K' Specification
(in support of comment 195)

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Outline

1. Proposal in comment 195

2. VCSEL measurements

3. Work in 802.3cu
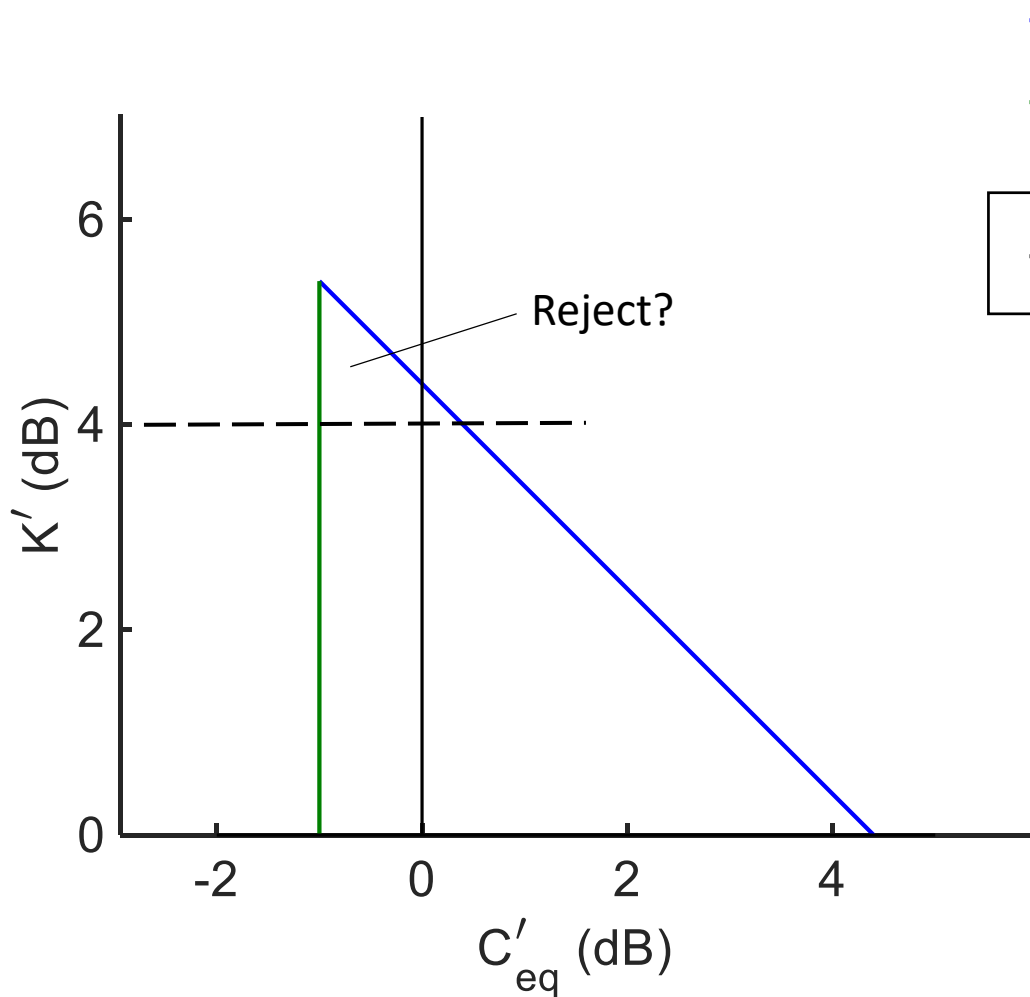
TECQ/TDECQ Components

$\text{TECQ} = C'_{eq} + K'$

$\text{TDECQ} = C_{eq} + K$

C_{eq}, C'_{eq}	noise enhancement at the reference equalizer
K, K'	non-equalizable component of the optical waveform at the receiver

Determination of K' does not require a new measurement.

Proposal in Comment #195

Legend:
- **TECQ (max) = 4.4 dB** (blue line)
- **Minimum value of cursor in the reference equalizer (0.8)** (green line) [Note: a vertical line is drawn, strictly should have some slant]
- **K' (max) = 4 dB proposed to remove bad Tx [comment #195]** (dashed line)

Plot axes: K' (dB) vs C'_{eq} (dB), with "Reject?" annotation.

SR Link
There is a *de facto* limit on K' near 4 dB because C_{eq} varies by more than 1 dB over $0.5 - 100$ m.

VR Link
Examples of high K' links are shown on the next page.

TDECQ Calculation
Eye threshold adjustment change from $\pm 1 \rightarrow \pm 2\%$ has only a small impact (< 0.1 dB on average) on TECQ/TDECQ.

