100G/λ TDECQ analysis 53.1 GBd MZM Tx

P802.3bs SMF ad hoc, 16th May 2017

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Summary

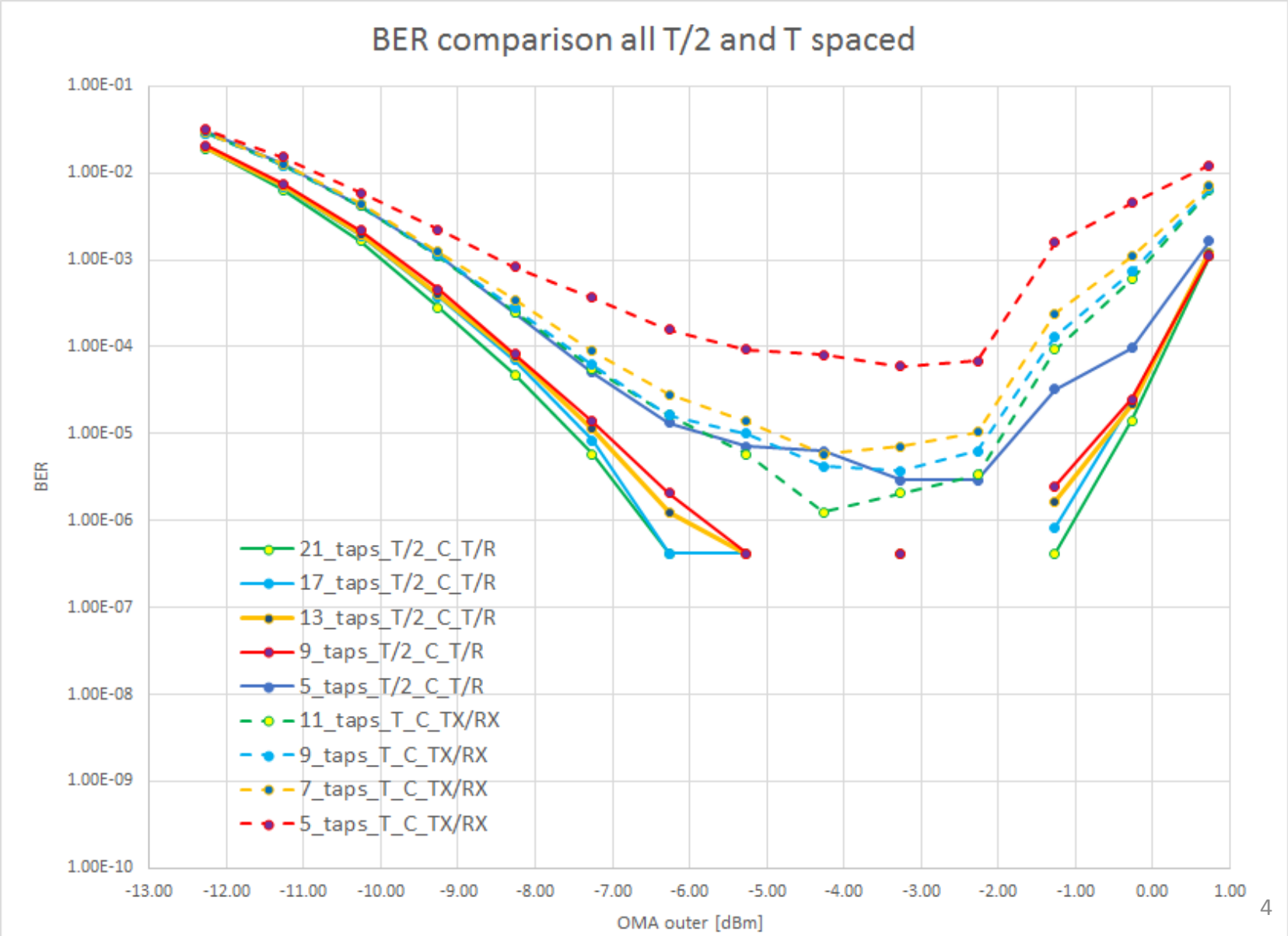
- TDECQ and system BER prediction were calculated for the waveforms shared by Marco Mazzini, Cisco (MZM based 53.1GBd PAM4 Tx) on the IEEE P802.3bs website
  - www.ieee802.org/3/bs/public/wave/index.shtml
- Graphs show:
  - TDECQ vs EQ length
  - TDECQ vs Ref Rx Bw
  - TDECQ vs system BER penalty

