On TDECQ and Overshoot Specifications

(in support of comments 7, 12, 50, 66, 67, 10 and 49)

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IEEE P802.3db 100 Gb/s, 200 Gb/s, and 400 Gb/s Short Reach Fiber Task Force

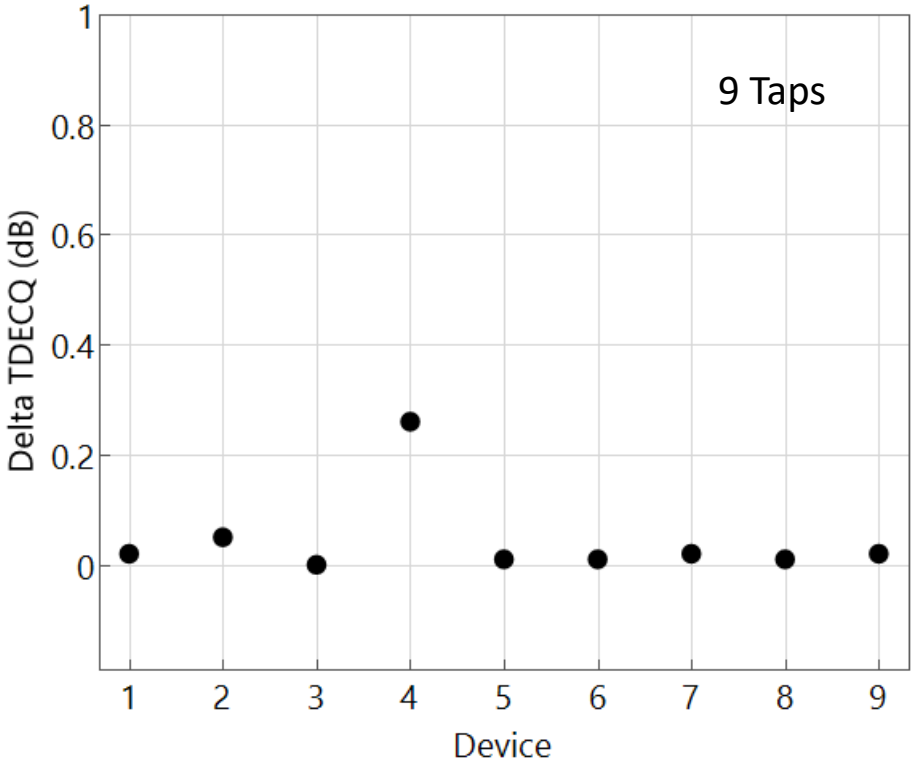
P802.3db TF Interim Teleconference

TDECQ Calculation: Eye Threshold Adjustment

- TDECQ (MMSE) calculated with eye threshold adjustment of 1% and 2%
- Links with TDECQ between 3 and 5 dB
- Other settings:
  - 53.125 GBd PAM4
  - SSPRQ
  - 9 Taps

Impact of the eye threshold adjustment change is small: Less than 0.1 dB

Δ(TDECQ) = TDECQ (1%) – TDECQ (2%)



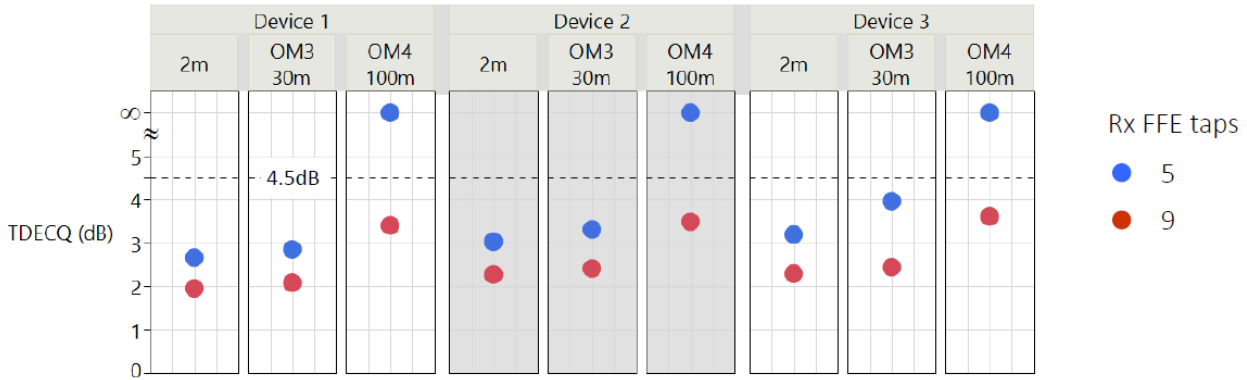
Considerations for TDECQ (max)

- SR Links: Manufacturing requires margin
  ingham_3db_adhoc_01a_062520.pdf presentation shows TDECQ between 3 and 4 dB on 100m OM4 links.

- VR Links: Low cost
  Enable slower VCSELs ⇒ allow for higher TDECQ.

- Different values of TDECQ(max) for SR and VR will require an additional transceiver test on SR links to ensure interoperability.

- TDECQ(max) for SR and VR differing by 0.2 dB does not have a big impact on the worst optical waveform presented to the receiver.



ingham_3db_adhoc_01a_062520.pdf

Different TDECQ(max) for SR and VR requires an additional test on SR transceivers.

