Supporting information for D1.2 comments*

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* Reference D1.2 comments #227, 230, 233, 236, and 228, 231, 234

Supporters

- Xiang Liu, Huawei
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- Earl Parsons, CommScope
- Frank Chang, Source Photonics
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- Support TPE proposals only:
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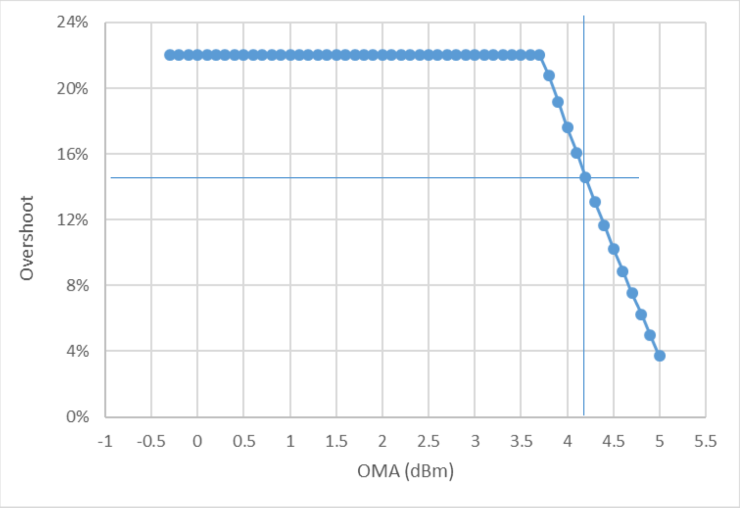
Transmitter power excursion (TPE)

- TPE = Max(P_{max} – P_{avg}, P_{avg} – P_{min}).
- Since overshoot (OS) is typically larger than undershoot in optical signals, typically TPE = P_{max} – P_{avg} = P_3 + OS*OMA – P_{avg}
- Assuming ideal linearity, this simplifies to TPE = OMA*(OS + ½) for all values of ER.
- At a fixed value of TPE, the allowable maximum OS is reduced for high OMA, as shown previously in rodes_3cu_01a_110920.
- Analysis of 802.3cu TX specs shows that TPE was chosen to give OS at OMA(max) ~ 13.1% to 14.6%, down from OS(max) = 22% at low OMA.
- Comments #227, 230, 233 and 236 propose to apply these same relative spec limits to the P802.3dj IM-DD PMDs.

Proposed TPE(max) values

PMD	OMA(max) (dBm)	Pavg(max) (dBm)	OS(max)	TPE(max) (dBm)	Max OMA @ OS(max)	OS @ OMA(max)
802.3cu PMDs						
100G-FR1	4	4	22%	2	3.43	13.1%
400G-FR4	3.7	4.4	22%	1.8	3.23	14.6%
100G-LR1	4.8	4.8	22%	2.8	4.23	13.1%
400G-LR4-6	4.4	5.1	22%	2.5	3.93	14.6%
P802.3dj draft D1.2						
800G-DR4	4.2	4	22%	TBD	TBD	TBD
800G-FR4-500	4.8	4.9	22%	TBD	TBD	TBD
800G-DR4-2	4.2	4	22%	2	3.43	10.3%
800G-FR4	4.8	4.9	22%	2.9	4.33	14.6%
800G-LR4	5.7	5.5	22%	3.1	4.53	5.0%
P802.3dj D1.2 comments						
800G-DR4 (#227)	4.2	4	22%	**2.3**	3.73	14.6%
800G-FR4-500 (#230)	4.8	4.9	22%	**2.9**	4.33	14.6%
800G-DR4-2 (#233)	4.2	4	22%	**2.3**	3.73	14.6%
800G-FR4	4.8	4.9	22%	2.9	4.33	14.6%
800G-LR4 (#236)	5.7	5.5	22%	**3.8**	5.23	14.6%



Proposed 800G-DR4:
OS(max) = 22%
TPE(max) = 2.3 dBm
gives OS = 14.6% at
OMA(max) = 4.2 dBm

- In P802.3dj D1.2, TPE(max) …
  - is TBD for DRn and FR4-500 PMDs.
  - exists for DRn-2 and LR4 PMDs, but the values result in overly restrictive OS at OMA(max).
  - gives OS at OMA(max) for FR4 similar to P802.3cu.
- Propose that the TPE(max) values shown in red at left be adopted for D1.3 DRn, FR4-500, DRn-2 and LR4.