Context

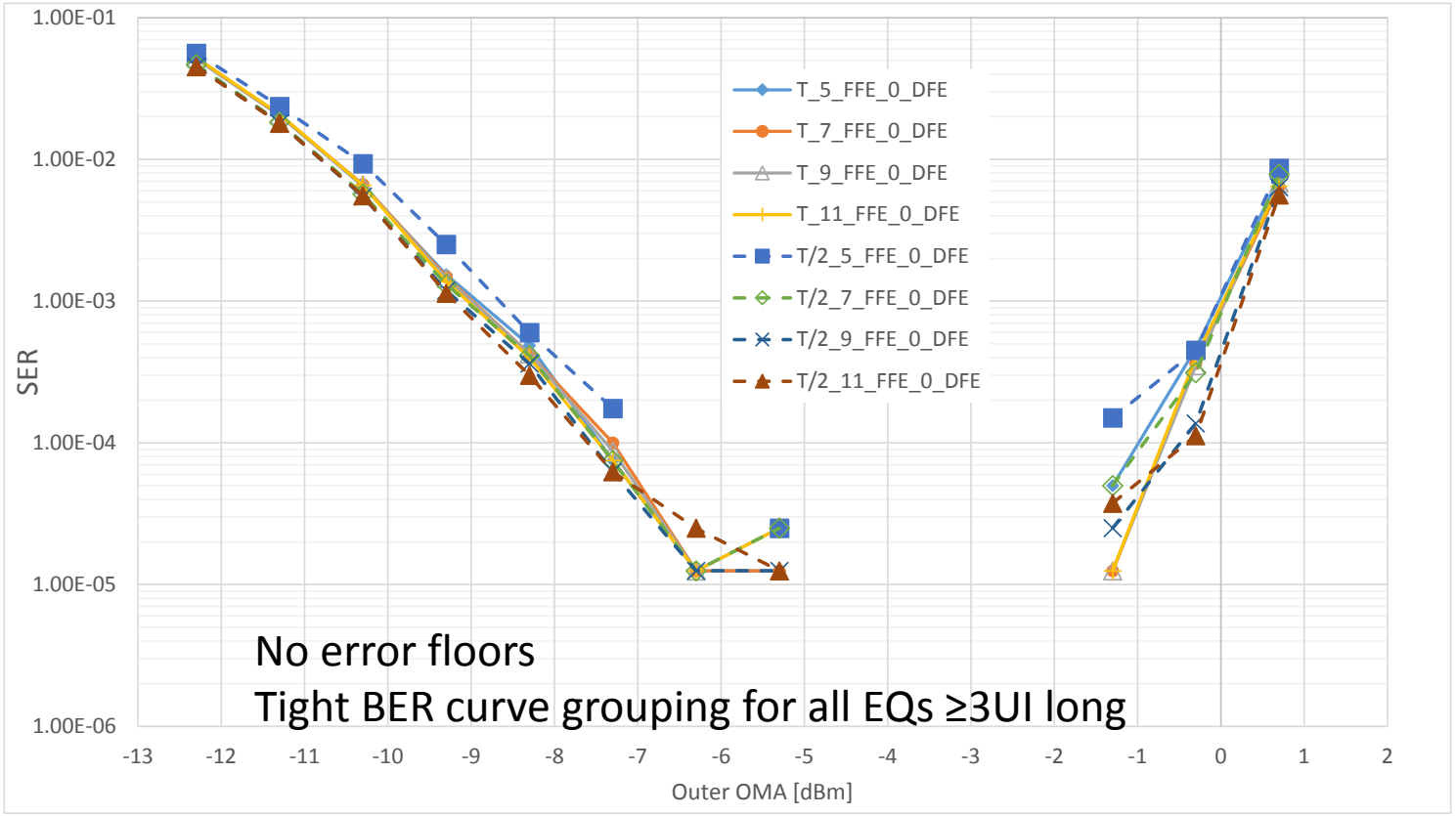
- PAM4 waveforms from Marco Mazzini, Cisco
- Single channel MZM based transmitter waveforms
    - Described in Mazzini_01a_0317_smf
- http://www.ieee802.org/3/bs/public/adhoc/smf/17_03_07/mazzini_01a_0317_smf.pdf

