Completing the family of TDECQ-related specifications

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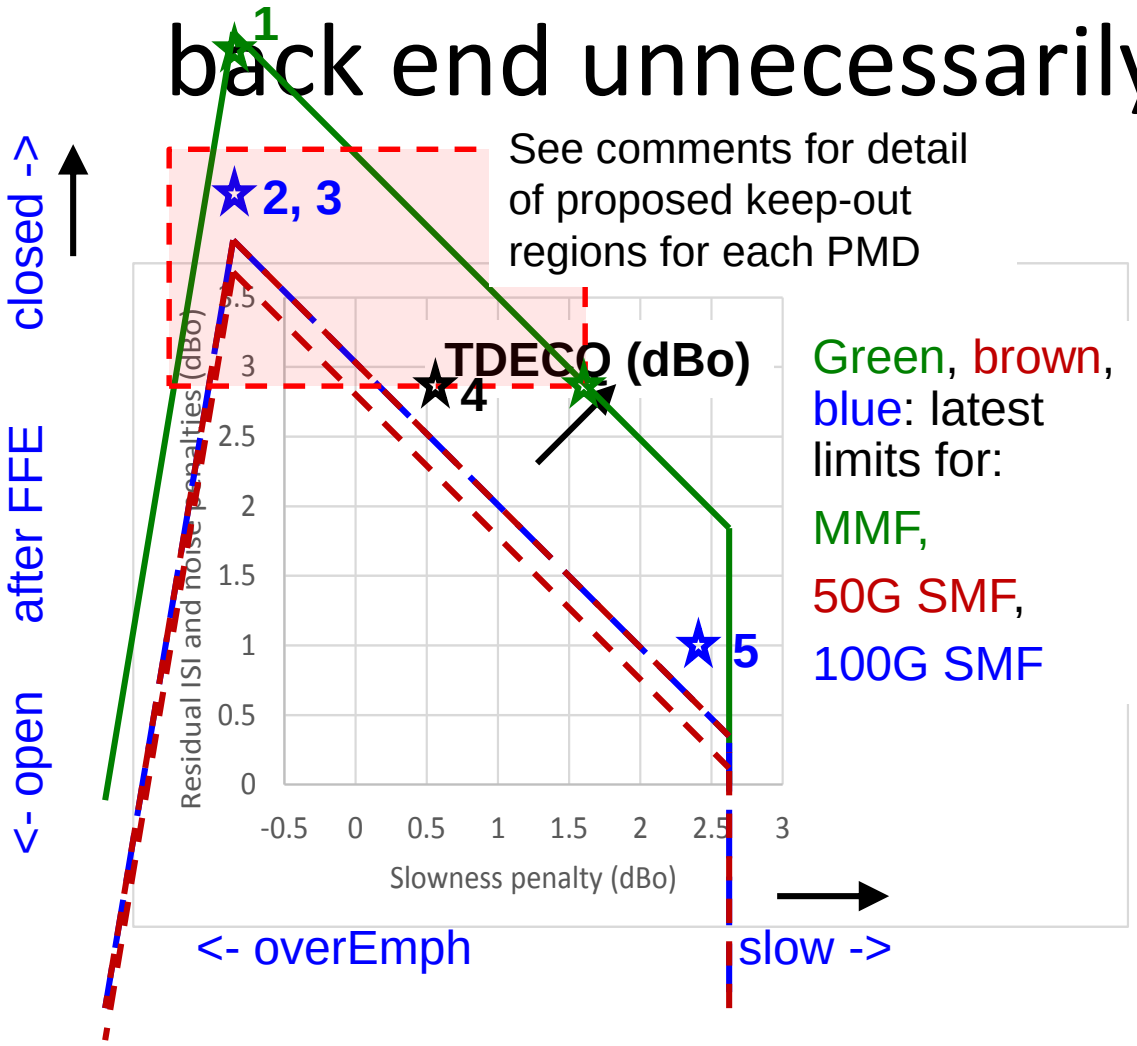
This week – includes worst MMF signal

