Improved 100GBASE-SR4 transmitter limits and budget

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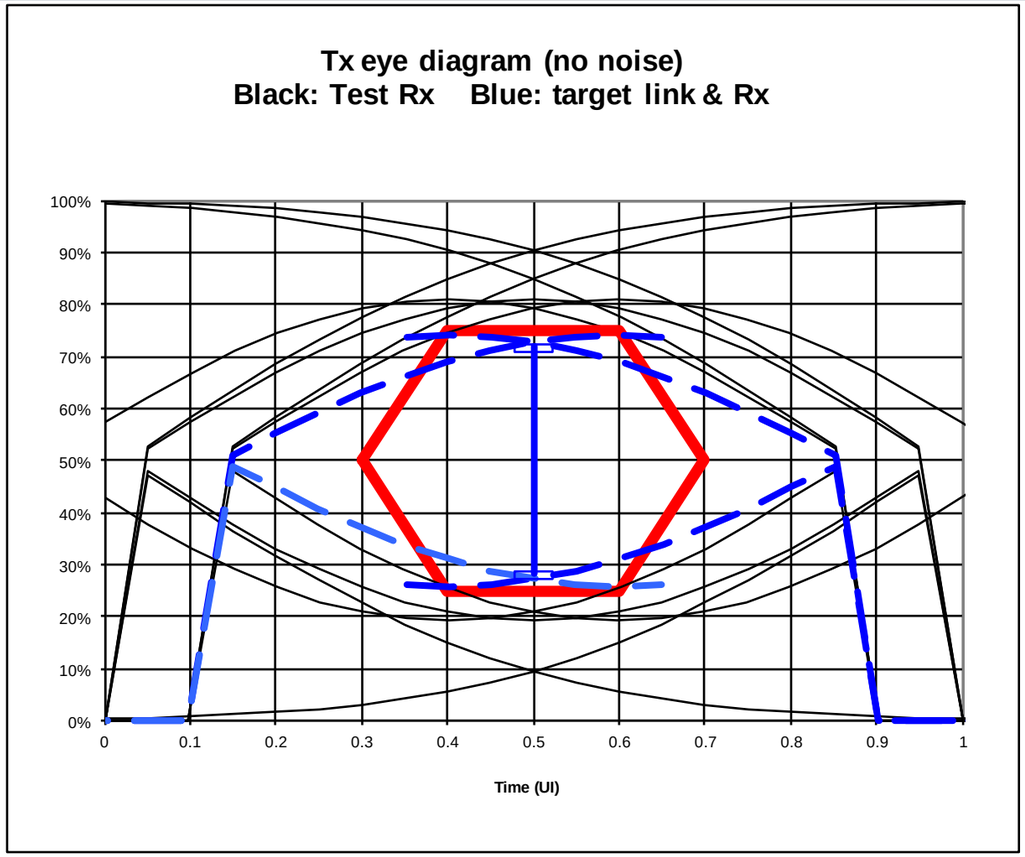
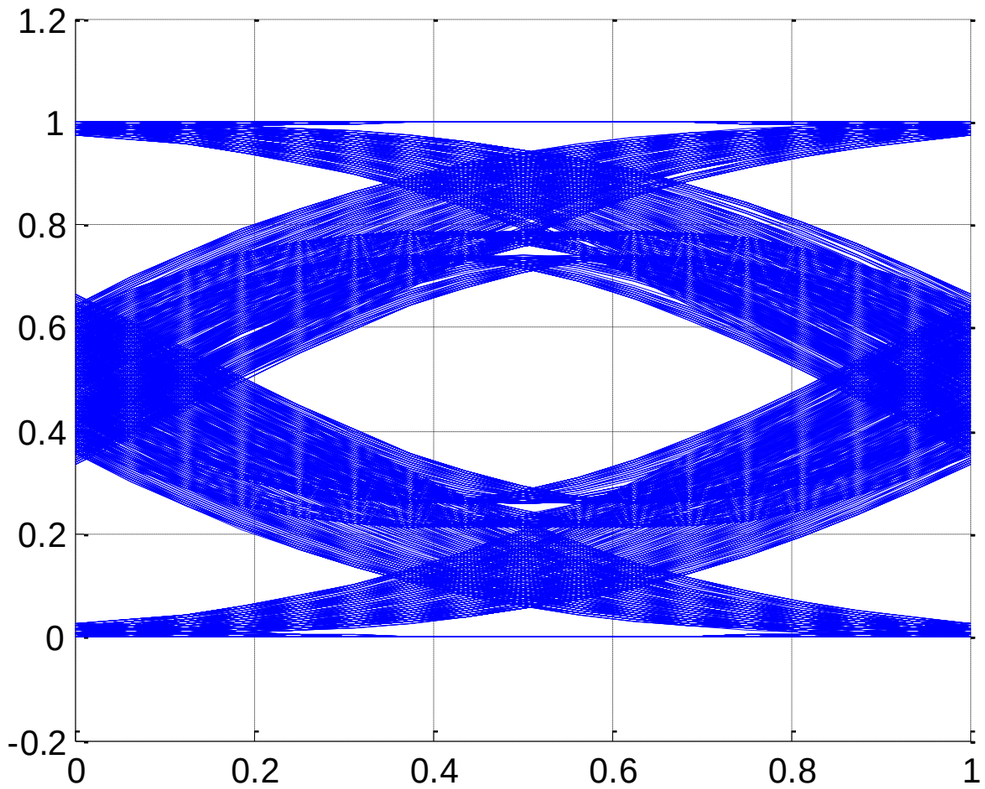
Introduction