- Independent analysis by Thang Pham and Jonathan King, Finisar, presented here.

Mazzini_01a_0317 BER plots



Finisar BER plots (same waveforms, different processing)

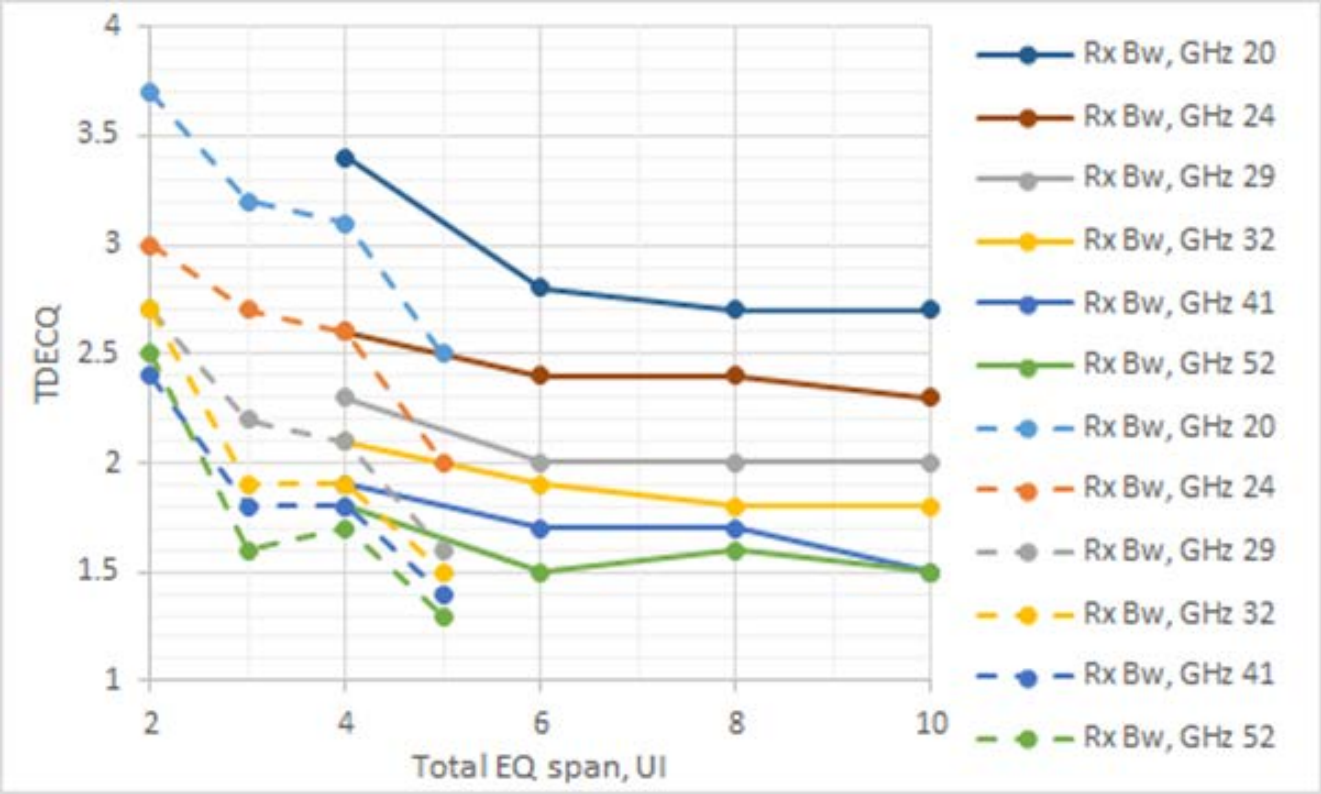


