

**SIMULATING IMPAIRMENTS FOR AN
MMF PHY WITH FEC
PIERS DAWE
IEEE P802.3BM MAY 2013**

Problem statement (from daw_e_01_0113_mmf.pdf)

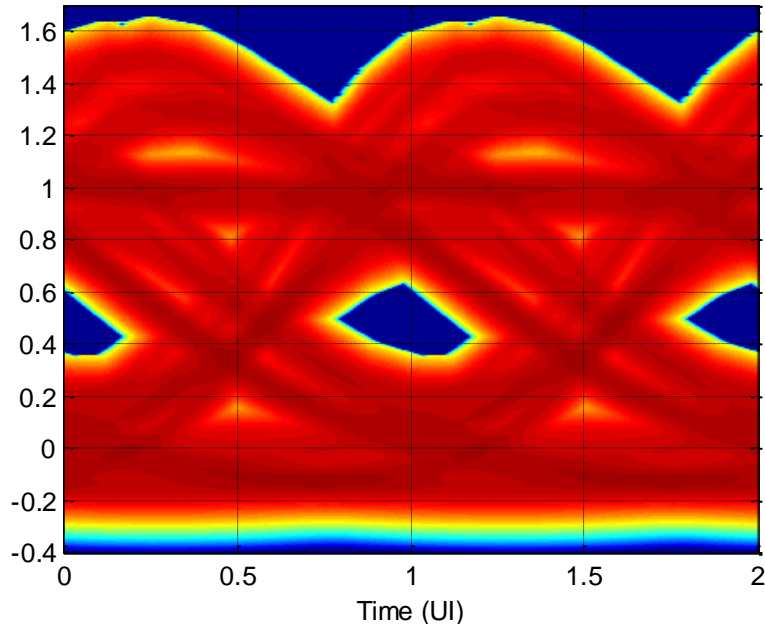
- 100GBASE-SR4 baseline proposal proposes a TDP of 5 dB (to be confirmed)
- This seems high
- It puts a lot of strain on the receiver in the as yet undefined stressed sensitivity spec
- It may also imply a VECP that exceeds the 3.6 dB needed to avoid "on the cliff edge" extreme sensitivity to small changes in fiber bandwidth
- Would expect that transmitters could do a little better
- But the devil is in the detail
 - Depends how chromatic dispersion penalties (part more ISI, part MPN) are accounted for
 - Depends on timing offsets and choice of reference receiver bandwidth in the TDP test

This work

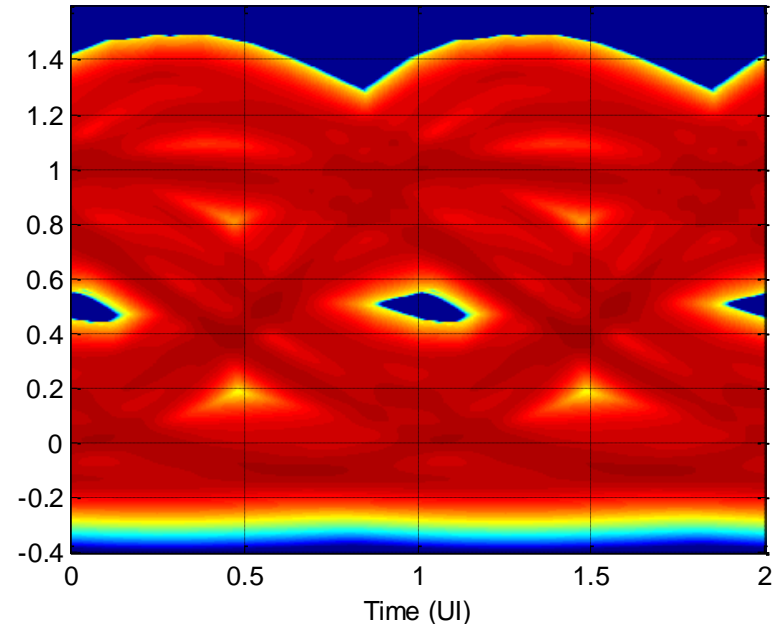
- This presentation shows what a transmitted eye that gives 5 dB TDP with FEC might look like

