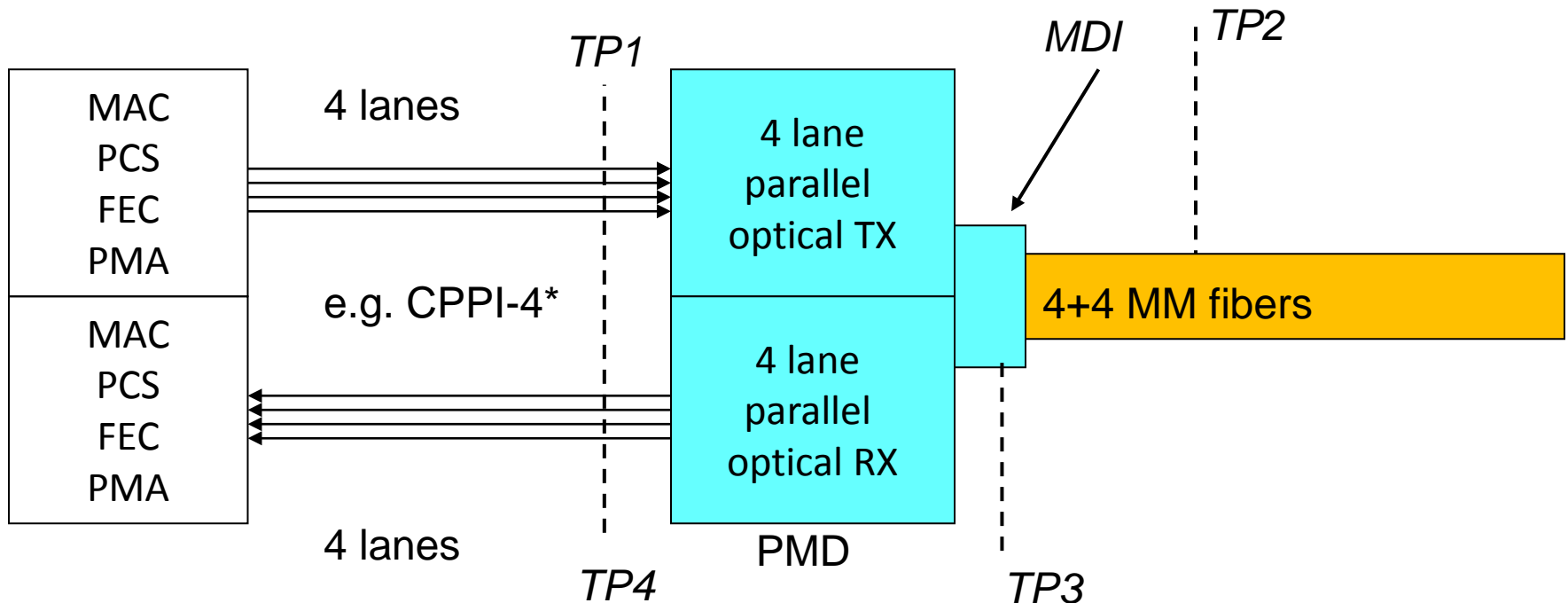
Summary of work towards baseline proposal for 20 m reach objective

- If the task force* decides to pursue the standardization of the unretimed 20 m reach PMD, the baseline proposal is likely to contain:
 - Proposed optical spec's for an FEC supported, unretimed PMD with similar optical parameters as the 100 m retimed PMD
 - Proposed spec's for 'CPPI-4', the unretimed electrical interfaces (TP1a and TP4)

*Not all contributors to the MMF ad hoc work on the 20 m reach PMD support it's standardization

Proposal

- 4 unretimed parallel lanes @ 25.78125 GBd for 100GBASE-UR4[†] over OM4 fiber
- 850 nm sources, up to at least 20 m on MMF
- Uses 100GBASE-KR4 FEC being defined in P802.3bj



[†] 100GBASE-UR4 is a working name for the 100 GBd unretimed 20 m PMD

*Definition of an unretimed interface ('CPPI-4') is a required for the unretimed 20 m PMD 6

Optical Transmitter characteristics (each lane)

Description	Type	Unit	Strawman proposal
Signal rate		GBd	25.78125 ±100 ppm
Center wavelength	range	nm	840 to 860
RMS spectral width	max	nm	tbc (0.6 to 0.8)
Average launch power	max	dBm	2.4
	min		TBD { $T_{x_{OMAmin}}-2$ }
Optical Modulation Amplitude (OMA)	max	dBm	3
OMA	min	dBm	TBD { $T_{x_{OMA@TDP}}-TDP+1$ }
OMA at max TDP	min	dBm	-3
Launch power in OMA minus TDP	min	dBm	TBD { $T_{x_{OMA@TDP}}-TDP$ }
Difference in launch power between any two lanes (OMA)	Max	dB	$(T_{x_{OMAmax}}-T_{x_{OMA@TDPmax}})$
Transmitter and dispersion penalty (TDP) at target BER before FEC	Max	dB	TBD
Extinction ratio	Min	dB	3
Optical return loss tolerance	Max	dB	12
Encircled Flux			≥ 86% at 19 um, ≤ 30% at 4.5 um
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}, 5×10^{-5} hits/sample			TBD {ffs}
Average launch power of OFF transmitter	Max	dBm	-30

Expressions in {} are from 100 m baseline.

Gray text items in the strawman proposal have not been reviewed yet.

Optical Receiver characteristics (each lane)

Description	Type	Unit	Strawman
Signal rate		GBd	25.78125 ±100 ppm
Center wavelength	range	nm	840 to 860
Damage threshold	min	dBm	3.4
Average power at receiver	max	dBm	2.4
	min		TBD { $T_{x_{av_min}} - IL$ }
Optical Modulation Amplitude (OMA)	max	dBm	3
Stressed receiver sensitivity (OMA)	max	dBm	ffs
SRS test conditions			ffs
Receiver reflectance	max	dB	-12

* IL = max insertion loss of connections + fiber link

expressions in {} are from 100 m baseline

TP1a specifications (each lane)

Description	Type	Unit	CPPI-4 Strawman
Signal rate		GBd	25.78125 ±100 ppm
J2 Jitter	Max	UI	
J4 Jitter	Max	UI	
DDPWS	Max	UI	
Equalized J2*	Max	UI	
Equalized J4*	Max	UI	
Equalized DDPWS*	Max	UI	
CTLE peaking*	Max	dB	
	Min		
Equalized eye mask definition {X1, X2, Y1, Y2}, 5×10 ⁻⁵ hits/sample		UI, mV	
Peak-to-peak voltage	Max	mV	
Qsq	Min	V/V	
Single ended output voltage		V	
AC common-mode output voltage	Max	mV	
Transition time, 20% to 80%	Max	ps	

** Similar methodology to CEI-28G-VSR; CTLE is part of the test equipment used to verify the electrical signal compliance*

TP4 specifications (each lane)

Description	Type	Unit	Strawman
Signal rate		GBd	25.78125±100 ppm
J2 Jitter	Max	UI	
Equalized J2*	Max	UI	
Equalized J4*	Max	UI	
CTLE peaking*	Max	dB	
	Min		
Equalized eye mask definition {X1, X2, X3, Y1, Y2, Y3}, 5×10 ⁻⁵ hits/sample		UI, mV	
Single ended output voltage tolerance **		V	
AC common-mode output voltage	Max	mV	
Transition time, 20% to 80%	Max	ps	

* *Similar methodology to CEI-28G-VSR; CTLE is part of the test equipment used to verify the electrical signal compliance*

** DC common-mode voltage is set by host

Thanks !