Revision a re-orders and clarifies the material

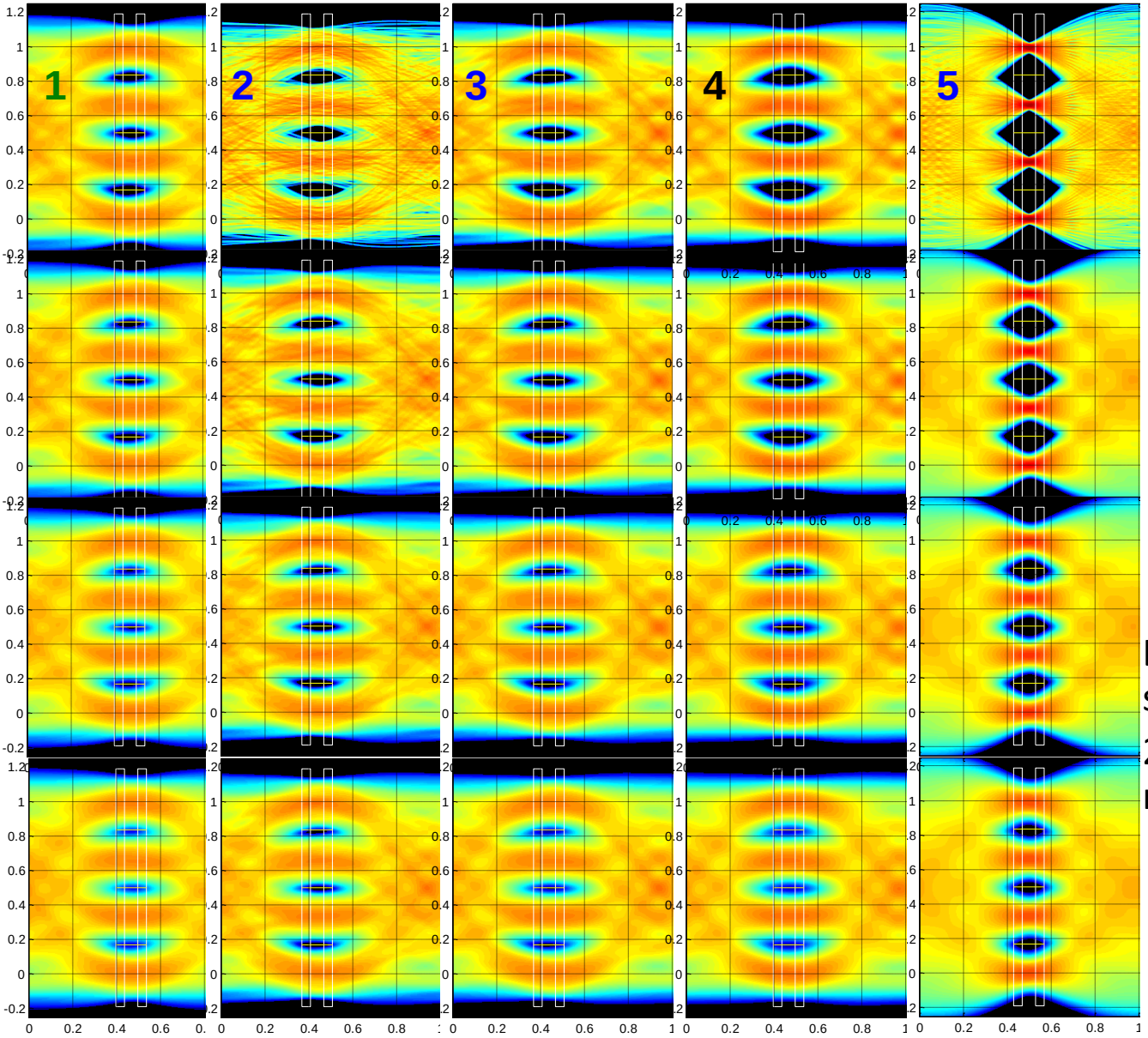
Supporter

- Johan Jacob Mohr Mellanox

The region in red burdens the receiver back end unnecessarily



- Blue stars investigated in slides 4 and 5
- Green and black stars: worst today and proposed worst corners
  - See slides 4 and 5 for investigation of top left green star and black star



