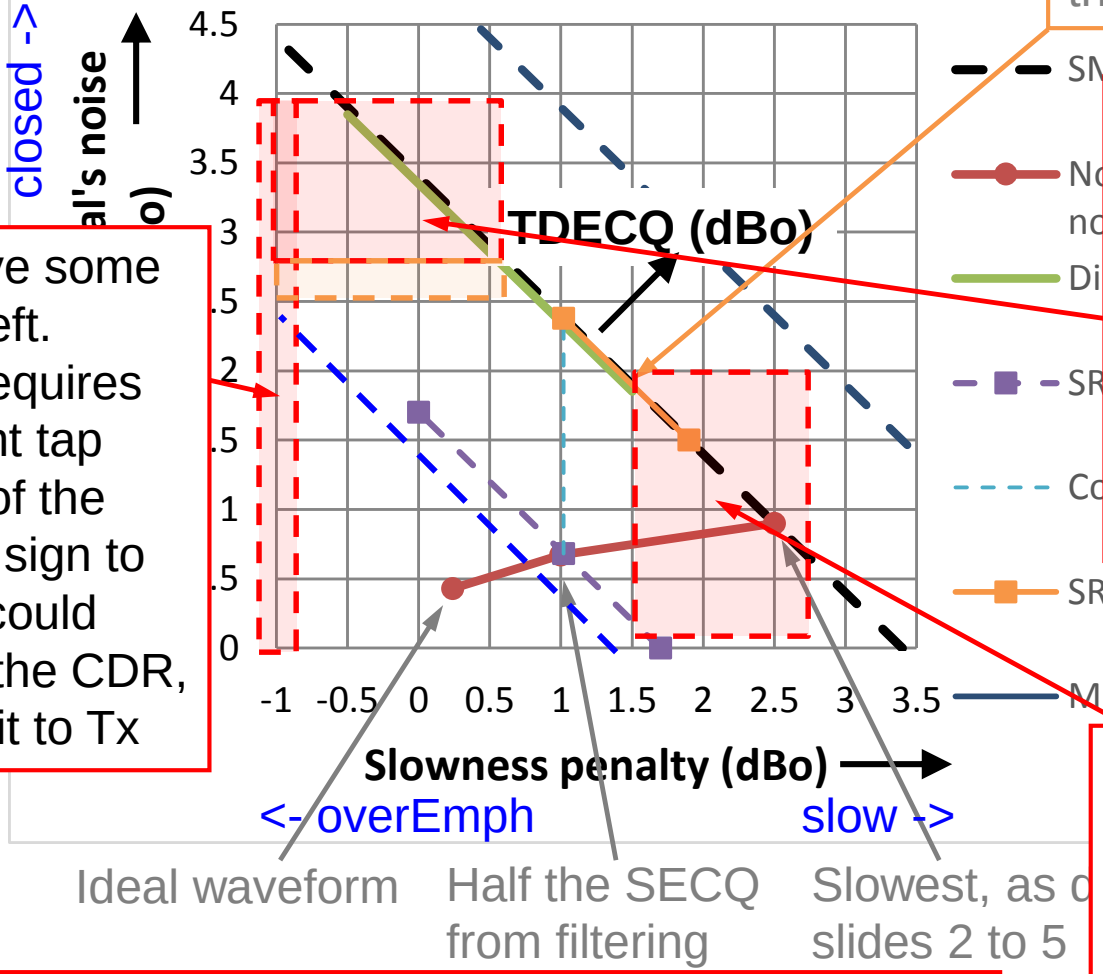
Completing the family of TDECQ-related specifications