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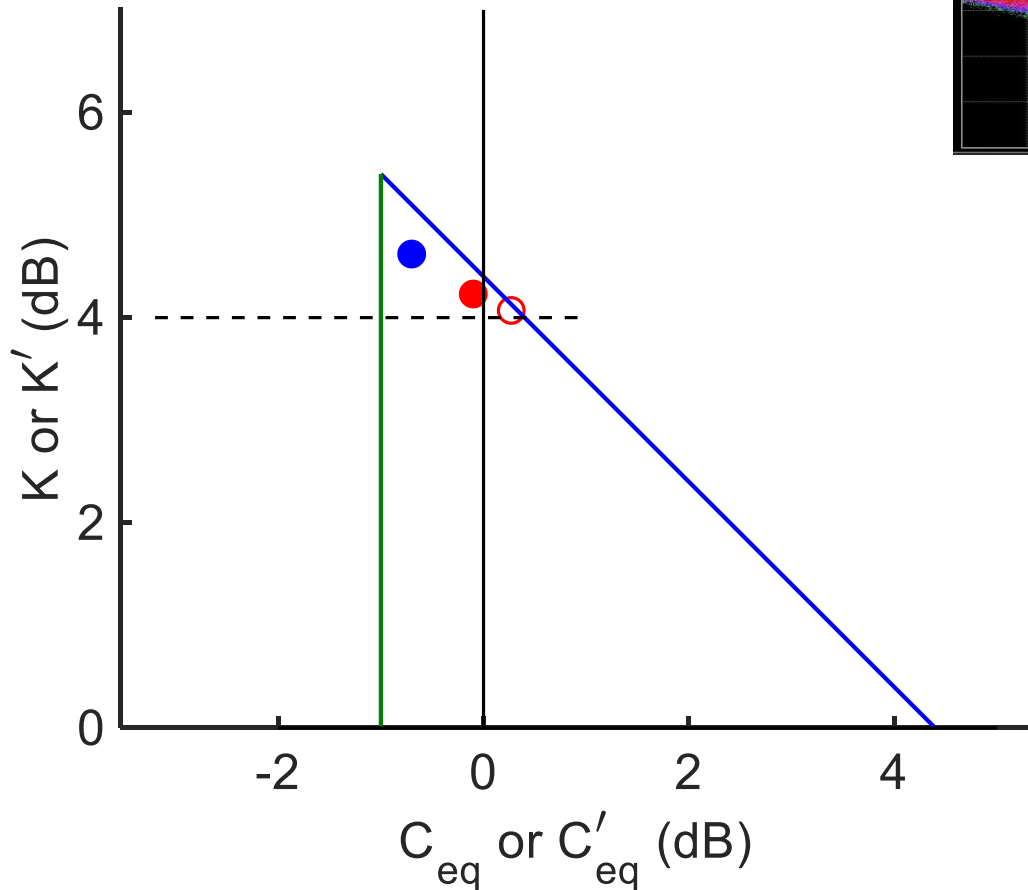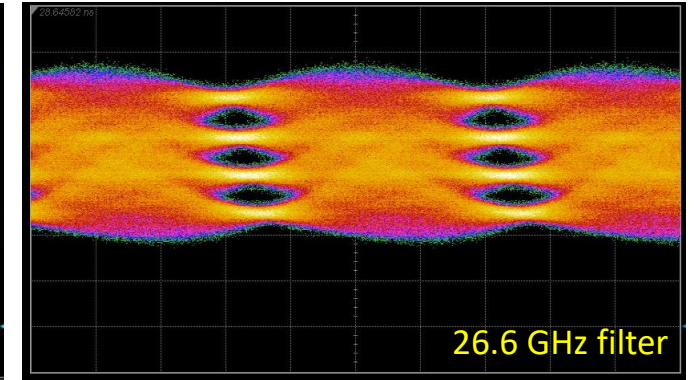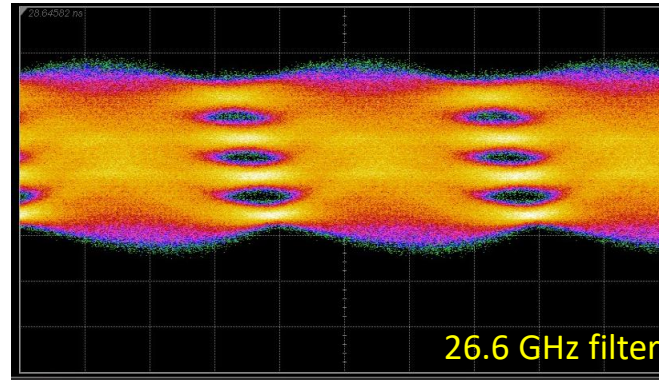murty_3db_01a_092321.pdf

Links with high K'

Link 1

Before equalization

After equalization

26.6 GHz filter

26.6 GHz filter

Link 1
OM4 2m (●) and +33.6 GHz filter [OM4 50m] (○)
Overshoot 24.5% at OM4 2m (HR 3E-3)

Tx should be able to pass Table 167-7 specifications.

Link 2
OM4 2m (●)
Overshoot 32.7% (HR 3E-3)

Tx will be rejected for the high overshoot.

High K' in DML Links

Observations on the high K' region:

- It is easier to get into the high K' region with high overshoot, e.g., link 2.

- Eye skew contributes to K' in DML links.

<u>SR Link</u>
Change in C_{eq} with fiber length will prevent Tx with K' $\gtrsim$ 4 dB from passing Table 167-7 specifications.

<u>VR Link</u>
One example shows the possibility for a Tx with high K' to pass Table 167-7 specifications.

Work in 802.3cu

- A specification for overshoot was adopted in 802.3cu.

- A limit on K' (K) was discussed but not adopted.

Measurements:

Lane	TDECQ(dB)	Ceq(dB)	TDECQ-Ceq(dB)	error floor
1	2.00	-0.53	2.53	1.06E-06
2	1.72	-0.68	2.4	2.98E-07
3	2.03	-0.56	2.59	4.15E-07
4	3.35	-0.12	3.47	7.27E-09

Purposely modified FR4 module to show:

☐ TDECQ-10log(Ceq) spec would fail the Tx that has the best error floor (by more than 1 decade)

☐ TDECQ-10log(Ceq) spec will pass transmitters that will show very poor error floor in the field

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