Left: 4.5 dB TDECQ; 4 others: ~3.4 dB TDCEQ

From top:

Very little Rx noise

3 dB above sensitivity

1 dB above sensitivity

At sensitivity

Left: worst MMF (top green star), RIN -128 dB/Hz

2:dirty signal, bounded noise (top blue star)

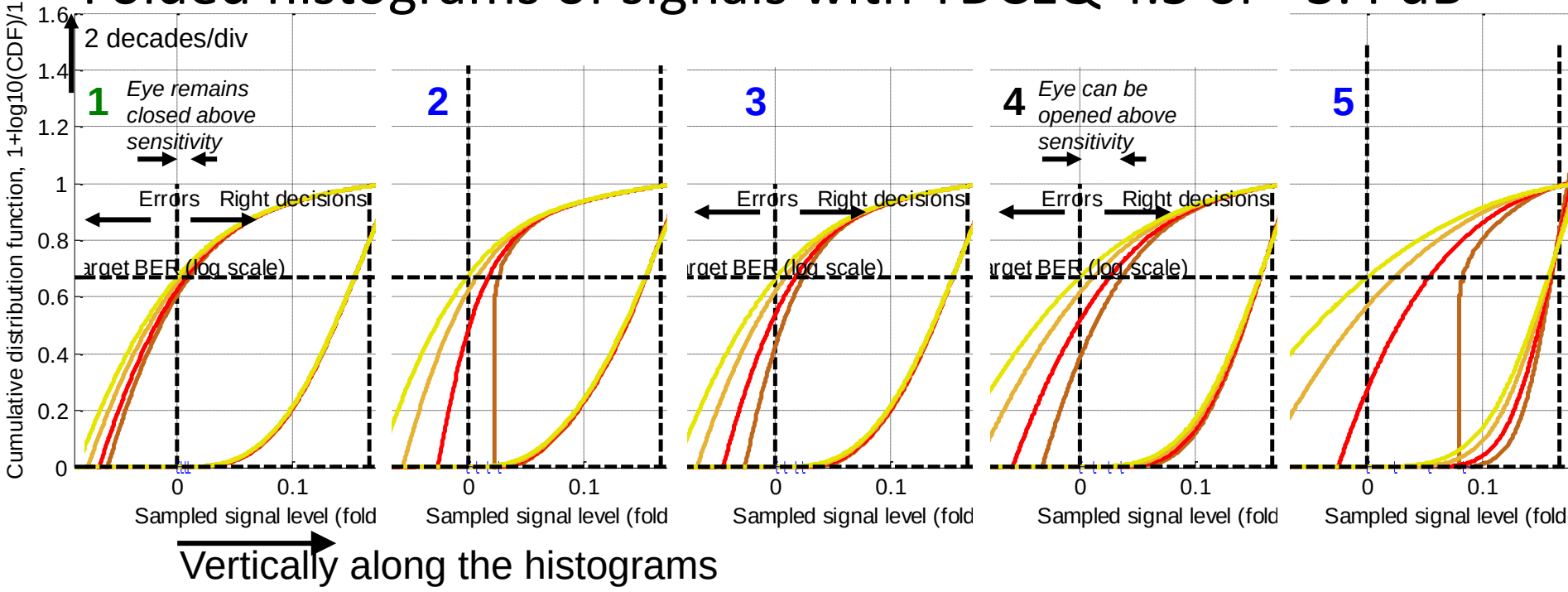
3: dirty, RIN -132 dB/Hz (50GBASE-FR and 50GBASE-LR) (also top blue star)

4: black star

Right: slow clean signal (bottom blue star)

To quantify these, the three sub-eyes of a histogram are overlaid and the histogram is folded about the threshold. The resulting vertical CDFs are plotted left-to-right on the next slide

Folded histograms of signals with TDCEQ 4.5 or ~3.4 dB



- Left: worst MMF (top green star) 2 and 3: dirty 4: black star Right: slow, clean
  - 1, 2 and 3 have RIN, 2 and 5 don't
  - 4 CDFs per signal: almost no Rx noise, 3, 1, 0 dB above sensitivity
  - The eyes are folded: threshold at 0, nominal signals at 1/6