Simulated eye with TDP approaching 5 dB

Eye at TP2 gives TDP ~ 4.8 dB before MPN

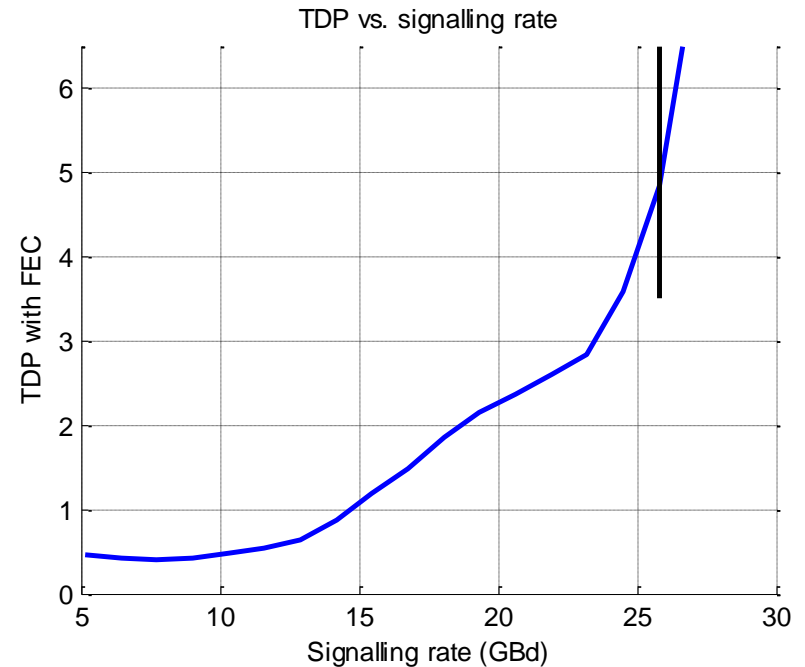
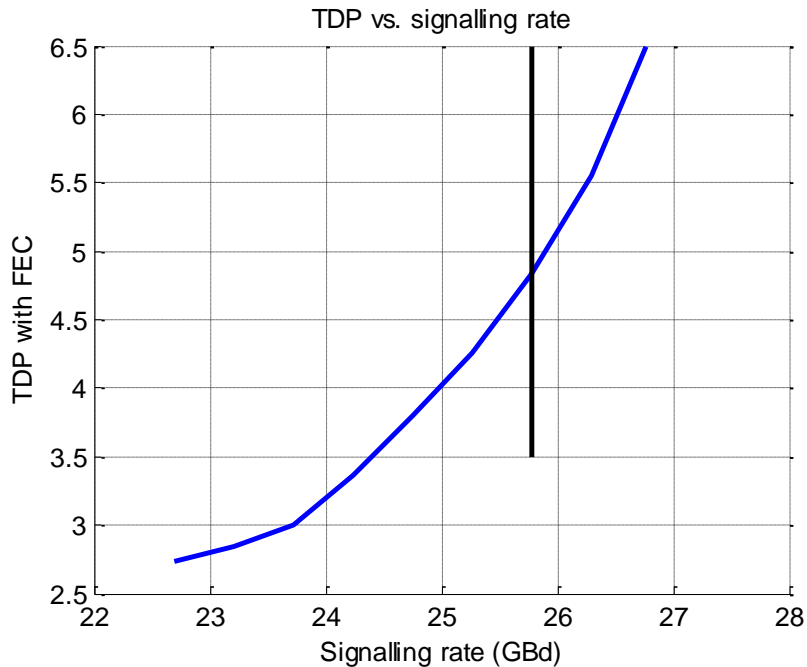


This eye at TP3 has TDP ~ 4.8 dB before MPN



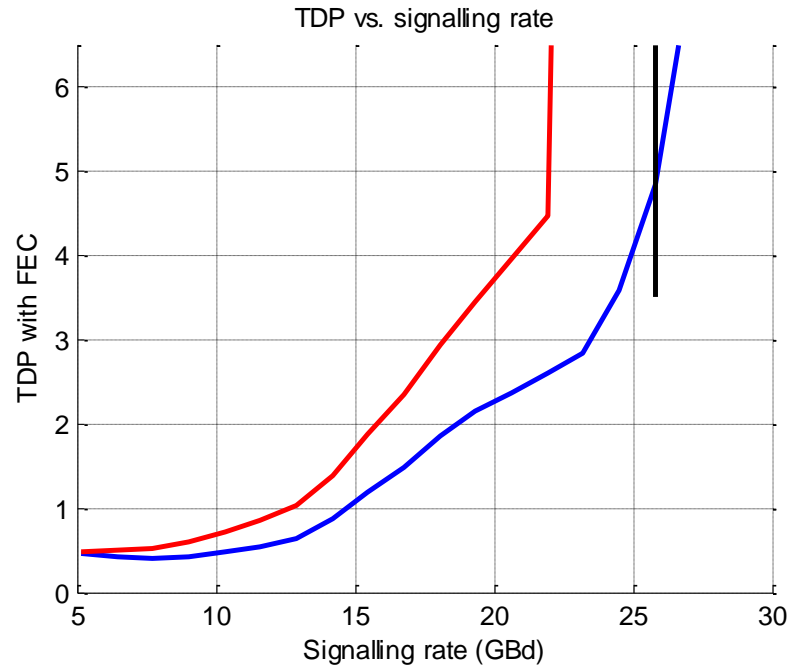
- TDP like Clause 52: ± 0.05 UI, but:
 - BER = $5e-5$
 - 100 m of OM4 modelled as a Gaussian filter, like spreadsheet model
 - Standard fourth-order Bessel-Thomson
- Includes ISI from chromatic dispersion but not MPN
- Is this on the cliff edge?

TDP vs. signalling rate



- IC bandwidths scaled with signalling rate, laser not scaled
- 2% rate change increases TDP by 0.7 dB – yes, cliff edge

Effect of FEC



- FEC has a moderate effect on this TDP because so much of this transmitter penalty is deterministic and high probability
- FEC has other significant benefits for the link
 - E.g. receiver noise, MPN penalty
- This laser could have been used for a 14 GBd retimed link without FEC - 14 GBd unretimed links without FEC are established products now