- The present TDP limit of 5 dB seems to allow eyes that look difficult to receive and links that can be "on the edge of a cliff"
  - http://ieee802.org/3/bm/public/may13/dawe_01_0513_optx.pdf
  - Also there seems to be a discrepancy between the example link model http://ieee802.org/3/bm/public/may13/ExampleMMF%20LinkModel%20%20130503.xlsx and this limit
- If TDP is replaced by a new kind of transmitter specification, a limit to go with that new metric will be needed
- This presentation uses the waveform in the example link model as an example of a worst case transmitter
  - Finds its TDP and worst-case link penalty
  - Finds its TxVEC
    - At 0.005%ile, and
    - Using the noise adding method
    - This waveform has known parameters such as risetime and jitter

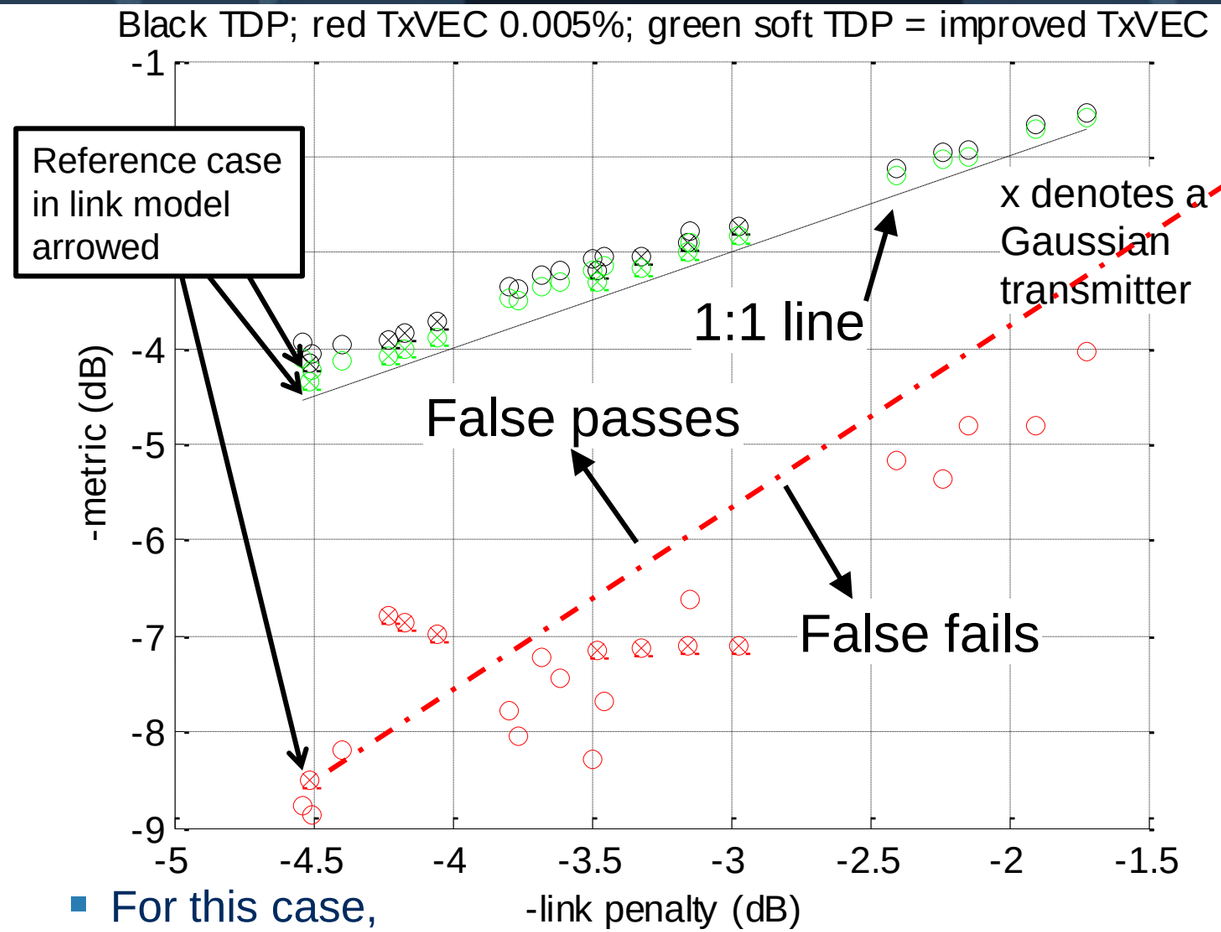
Comparing spreadsheet and simulated eye

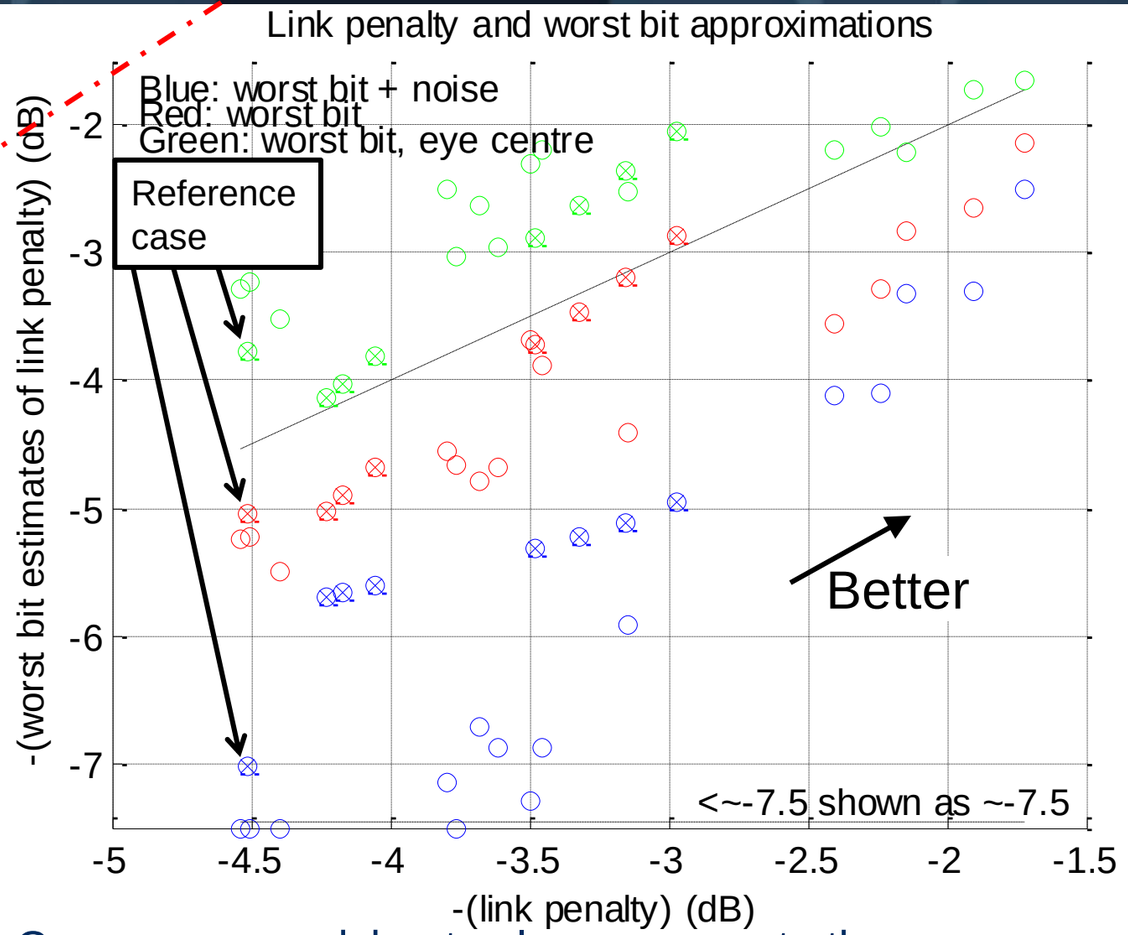




- These eyes represent a signal from a particular transmitter after a worst channel and a receiver of defined bandwidth
  - They do not show the noise, which is similar for spreadsheet and simulation