BER =			
4.9e-5	7.9e-5	1.4e-4	2.2e-4
2-sided eye opening / OMA			
0.021	0.016	0.008	0.001

3 dBo gives only 1.6% room for real EQ accuracy – "on the cliff edge"

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

up to 50% more room for EQ accuracy

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

Candidate remedies

- *Any of these could limit the top of the chart*
- TDECQ – 10 log10(Ceq)
  - Free by-product of TDECQ measurement
- TDECQrms
  - Free by-product of TDECQ measurement
- SNDR
  - Would use same EQ as TDECQ
- EVM (reduced to one dimension)
  - Error vector magnitude
- Broad thresholds

More information on TDECQ and measured performance follows

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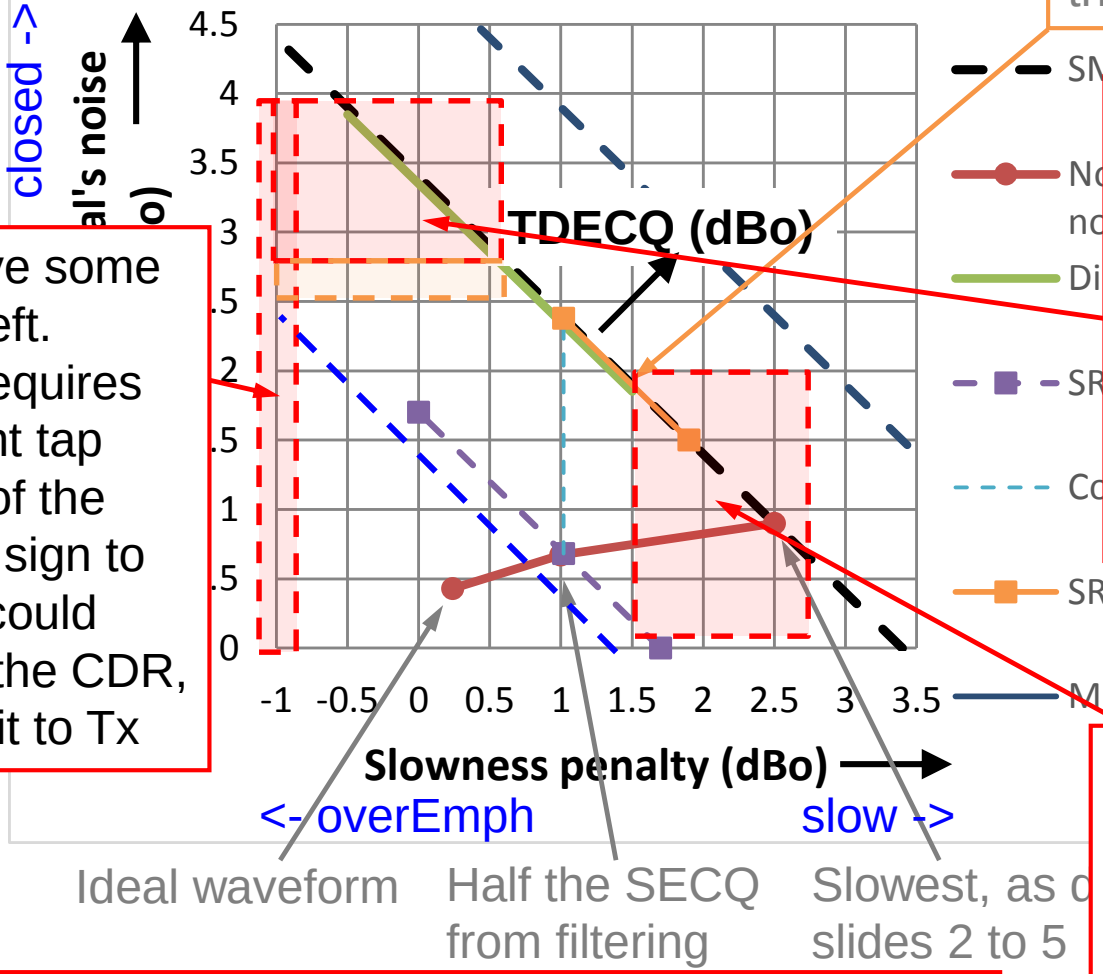
Don't support unrealistic bad scenarios

