Refining TDECQ (continued)

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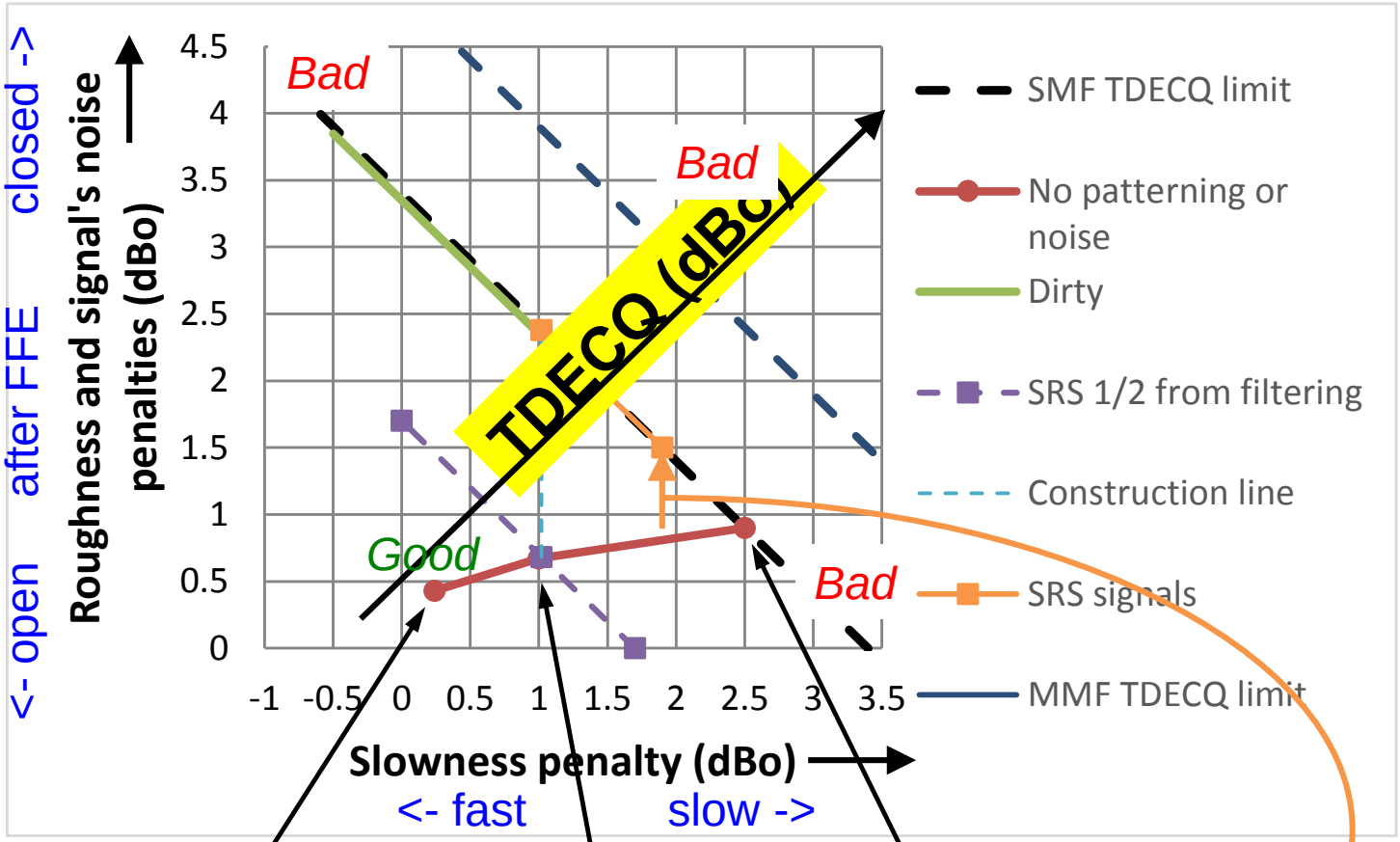
Not all maximum-TDECQ signals are equal

- Continuing to investigate the variety of bad signals (both in-service signals and stressed receive signals) and considering where the limits of compliance should be
- Follows dawe_3cd_01a_0318.pdf and dawe_032118_3cd_adhoc.pdf