- Compare the blue eye on the left (spreadsheet) with the eye on the right (simulated)
  - Good agreement

Relating the simulations to spreadsheet model





- For this case,
- TDP is about 4.1 dB
- Soft TDP = improved TxVEC is about 4.4 dB
- 0.005%ile TxVEC is about 8.5 dB
- Total of link penalties (from x axis) is about 4.5 dB

- Compare spreadsheet values to these:
  - Worst bit, eye centre 3.4? 3.8
  - Worst bit 4.925 5
  - Worst bit + noise 6.34 7
  - Reasonable agreement

Notes

- The reference eye in the spreadsheet is worse than all but one of the simulated signals in this set
- For the simulation of the reference case, signal parameters are taken from the spreadsheet. "DCD" is implemented as EOJ and other DJ is implemented as SJ
- TDP is found from a simulation of the method in the draft but assuming an ideal reference transmitter
- A worst bit + noise estimate of TDP gave 5.9 dB. A "noise adding" calculation (considering all the bits) gave about 4.1 dB as shown

- The worst bit + noise method is not valid across a range of different waveform shapes: huge scatter in the blue points

- 0.005%ile TxVEC is much more than the penalty, and shows a lot of scatter. A limit line replacing the present OMA-TDP limit would have a slope greater than one. A 1%ile TxVEC would be closer to the penalty, have less scatter, and a slope closer to 1: see http://ieee802.org/3/bm/public/jul14/dawe_01_0714_optx.pdf slide 8.

Discussion

- If this reference case is our worst case, then the soft TDP = improved TxVEC limit in the spec would be 4.4 dB and the allocation for penalties (for the budget) would be 4.5 dB
  - If we assume the receiver bandwidth in the spreadsheet

- For minimum OMA at maximum TDP = -3 dB, as agreed, the specs for minimum OMA-TDP, minimum OMA and minimum mean power would all increase by 0.6 dB
- Comment 46 proposes a soft TDP = improved TxVEC limit of 4.3 dB with a consequent increase of 0.7 dB

- The Power budget and the allocation for penalties should be consistent with each other, but do not determine the compliance parameters

Thank You