From a previous presentation



SRS signal must be in this range – see backup

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

Ideal waveform

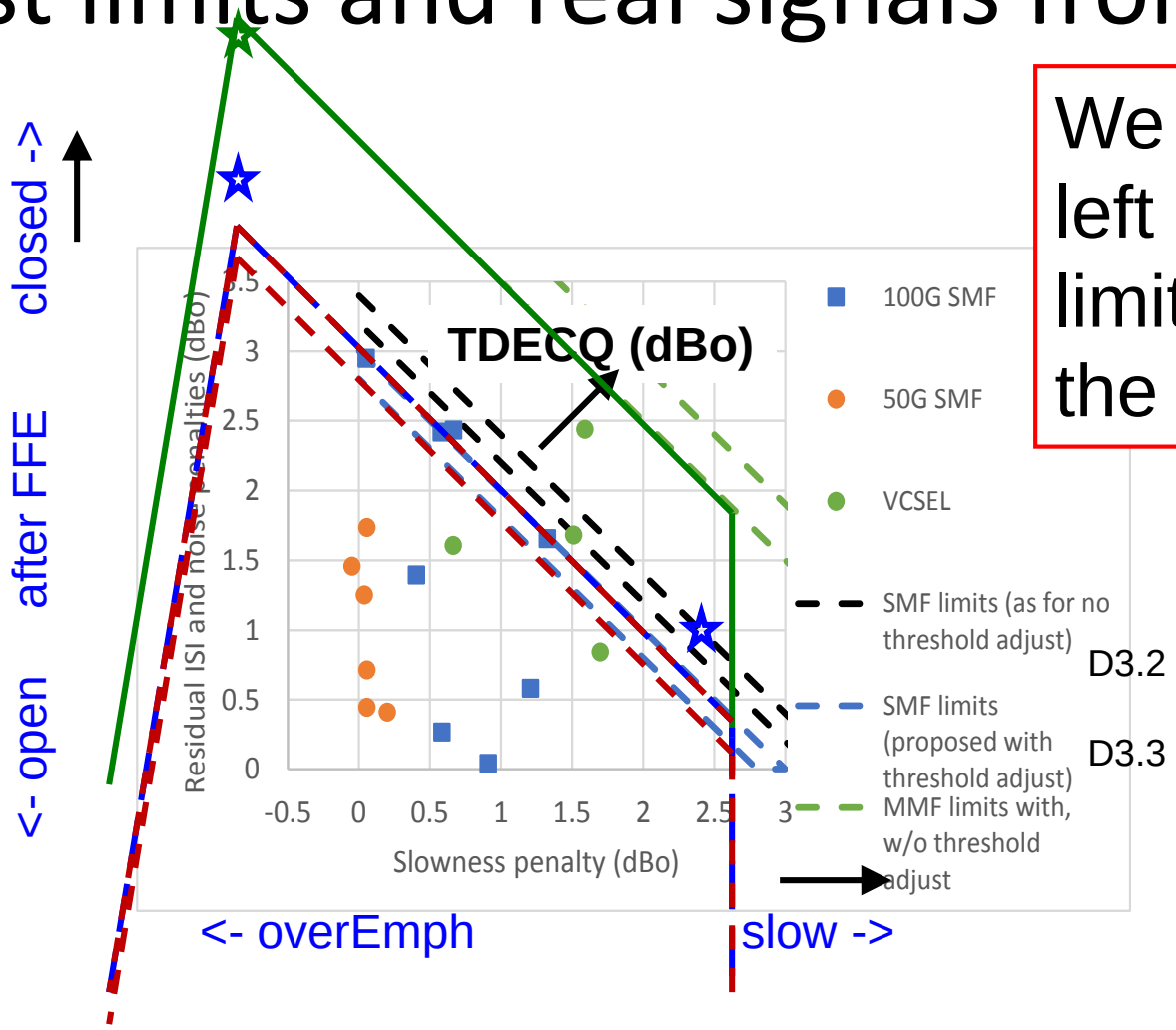