TDECQ map

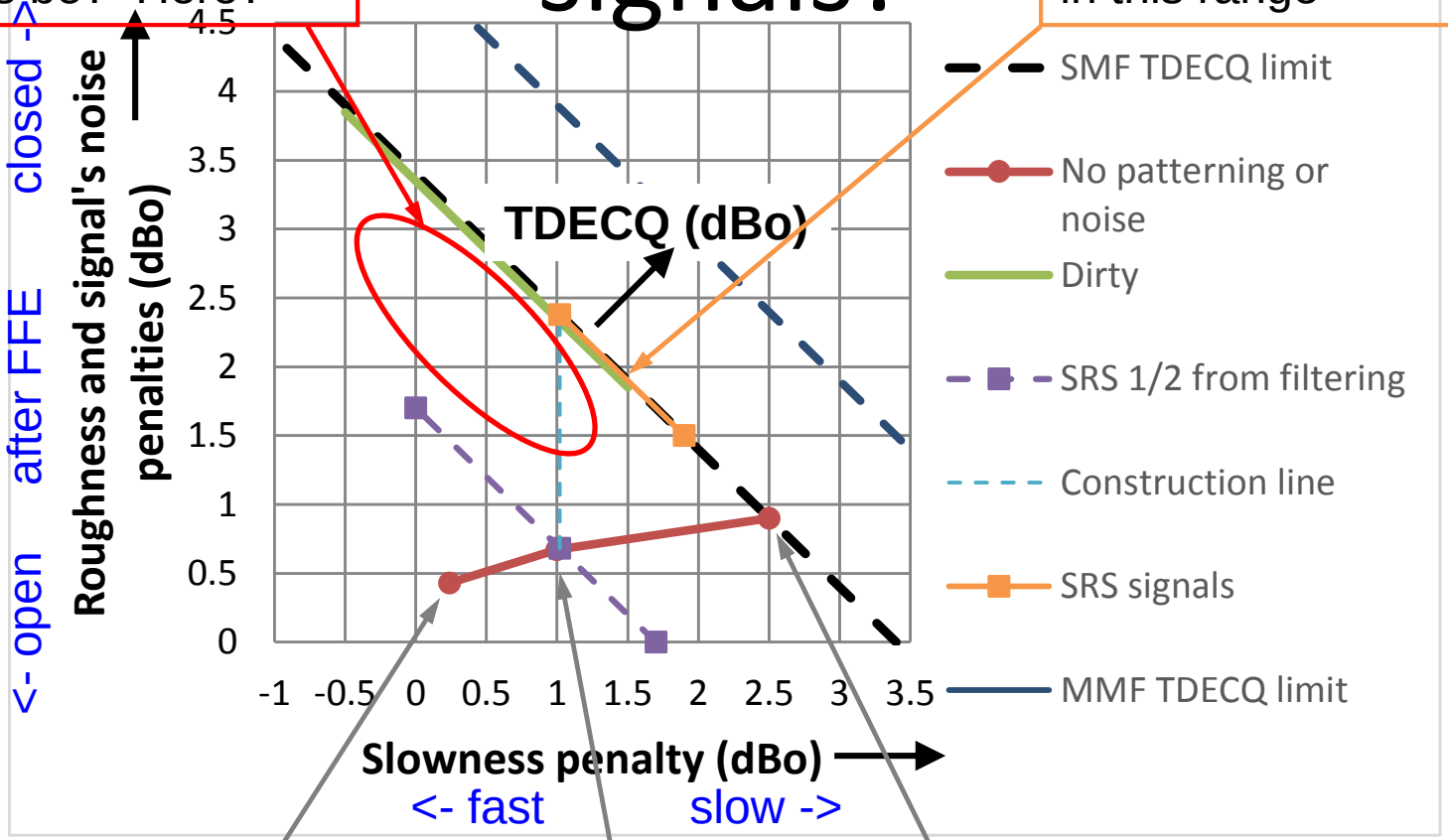


Update from dawe_3cd_01a_0318: the SRS signal has SJ that increases its ISI

Mismatch between SRS and real signals?

Where will real poor signals be? Here?

