

# RE: Comments on TDECQmax Reduction by 0.2dB (#33, 34)

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# Historical background

- During 802.3cd project in July 2018 San Diego plenary, some kind of agreements for 50G-FR/ER based on 25GBd SMF PMDs was reached to have TDECQmax reduced by 0.2dB for the change to viable thresholds ([tamura 3cd 01c 0718.pdf](#); [chang 3cd 01b 0318.pdf](#)).
- D2.0 extends this TDECQmax reduction to the rest of WDM-based PMDs for 200G/400G ([anslow 3cn 01 0119.pdf](#)).

We now have the TDECQmax as follows:

	-DRn	-FRn	-LRn	-ERn	
50GBASE-		3	3.2	3.2	dB
200GBASE-	3.2	3.1	3.2	3.2	dB
400GBASE-		2.9	3.1	3.4	dB

*Note: No 100G PMDs in the table*

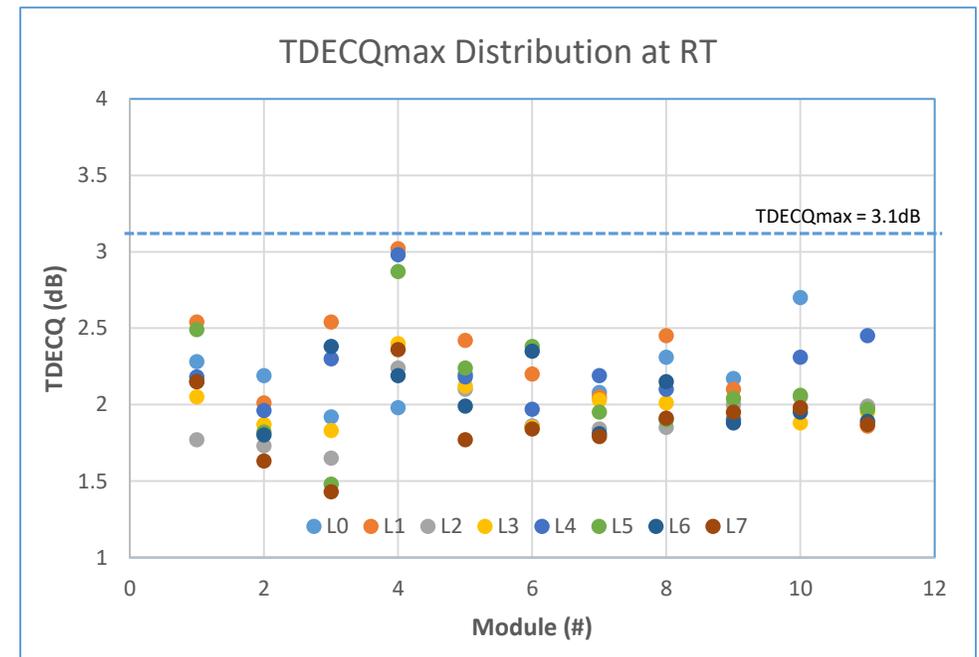
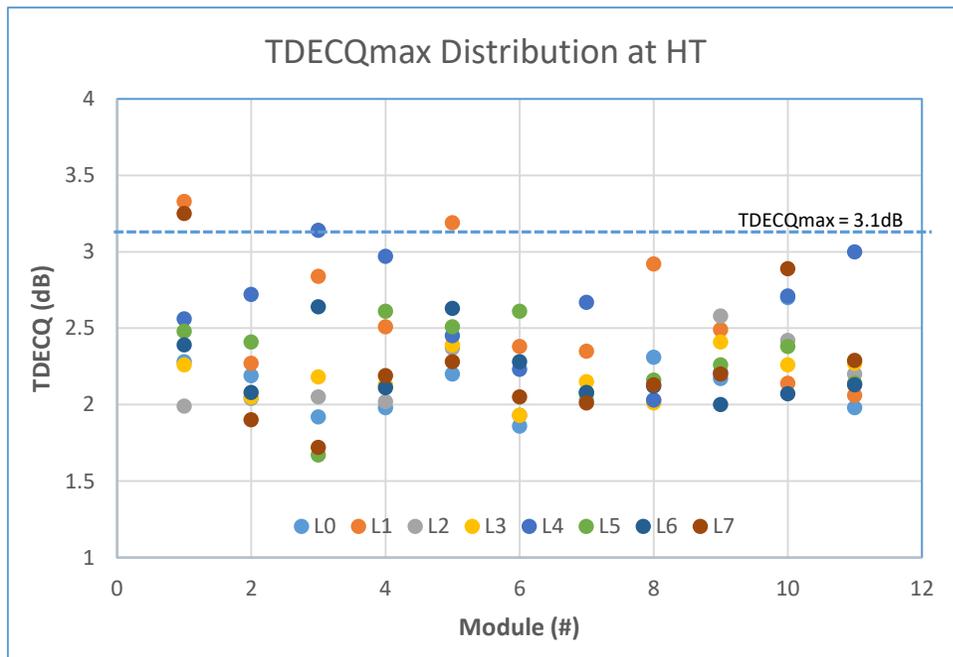
- It appears there exists inconsistency for having a lower TDCEQmax for 400G-LR8/ER8, and seems to be counter-intuitive as well.
- The team was asked to brings up this issue for TF discussion via a comment to the draft, with this supported technical presentation for extra thoughts in the following slides.