Piers Dawe

Mellanox

Don't support unrealistic bad scenarios

From a previous presentation



SRS signal must be in this range – see backup

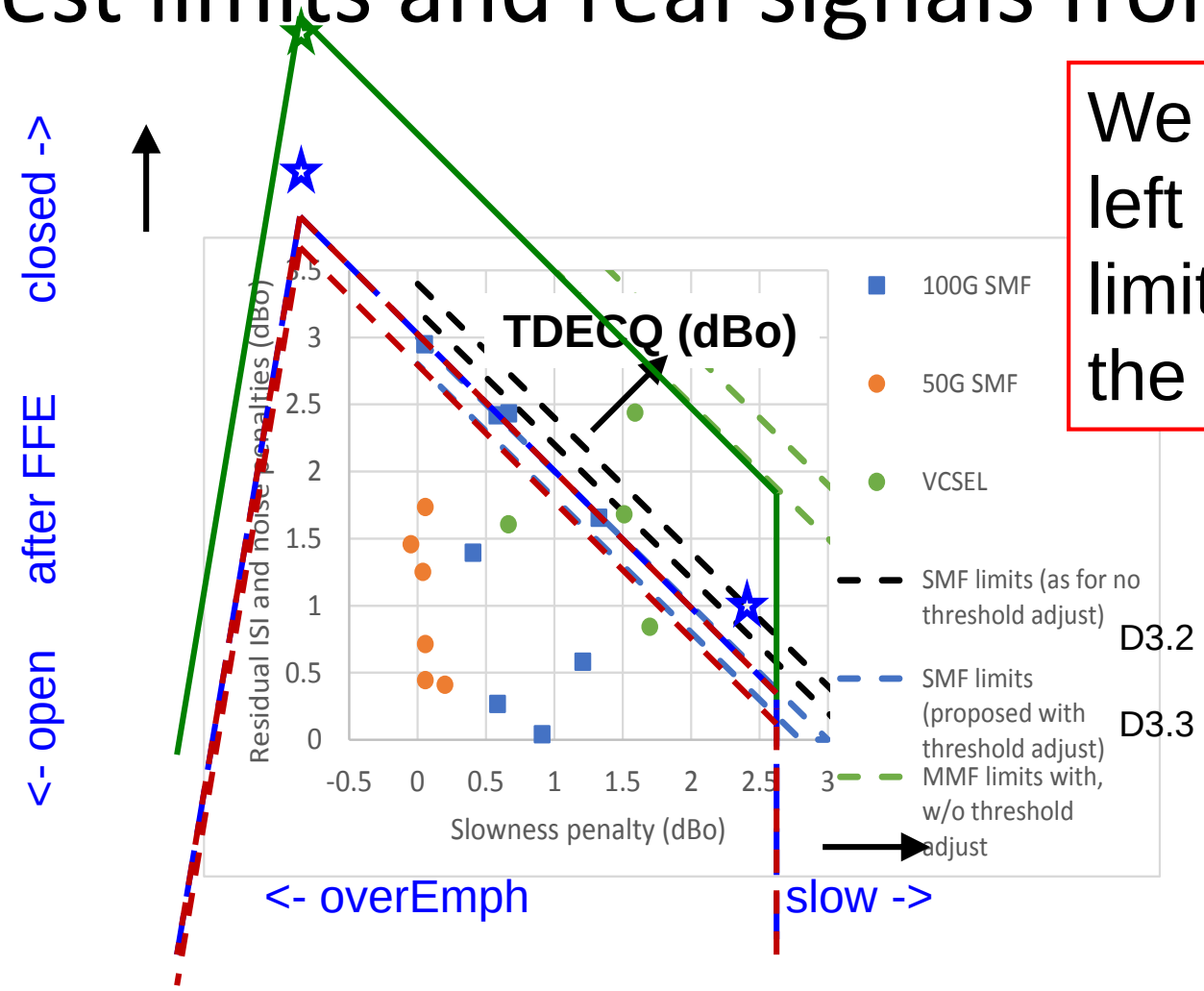
Should be excluded because the eye after FFE is very closed, and small inaccuracies in Rx would cause big additional penalties (cliff edge)
Like VEC issue in C2M

Must have some limit on left.
Too far requires significant tap weights of the opposite sign to normal, could confuse the CDR, no benefit to Tx

Should be excluded because it requires strong tap weights not useful in practice, for SMF would have failed T/2-spaced TDECQ