Blind EQ with initial main tap set to the middle tap

EQ is continuously adaptively trained

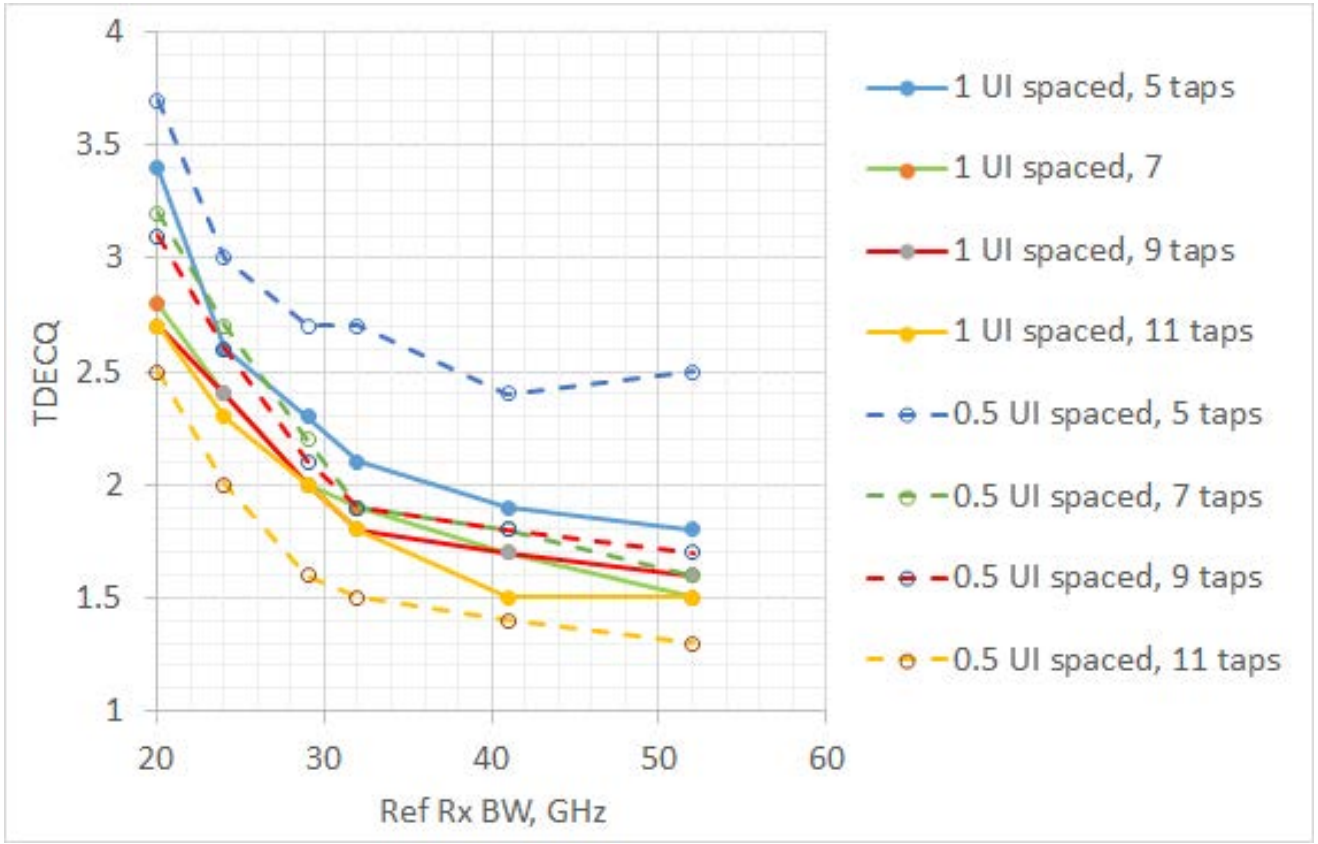
SER is calculate for last 90k symbols (first symbols aren't used as EQ hasn't converged to good state yet)