Half the SECQ from filtering

Slowest, as d slides 2 to 5

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

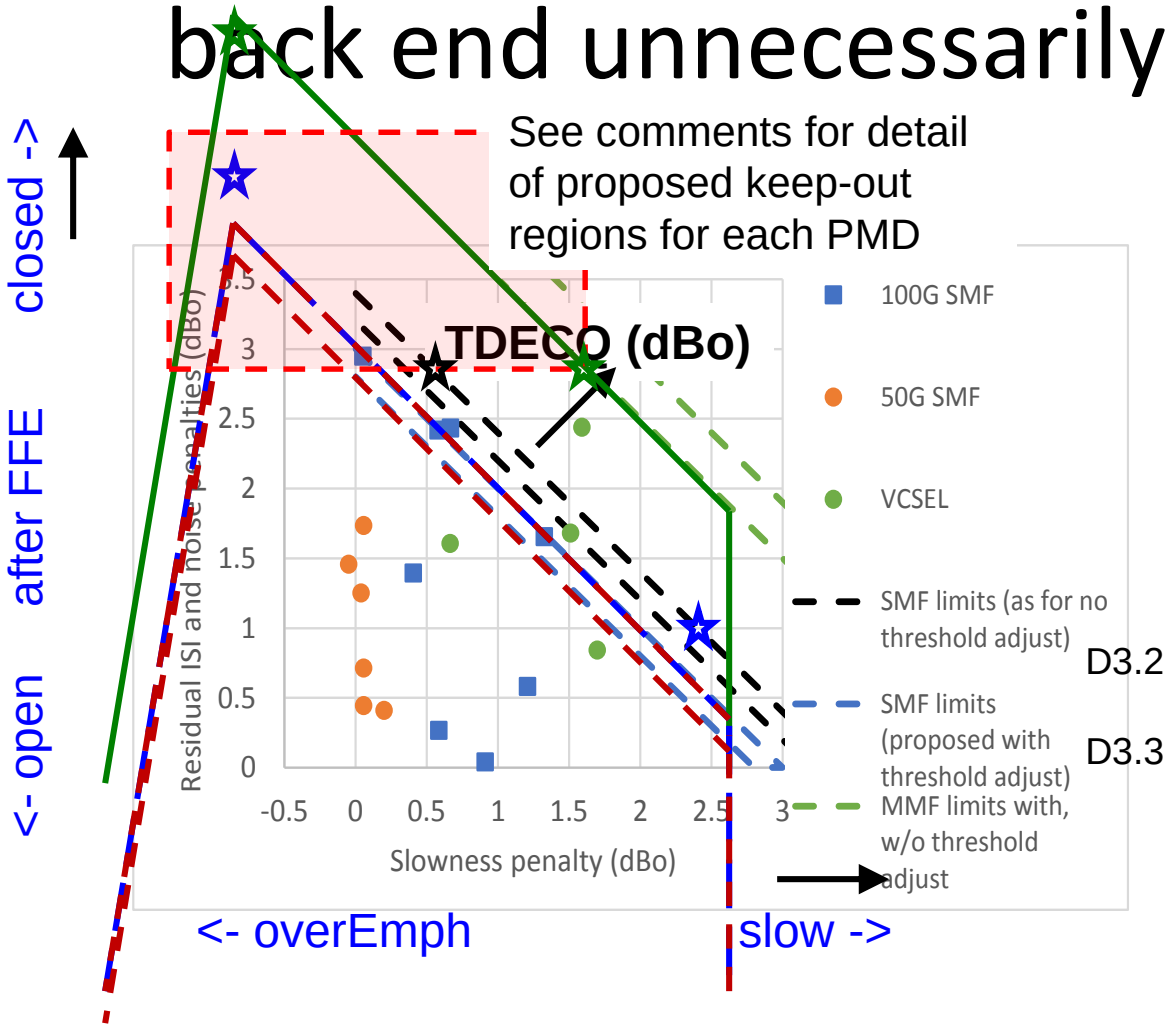
Latest limits and real signals from survey