SRS signal must be in this range



Ideal waveform

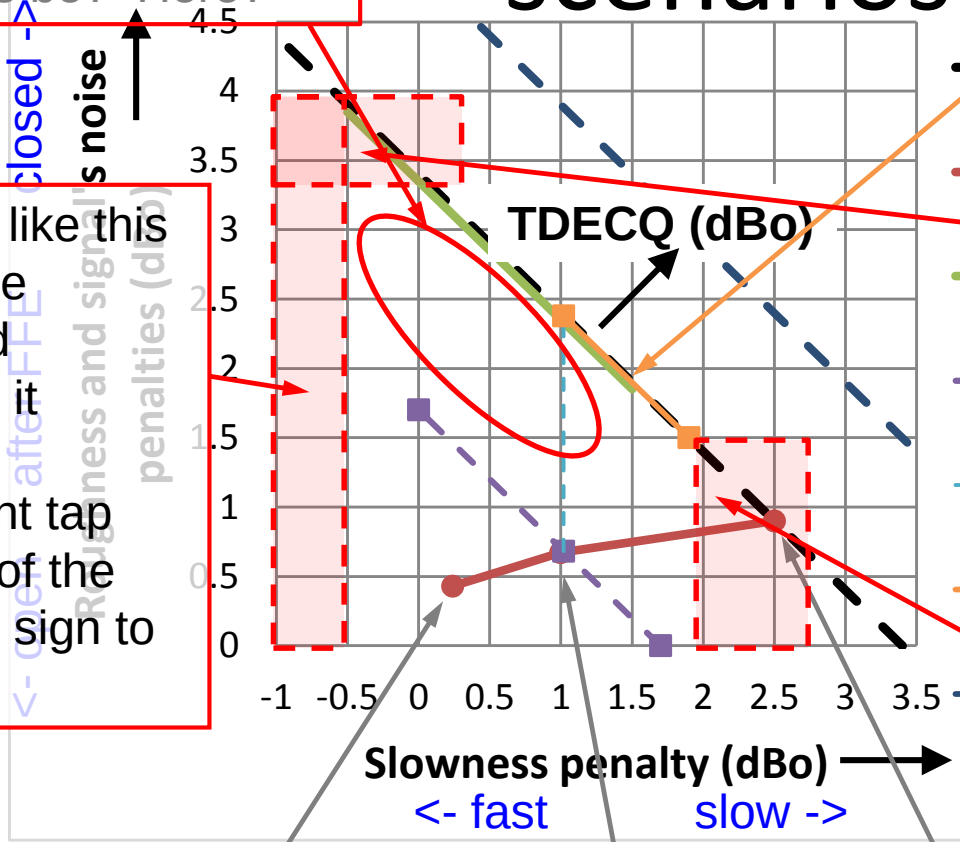
Half the SECQ from filtering

Slowest, as dawe_3cd_01a_0318 slides 2 to 5

Don't support unrealistic bad scenarios

Where will real poor signals be? Here?

SRS signal must be in this range



A region like this should be excluded because it requires significant tap weights of the opposite sign to normal

A region like this should be excluded because the eye after FFE is very closed, and small amounts of e.g. nonlinearity would cause big additional penalties (cliff edge)
Like VEC issue in C2M

A region like this should be excluded because it requires strong tap weights not useful in practice, and is not screened for in SRS

