Resolving TDP measurement and spec values

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$TDP = P_{\{DUT\_Tx,\ stress+ref\_Rx\}} - S_{\{ref\_Tx,ref\_Rx\}}$

- In the definition of TDP in Clause 95, the ref_Rx has a bandwidth restriction (12.6 GHz) which adds the stress equivalent to 100 m OM4, similar to Clause 86, including the deterministic effects of worst case chromatic dispersion.
- In practice, the ref_Tx is expected to have rise-fall times of 12 ps, which, in combination with the 12.6 GHz ref_Rx, will result in significant ISI penalty, and a reference sensitivity measurement which is higher than for a 1 ps rise/fall time Tx measured into a Rx with a bandwidth of 0.75 x bitrate .
- To align the TDP spec value in Table 95-6 and the measured values of TDP (as currently defined), the effect of ISI introduced by the 12.6 GHz ref Rx should be corrected for in the reference sensitivity measurement.
- There are several ways of doing this:
  1. Use a 0.75 x bitrate bandwidth receiver for the reference sensitivity measurement with the ref_Tx.
  2. Add a correction to the TDP value
  3. Add an additional line item into the allocation for penalties which accounts for the correction required.

Options

- Option 1 would specify that the ref Rx has 19.3 GHz bandwidth for the reference sensitivity measurement
  - This means effectively two different receivers are used for measuring the ref_Tx and DUT_Tx sensitivity measurements, which has several practical difficulties
- Option 2 would add text to 95.8.5, describing the TDP test, to include the correction factor in the formula for TDP.
- Option 3 would add a note to the 'Allocation for penalties' in Table 95-8, saying that the allocation for penalties is larger than the TDP to account for (among other things) the restricted bandwidth receiver used to measure the reference sensitivity S.

- *In discussion, no-one supported option 1, because of the practical difficulty of using effectively two different receivers to measure a difference in sensitivity.*
- *Option 2 and 3 were discussed (as were alternatives with higher and lower bandwidth reference receivers); Option 2 was favored because it makes the resulting TDP number closest to the worst case penalty due to transmitter ISI and path penalty.*

Proposed changes to clause 95 D1p1 (for Option 2)

- In section 95.8.5 modify items ‘d’ and ‘g’ to become:

“d) The reference transmitter rise/fall times should be less than 12 ps at 20% to 80%. The reference transmitter optical waveform is measured for vertical eye closure penalty (VECP), as defined in Equation 52-4, but evaluated at +/- 0.11 UI from the eye center, using a receiver with a fourth-order Bessel-Thomson filter response with a bandwidth of 12.6 GHz.“

“g) The reference sensitivity S and the measurement P_DUT are both measured with the sampling instant displaced from the eye center by ± 0.11 UI. Because the reference sensitivity test is done with a restricted bandwidth receiver, a correction is required to calculate S. S is equal to the measured sensitivity minus the measured reference transmitter VECP from item d).

For each of the two cases (early and late), if P_DUT(i) is larger than S(i), the TDP(i) for the transmitter under test is the difference between P_DUT(i) and S(i), i.e. TDP(i) = P_DUT(i) – S(i). Otherwise, TDP(i) = 0. The TDP is the larger of the two TDP(i).“