Measurements of TDECQ as a function of target SER

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Contributors and Supports

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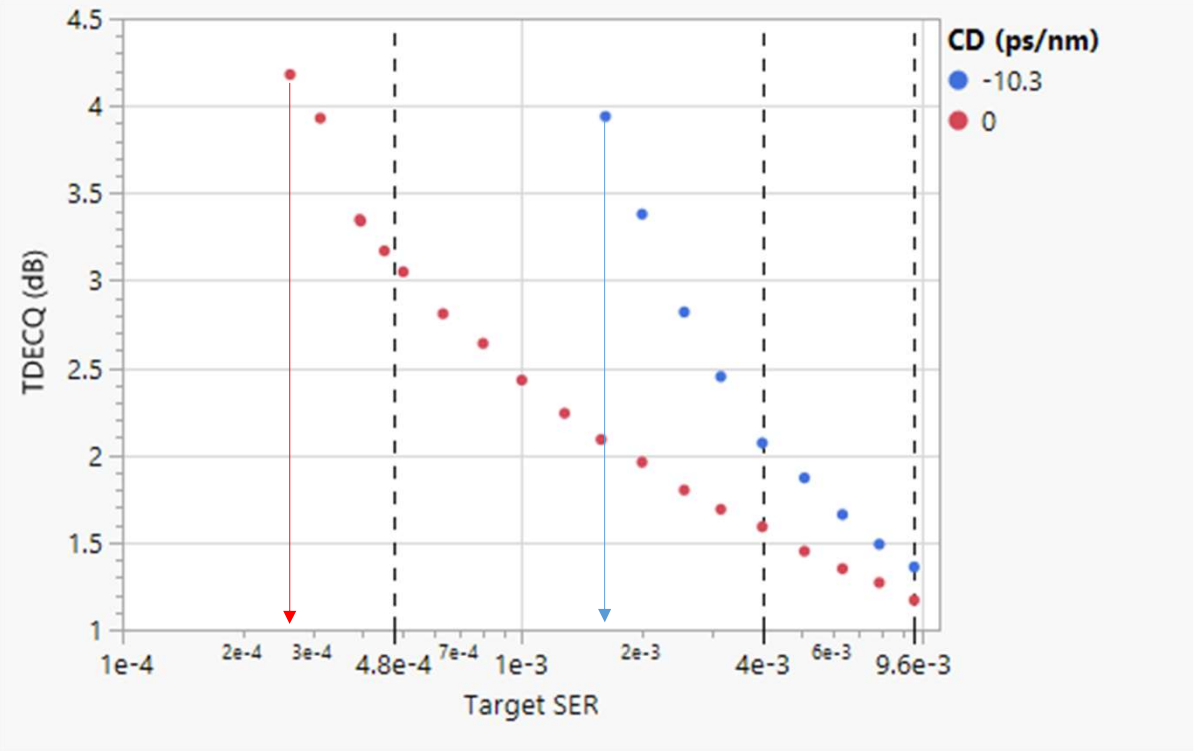
Introduction

- There has been much discussion in the last meetings about budgeting BER across inter-sublayer links (ISL) and ensuring that both inner FEC and host FEC have adequate margin.
- Transmitter testing (TDECQ) relies on a pre-FEC target SER that is based on an assumption of random errors. Soft-decision inner FEC coding gain is potentially implementation dependent, adding another variable in pre-FEC target SER.
- There have been suggestions that target SER should be set below the theoretical pre-FEC value for uncorrelated errors. While this is a valid idea, there may be limits to how low target SER can be set in practice.
  - D1.2 comments # 103-107 (DRn-2) and 108-112 (FR4) propose using 4.8e-4 for FECi PMDs.
- This contribution presents example measurements of TDECQ for EML chips-on-carrier (CoC) to explore possible measurement limitations to reducing target SER.
- It doesn't seek to make any proposals for pre-FEC target SER values. The data is intended to aid in discussions only.