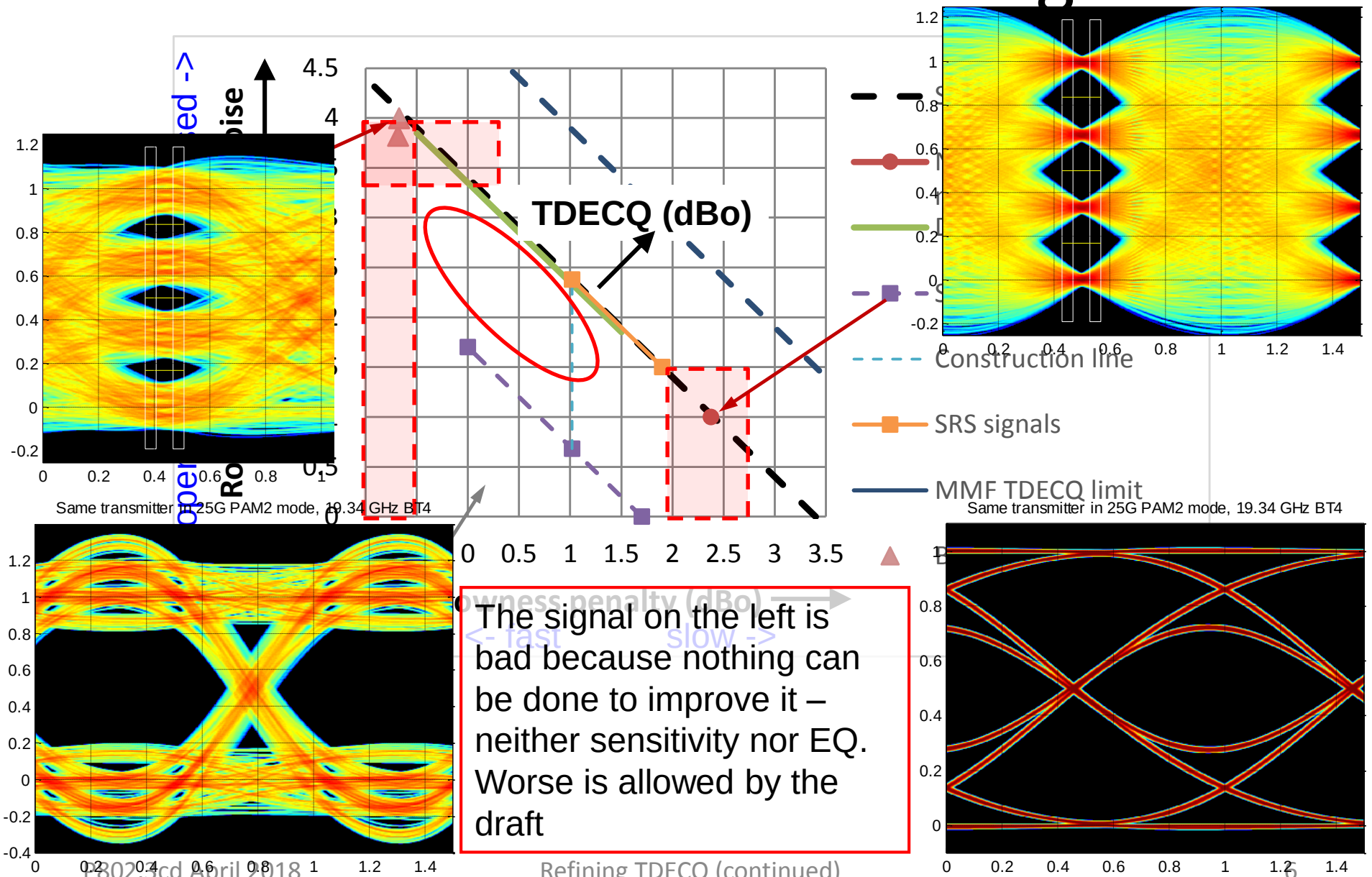
Ideal waveform

Half the SECQ from filtering

Slowest, as dawe_3cd_01a_0318 slides 2 to 5

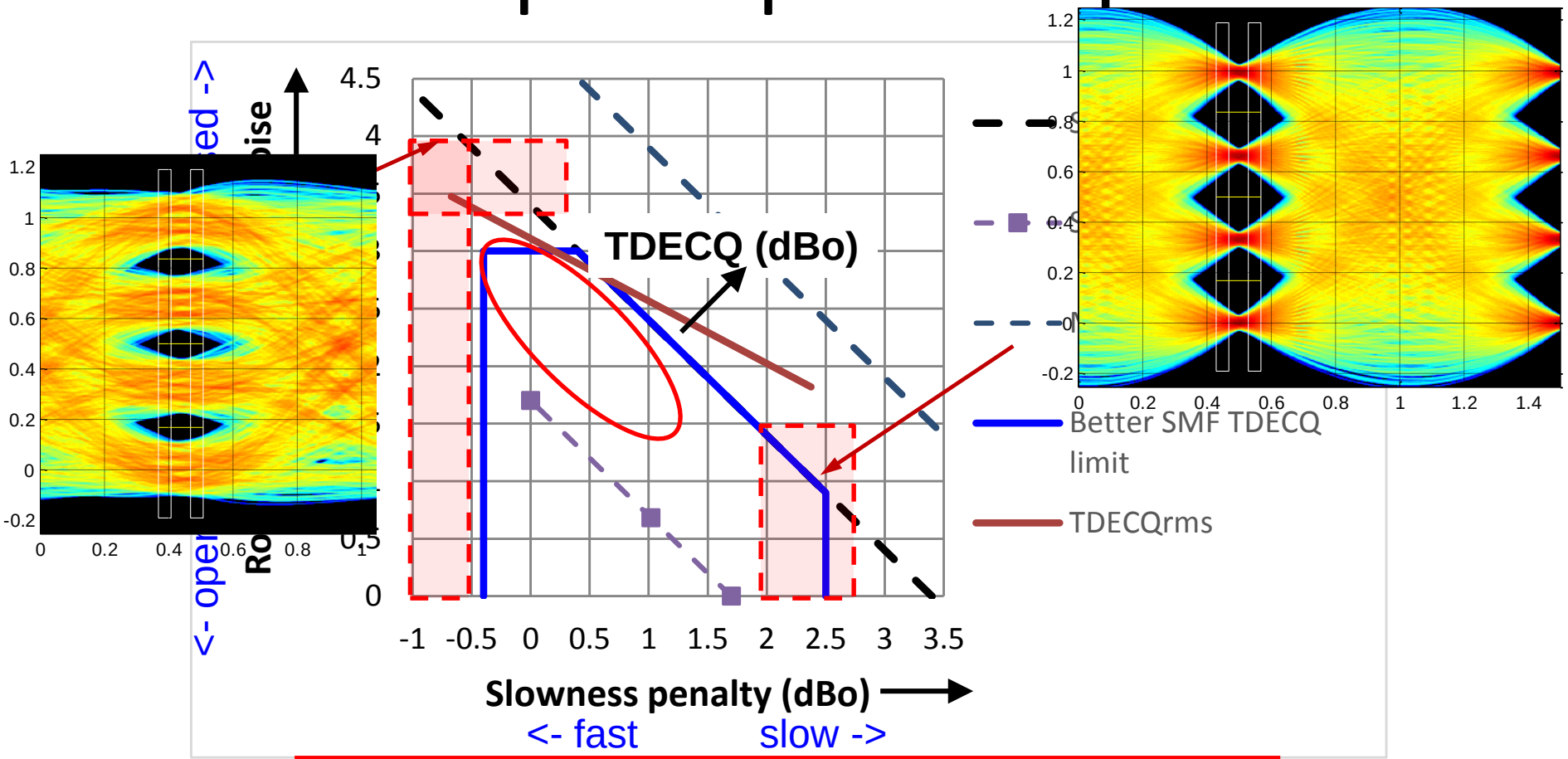
"Exclusion" could be by giving signals in the red boxes worse TDECQ scores, or by "hard" pass-fail rules