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

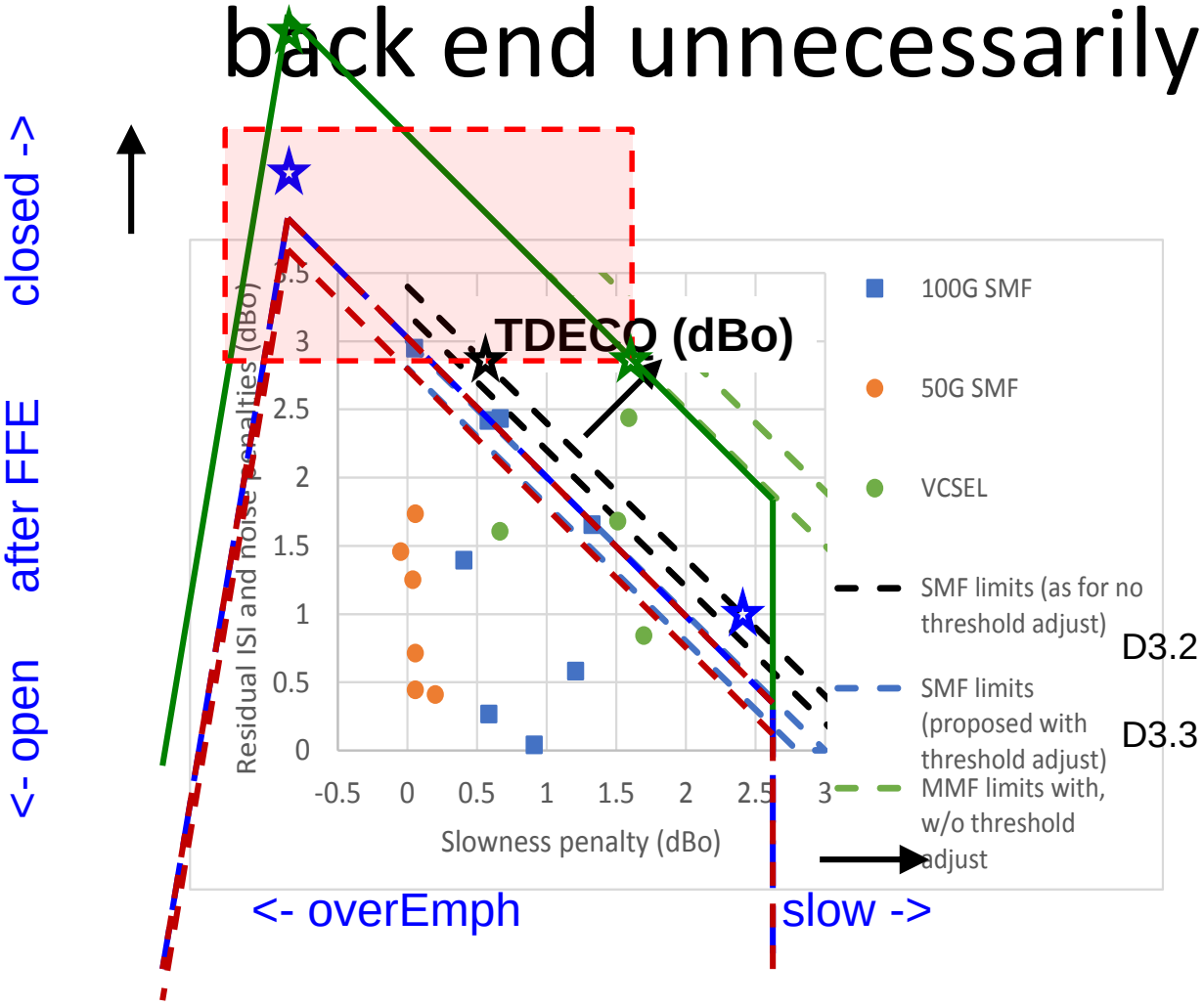
Latest limits and real signals from survey



We now have left and right limits but not the "top" limit

❖Blue stars investigated in later slides

The region in red burdens the receiver back end unnecessarily



Green, brown, blue: latest limits for:

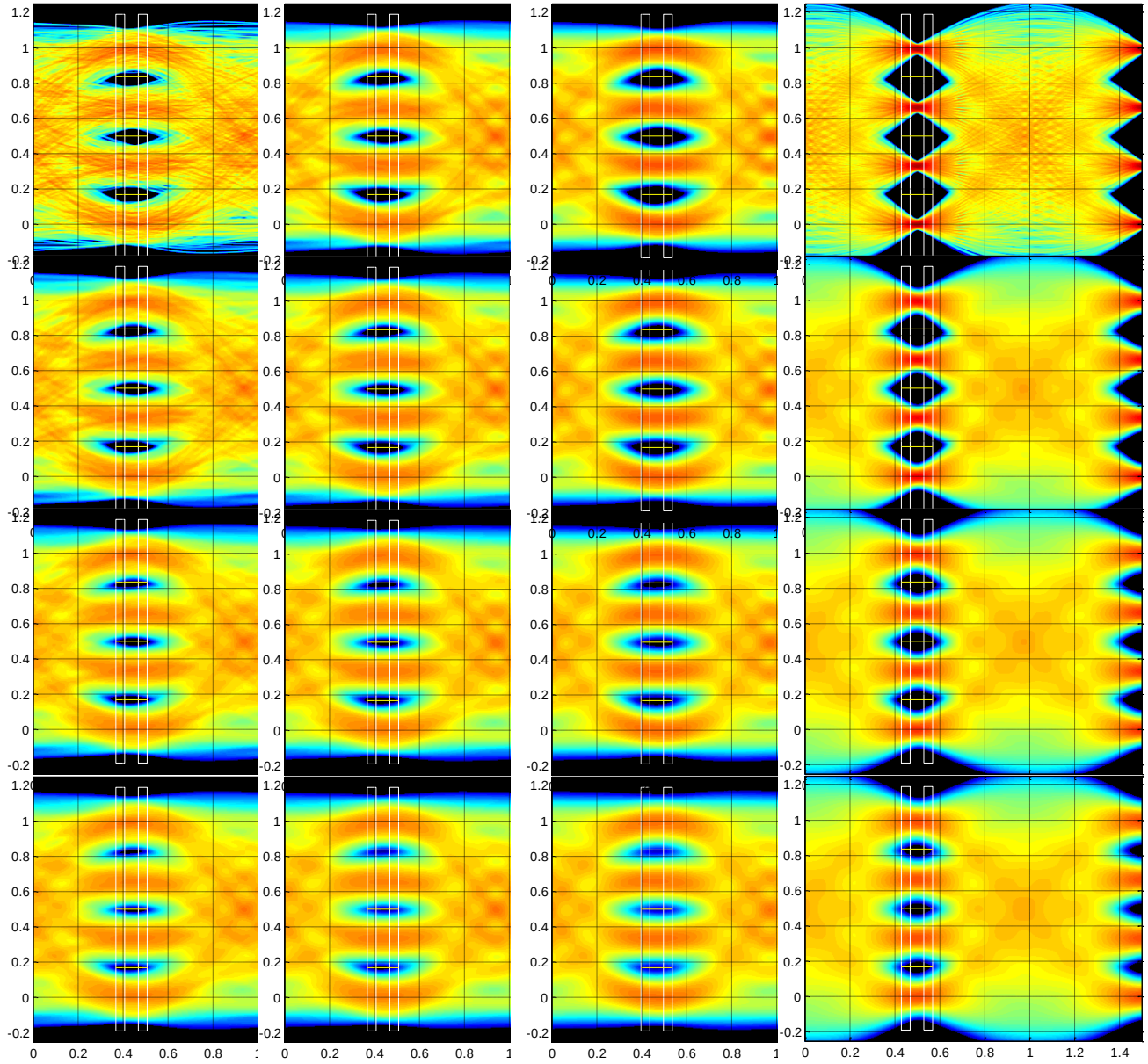
MMF,

50G SMF,

100G SMF

- Blue stars investigated in later slides
- Green and black stars: proposed worst corners
  - See slides 5 and 6 for investigation of black star

Three signals with very similar TDCEQ



From top:

Very little Rx noise

3 dB above sensitivity

1 dB above sensitivity

At sensitivity

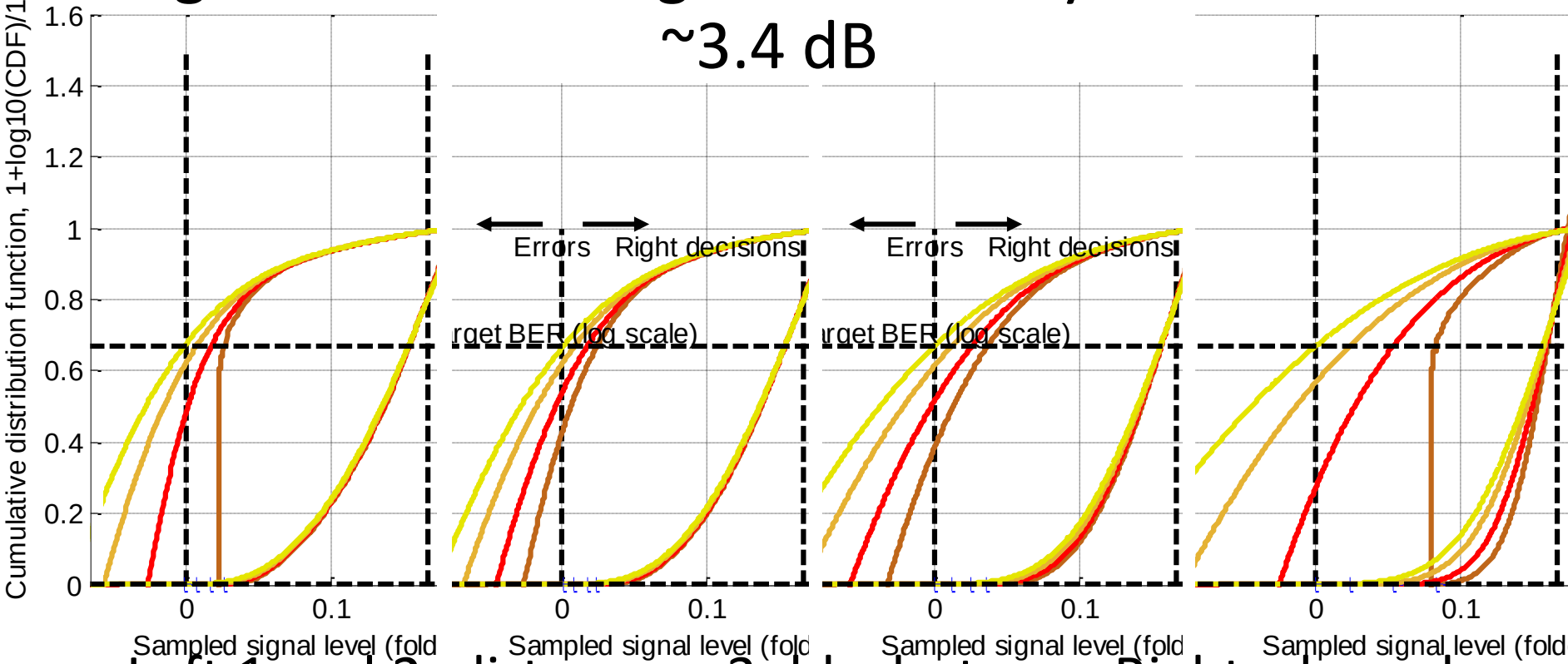
Left: dirty signal, bounded noise

2: dirty, RIN -132 dB/Hz (50GBASE-FR and 50GBASE-LR)

3: black star

Right: slow clean signal

Histograms of three signals with very similar TDCEQ ~3.4 dB



- Left 1 and 2: dirty 3: black star Right: slow, clean
  - 2 and 3 have RIN, 1 and 4 don't
  - Almost no Rx noise, 3, 1, 0 dB above sensitivity
  - The eyes are folded: threshold at 0, nominal signals at 1/6

BER = 0 2.6e-6 7.4e-5 2.6e-4
2-sided eye opening / OMA =
0.053 0.035 0.015 -0.002

BER = 7e-7 1.0e-5 6.9e-5 2.0e-4
2-sided eye opening / OMA =
0.050 0.036 0.018 0.003

BER = 3e-7 6.7e-6 6.5e-5 2.3e-4
2-sided eye opening / OMA =
0.074 0.052 0.025 0.001