Calculated TDECQ vs EQ length, various ref. Rx bandwidths



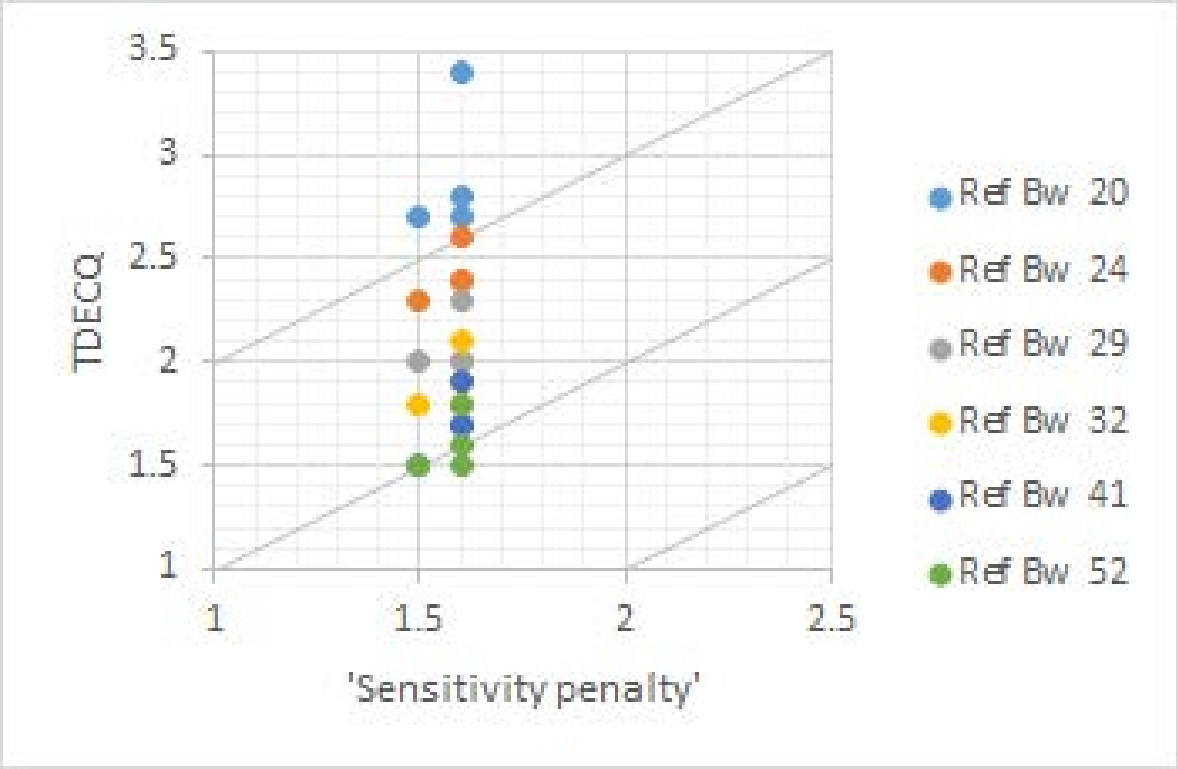
- TDECQ depends on total EQ length (not tap spacing) and ref Rx bandwidth. Dashed lines are T/2 spaced, the solid are T spaced.
- Looks like a 2UI EQ is too short for this 53GBd Tx (perhaps there are reflections or multi UI ISI issues).
- Looks like 20GHz, and probably 24Ghz, Ref Rx bandwidths are too low – there's a significant increase in TDECQ.