Extremes of worst-case signals



The signal on the left is bad because nothing can be done to improve it – neither sensitivity nor EQ. Worse is allowed by the draft

Example improved specs



These example limits are not identical to the ones in 802.3cj comments
(see next slides)
Need to come to a consensus on what's reasonable

Bound the left side (too much emphasis)

- *Cl* **121** *SC* **121.8.5.4** *P* **136** *L* **20** # r02-7 **TR**
- A much wider range of signals are allowed to be transmitted than are covered by SRS (required to be received).
- At present it is allowed to make a transmitter with a noisy or distorted signal, use heavy emphasis to get it to pass the TDECQ test, yet a compliant receiver that passes SRS would not need to receive it. The range needs to be bounded on the left hand side of the maps in dawe_3cd_01a_0318 and dawe_032118_3cd_adhoc so that the receiver design can be bounded in terms of having to "invert" heavily over-emphasised signals, and the gap between possible signals and SRS closed or narrowed.
- The remedy doesn't directly outlaw over-emphasised signals, but gives them worse TDECQ scores.
- D3.1 comment 35
- *SuggestedRemedy*
- This remedy lets the transmitter designer use reasonable amounts of emphasis, balancing his own transmitter bandwidth and the reference receiver front-end bandwidth.
- After saying where the largest magnitude tap coefficient is, add **"The tap coefficients are constrained so that the sum of the other four tap coefficients is less than zero."**
- **Similarly in clauses 122, 124.**

Bound the top (irreparably bad)

- *Cl* **121** *SC* **121.8.5.3** *P* **136** *L* **14** *#* r02-8 **TR**
- A much wider range of signals are allowed to be transmitted than are covered by SRS (required to be received).
- At present it is allowed to make a transmitter with a noisy or distorted signal and use emphasis to get a "noise enhancement credit" to pass the TDECQ test, yet the eye closure is more than the TDECQ limit and a compliant receiver that passes SRS would not need to receive it. The range needs to be bounded on the top side of the maps in dawe_3cd_01a_0318 and dawe_032118_3cd_adhoc so that the receiver design can be bounded in terms of resolution and patterning, and the gap between possible signals and SRS closed or narrowed.
- The first remedy has the disadvantage that errors in OMA measurement degrade its accuracy.
- D3.1 comment 35
- *SuggestedRemedy*
- Either:
- 1. **Limit TDECQ -10*log10(Ceq) to <=2.8 dB**.
- **or**:
- 2. Define **TDECQrms** = 10*log10(A_RMS/(s*3*Qt*R)) where A_RMS is the standard
- deviation of the measured signal after the 13.28125 GHz filter response (before the FFE), Qt and R are as already in Eq 121-12. s is the standard deviation of a fast clean signal with OMA=2 and without emphasis, observed through the filter response (0.6254 for 13.28125 GHz).
- **Limit 3 dB**.
- Either remedy to apply to **all PMDs** that use TDECQ in Section 8, although it would not matter much for 400GBASE-FR8 if the over-emphasis limit (see another comment) is in force.