# TDECQmax Considerations

- In July18 San Diego meeting, 802.3cd project agreed to reduce TDECQmax for 50GBASE-FR/LR in scope. This extension to other WDM-based PMDs seems inevitable but may need further scrutiny.
- In practice it's commonly believed that the introduction of adjustable threshold equally to both reference 5-tap equalizer and real ASIC implantation won't over-penalize a PAM4 transmitter with very symmetric eye diagrams.
- The original TDECQmax of 3.3 to 3.4 was somewhat arbitrary values which has not been fully proved carefully.
- 802.3bs completed much early in 2017, such 400GbE products for PMDs like FR8/LR8 have already been qualified in fields under production phase. We can foresee following consequence with the change:
  - Likely have to recall some of marginal parts with this major specs change.
  - Yield impact due to tighten TDECQmax specs.  
(Both TDECQmax and TxOMA-TDECQ are tough parameters for EML)
  - Cause confusion to the industry for already implemented test guidelines.

# Yield Impact for QDD LR8 Modules

- We look into 11 known good LR8 production samples for measured TDECQ values (all <3.3dB by production process), it turned out the module yield impact would be as high as 27% due to TDECQmax change from 3.3 to 3.1dB.
  - It would impact TxOMA-TDECQ as well.
  - The test was done with SSPRQ pattern.



# Comments on 200G-FR4/LR4 and 400G-FR8/LR8

Cl 122 SC 122.7.1 table 122-9 P 43 L 30 # 33

Chang, Frank Source Photonics

Comment Type T Comment Status D

D2.0 has applied a 0.2dB reduction in TDECQ max value to WDM MUX based 200G-DR4/FR4/LR4 and 400G FR8/LR8. Our understanding during P802.3cd discussion, the consensus was focused on reducing by 0.2dB for 50G-FR/LR for non-WDM based PMDs non-WDM based PMDs by adding threshold adjust. While TDECQ max of 3.4dB was somewhat arbitrary values which has not been fully proved, so my suggest we should leave the TDECQ values unchanged for WDM MUX based PMDs including 200G-FR4/LR4 and 400G FR8/LR8. We will follow up with presenation slides.

*SuggestedRemedy*

change TDECQ and TDECQ-10log(Ceq) to 3.3 from 3.1 for 200G-FR4; and to 3.4 from 3.1 for 200G-LR4.

Cl 122 SC 122.7.1 table 122-10 P 44 L 35 # 34

Chang, Frank Source Photonics

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*SuggestedRemedy*

change TDECQ and TDECQ-10log(Ceq) to 3.1 from 2.9 for 400G-FR8; and to 3.3 from 3.1 for 400G-LR8.

SECQ may have to match TDECQmax change accordingly for RX.

# Recommendations

- We recommend the resulting set of penalties should be made more consistent with each other and suggest TF accept the comments.

Extra comments after May 9<sup>th</sup> ad hoc call discussion:

- Introduction of adjustable threshold will over-penalize a PAM4 transmitter with very symmetric eye diagrams (if no benefit from threshold adjustment).
- What else justification do we need to maintain TDECQ<sub>max</sub> unchanged?
- Can we put adjustable threshold as optional to P802.3bs for WDM based PMDs?

Thank YOU