Experimental method

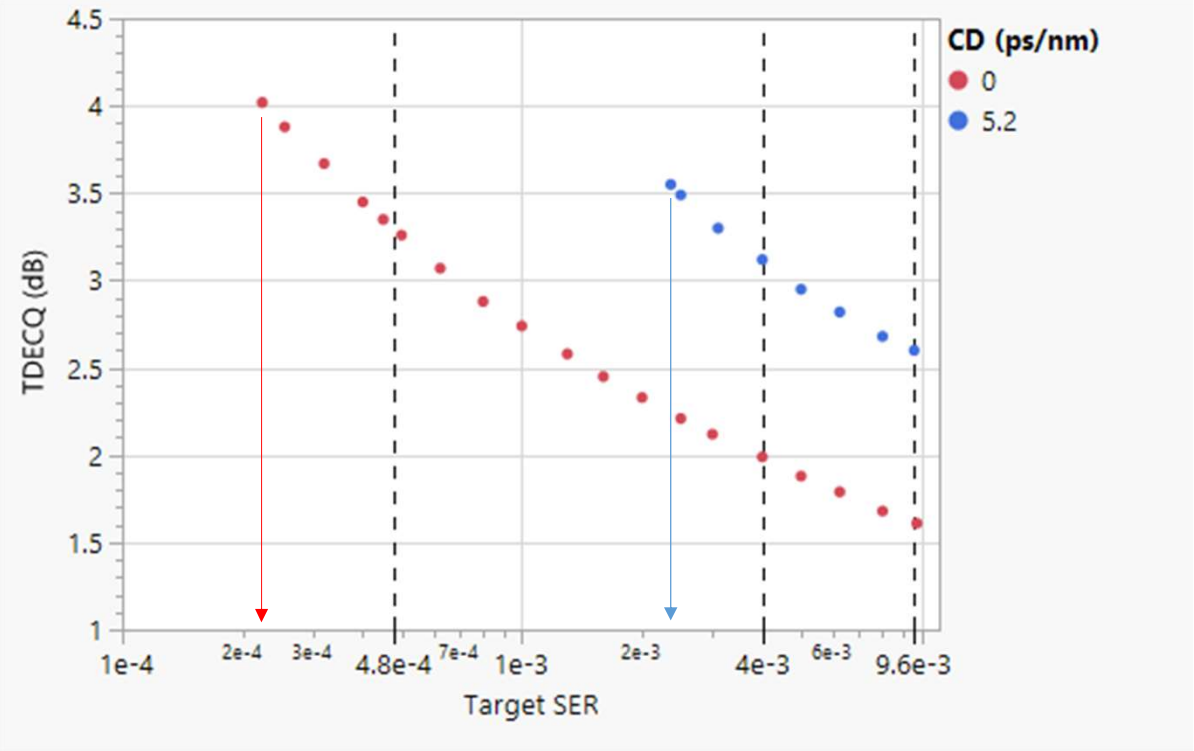
- The following slides show sample TDECQ measurements made with 1271 and 1331nm EML CoC's over 0m and 2.9km SMF
  - Signal: 113.4375 GBd SSPRQ pattern
  - Reference RX: 15-tap FFE
  - Target SER was scanned from 9.6e-3, down to the lowest value that gives a valid TDECQ
  - Chromatic dispersion
    - 2.9km spool: -10.3 ps/nm at 1270.6nm and +5.2 ps/nm at 1334.9nm
    - Compare with -11.26 to 6.02 ps/nm spec limits for 800GBASE-FR4 in D1.2
- Caveats:
  - Small sample size: 2 devices
  - CoC TX are driven by an AWG and RF probe, not integrated in a module
  - Different TX implementations and test equipment may give different results

Channel 1271 TDECQ



- B2B TDECQ was measurable down to < 3e-4.
- At 9.6e-3, TDECQ minus TECQ is only ~0.3dB. This increases to ~0.5dB at 4e-3, the original FR4 baseline target SER.
- For CD = -10.3ps/nm, TDECQ was only measureable down to 1.6e-3.

Channel 1331 TDECQ



- B2B TDECQ was measurable down to 2.2e-4.
- At 9.6e-3, TDECQ minus TECQ is ~ 1 dB. This increases to ~1.1 dB at 4e-3, the original FR4 baseline target SER.
- At CD = 5.2 ps/nm, TDECQ was only measureable down to 2.4e-3.

Discussion

- This contribution presents example TDECQ measurements illustrating possible limits to reducing target SER in order to guardband TX BER performance.
- The data show the expected compression of TDECQ values towards 1dB as the target SER is increased.
- At values of chromatic dispersion close the specs for 800GBASE-FR4, TDECQ becomes unmeasurable (or at least inaccurate) below target SER ~ 2e-3. Target SER of 4e-3 (the original FR4 baseline) is ok.
  - Different transmitters and test equipment may give different results.
  - The data suggests it may be impractical to use a target SER of 4.8e-4 for 800GBASE-FR4 TDECQ, although it could be used for TECQ if that adds value.
  - 1311nm DRn-2 TDECQ measurement might be practical at 4.8e-4, since the worst case channel dispersion is much lower than FR4. Measurement data is needed to confirm.

Thank You