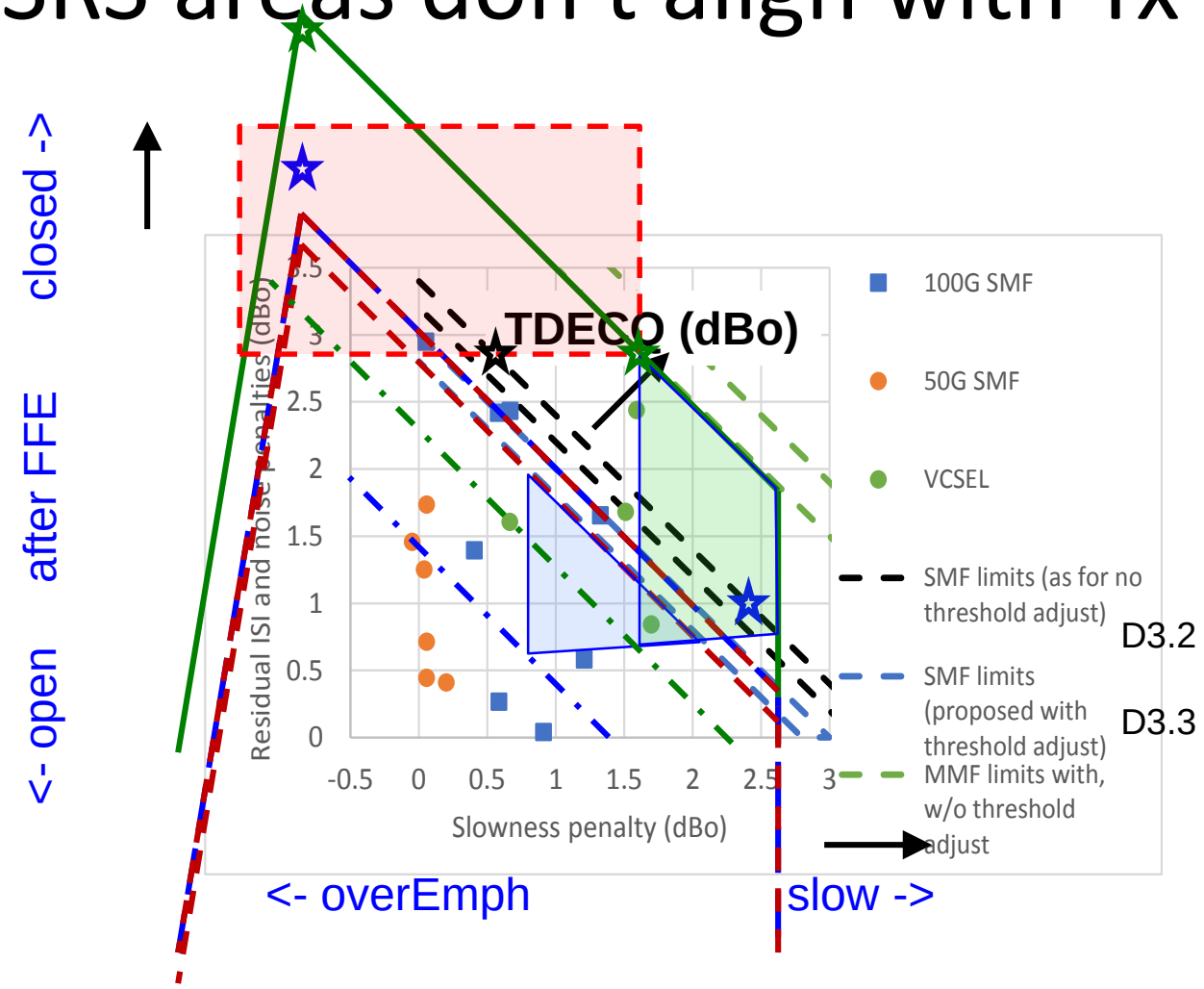
BER = 0 2.3e-8 2.1e-5 2.3e-4
2-sided eye opening / OMA =
0.167 0.108 0.048 0.001

up to 50% more room for EQ accuracy

Candidate remedies

- *Any of these could limit the top of the chart*
- TDECQ – 10 log10(Ceq)
- TDECQrms
- SNDR
- EVM (reduced to one dimension)
  - Error vector magnitude
- Broad thresholds

SRS areas don't align with Tx specs



Green, brown, blue: latest limits for:

MMF,

50G SMF,

100G SMF

-.- Green "half the penalty" rule and SRS area for MMF

-.- Blue "half the penalty" rule and SRS area for SMF