Aggressor lane OMA

- The value of Stressed receiver sensitivity(SRS)(max) is nominally given by the minimum TX OMA at TDECQ(max), minus the maximum channel insertion loss (IL) and MPI+DGD penalties.
  - SRS is tested without an actual fiber channel, using a synthetically stressed reference TX, and an optical attenuator to emulate the IL for the RX lane under test.
  - For multi-lane PMDs, aggressor lanes are additionally specified to emulate the optical and electrical crosstalk environment present in the worst case use condition.
- The relationship between the IL of the RX lane under test and the aggressor lanes depends on the PMD – there are three distinct types.
- Comments #228, 231 and 234 propose values of maximum aggressor lane OMS depending on the IL expected for each type of PMD.

Three aggressor lane cases

- WDM PMDs: The aggressor lanes (wavelengths) share the same fiber and connectors as the lane under test, so they experience the same channel IL.
  - The worst case aggressor OMA is the lesser of SRS(max) plus the max difference in RX OMA between lanes, or TX OMA(max), minus the maximum IL and MPI+DGD penalties.
- DRn PMDs without breakout: The aggressor lanes share the same multi-fiber cables and connectors as the lane under test.
  - Each fiber in the link may have slightly different IL, but they will be in a narrow range. A reasonable assumption is that the aggressor lanes have the same nominal IL as the RX lane under test.
  - It's highly unlikely that an aggressor lane could have zero IL when the RX lane under test has maximum IL.
  - The worst case aggressor OMA is TX OMA(max), minus the maximum IL and MPI+DGD penalties.
- DRn PMDs with breakout: The IL experienced by the aggressor lanes is unrelated to the IL of the lane under test since they come from different modules.
  - The worst case aggressor OMA is the TX OMA(max), i.e. insertion loss is zero.
  - Manufacturers may test all DRn modules this way if the end application is not known.

Proposed values for aggressor OMA

- Based on the previous explanations, new values for aggressor OMA are proposed as shown at right in red.
  - Original comments for DR4 and FR4-500 were incorrect – the corrected values are shown at right.
  - An alternate proposal assumes aggressors have only IL(max), not MPI+DGD.
- Additional text is proposed to add to the footnotes to cover the breakout cases for DRn and DRn-2 PMDs.

PMD	TX OMA(max) (dBm)	Channel IL(max) (dB)	MPI+DGD Penalties (dB)	RX SRS(max) (dBm)	RX Diff. OMA btw Lanes (dB)	D1.2 Aggressor RX OMA (dBm)	Proposed Aggressor RX OMA (dBm)	Alternate: Aggressor RX OMA, IL only (dBm)
800G-DR4 (#228)	4.2	3	0.1	-0.9	NA	2.9	~~0.9~~ 1.1*	1.2 *
800G-DR4-2 (#234)	4.2	4	0.4	TBD	NA	TBD	-0.2 **	0.2 **
800G-FR4-500 (#231)	4.8	3.5	0.5	-0.7	4.1	1.9	~~3.4~~ 0.8	1.3
800G-FR4	4.8	4	0.4	TBD	4.1	0.8	no comment	no comment
800G-LR4	5.7	6.3	1.1	-3	3.3	0.3	no comment	no comment

* To cover the case of breakout, add text to footnote (e), "If the device is being used to breakout lower line rate PMDs as described in Annex 180A, OMAouter of each aggressor lane should be equal to the value of Outer Optical Modulation Amplitude (OMAouter), each lane (max) given in Table 180-7."

** To cover the case of breakout, add text to footnote (e), "If the device is being used to breakout lower line rate PMDs as described in Annex 180A, OMAouter of each aggressor lane should be equal to the value of Outer Optical Modulation Amplitude (OMAouter), each lane (max) given in Table 182-7.“

Thank You