TDECQ vs Ref Rx Bandwidth, various EQs



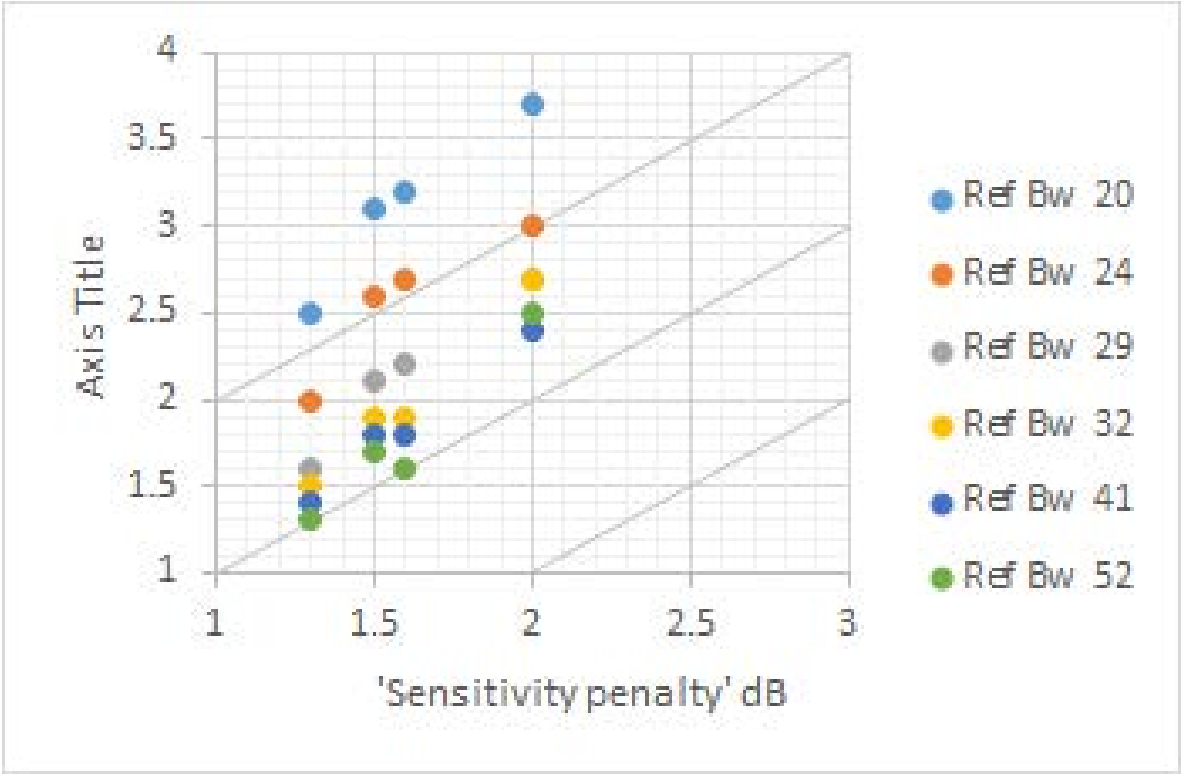
- TDECQ results for the various EQs vs bandwidth
- Looks like the 5 tap T/2 is not long enough, and the 11 tap T/2 too good compared to the T spaced EQs perhaps?
- Ref Rx bandwidth in the 30 to 40GHz range looks OK

TDECQ vs system penalty, T spaced



- TDECQ vs measured (post processed) system penalty (from Thangs results); the baseline Rx sensitivity is estimated to be -9.4 dBm.
- For T spaced EQs: little change in system penalty for the various length T spaced EQs but ~0.7 dB variation in TDECQ from a 1:1 slope of TDECQ vs system penalty (to be fair, the system penalty difference is so small it's hard to conclude that the T spaced EQ doesn't have a 1:1 relationship with system penalty).

TDECQ vs system penalty, T/2 spaced



- For T/2: a bigger change in system penalty for the various length EQs, ~0.6 dB variation in TDECQ from a 1:1 slope of TDECQ vs system penalty
  - System penalty range (0.7 dB)
  - ~0.5 dB variation in TDECQ from a 1:1 slope of TDECQ vs system penalty
  - The trend for TDECQ vs system penalty is consistent with a 1:1 relationship.