Measurement	Fiber emulation filter 3dB Bandwidth f_A (GHz) Table 167-12	Link
TDECQ	18.0	100m OM4
TDECQ	33.6	50m OM4

additional test

Proposal for TDECQ (max)

Table 167-7 Transmit characteristics

Description	100GBASE-VR1 200GBASE-VR2 400GBASE-VR4	100GBASE-SR1 200GBASE-SR2 400GBASE-SR4	Unit
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane (max)[b]	4.4	4.4	dB
Transmitter eye closure for PAM4 (TECQ), each lane (max)	4.4	4.4	dB

Table 167-8 Receive characteristics

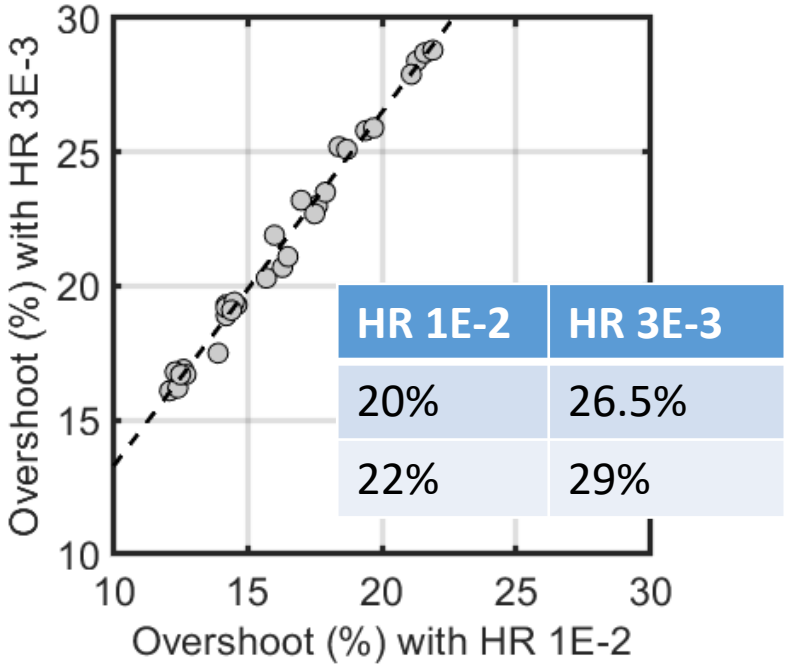
Description	100GBASE-VR1 200GBASE-VR2 400GBASE-VR4	100GBASE-SR1 200GBASE-SR2 400GBASE-SR4	Unit
Stressed eye closure for PAM4 (SECQ), lane under test	4.4	4.4	dB

Overshoot

- Overshoot/undershoot (max) was a TBD in the baseline proposal, murty_3db_adhoc_01b_121720.pdf, to identify any differences between a VCSEL-based link and SMF links.
  ghiasi_3db_01_092321.pdf is the first presentation on the topic in this Task Force.

- Considerations that apply to SMF links also apply to MMF links.

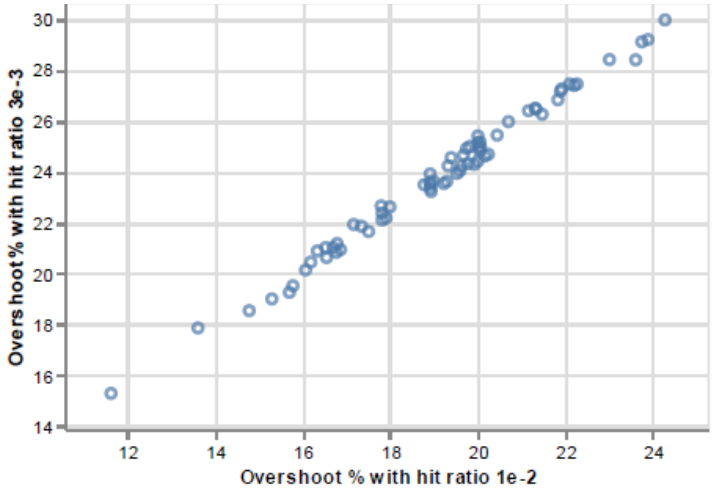
- There is good correlation between overshoot/undershoot (max) values with hit ratios 1E-2 and 3E-3.



HR 1E-2	HR 3E-3
20%	26.5%
22%	29%

The captured data shows a tight correlation between hit ratios. A direct translation from one hit ratio to another can be done. For instance, 22% overshoot measured with 1e-2 hit ratio is equivalent to:

- 27% at 3.3e-3



rodes_3cu_01a_052620.pdf

Proposal for Overshoot/Undershoot (max)

rodes_3cu_01a_052620.pdf used a 10 – 20X degradation in BER as a guide in setting the overshoot/undershoot (max).

Using similar considerations, propose setting the overshoot/undershoot(max) the same as for SMF links, but specified at 3E-3 hit ratio.

Table 167-7 Transmit characteristics

Description	100GBASE-VR1 200GBASE-VR2 400GBASE-VR4	100GBASE-SR1 200GBASE-SR2 400GBASE-SR4	Unit
Overshoot/undershoot (max)	~~TBD~~ 28	~~TBD~~ 28	%

at hit ratio 3E-3.