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

- Blue and green 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

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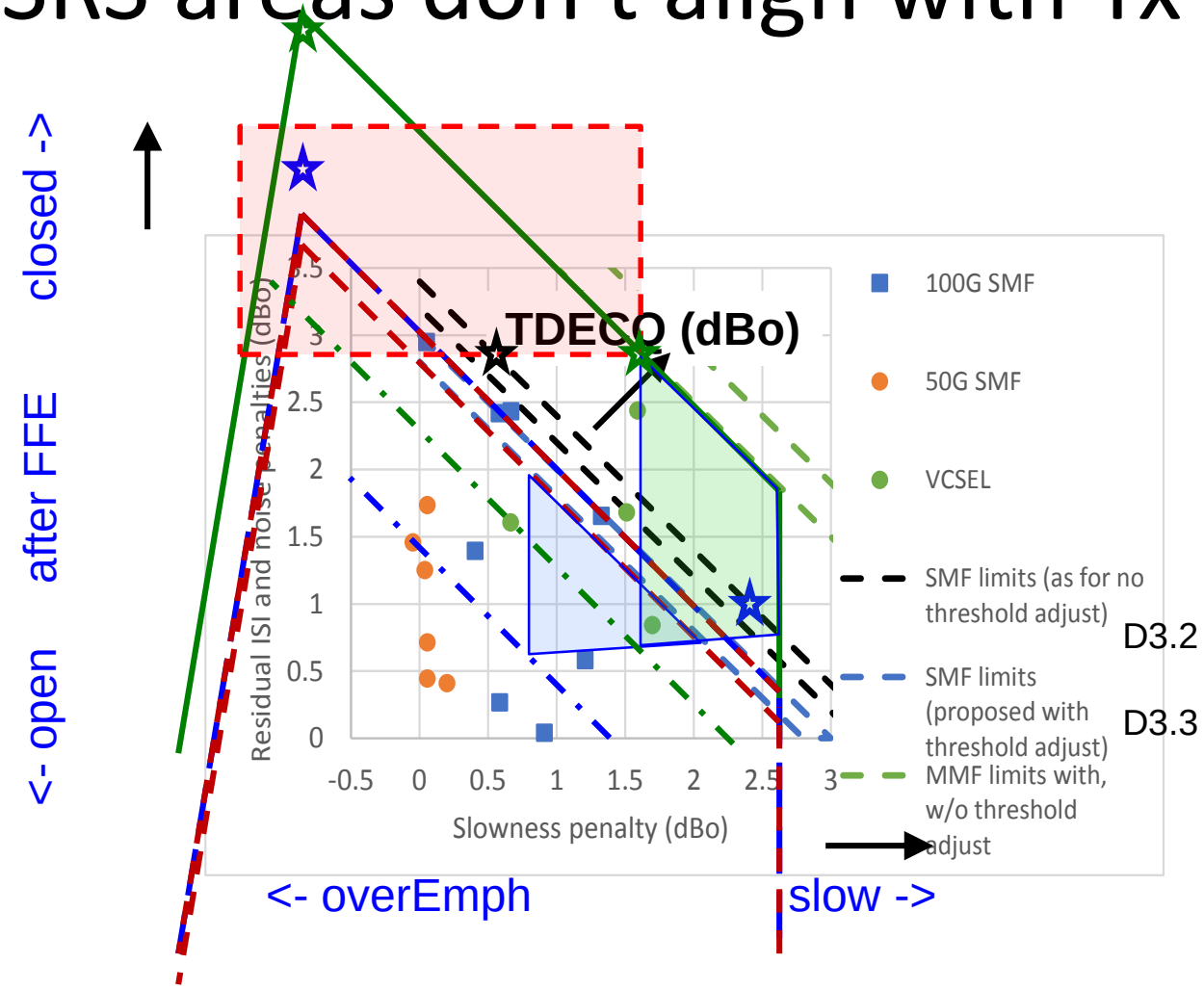
SRS areas don't align with Tx specs



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

- "Half the penalty" rule should be removed