Resolving TDP measurement and spec values

Working document – post MMF ad hoc of 15th August 2013

compiled by jonathan king

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

- 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 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 X dB higher than for a similar Rx with 0.75 x bitrate bandwidth.
- 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 compensated for in the reference sensitivity measurement.
- There's more than one way of doing this:
  1. Use a 0.75 x bitrate receiver for the reference sensitivity measurement with the ref_Tx.
  2. Add a compensation factor X dB to the TDP value
  3. Add an additional line item into the allocation for penalties which accounts for the X dB.

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 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 compensation factor X in the formula for TDP.
- Option 3 would add a note to table 95-8, describing the TDP test, to include the compensation factor X in the formula for TDP.

- *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. Option 2 was worked on.*

Option 2

- In section 95.8.5 modify item ‘g’ to become:

“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 is measured using the same reference receiver as the P_DUT measurement, a correction factor X dB is required to calculate TDP. For each of the two cases (early and late), if P_DUT(i) is larger than (S(i)-X), the TDP(i) for the transmitter under test is the difference between P_DUT(i) and (S(i)-X), TDP(i) = P_DUT(i) – S(i) + X . Otherwise, TDP(i) = 0. The TDP is the larger of the two TDP(i).”

- *Editors notes:*
  - *a) X=Y + ref Tx VEC at ± 0.11 UI from the middle of eye, in 19.3 GHz Bw Rx.*
  - *b) Y is ~ 0.7 dB, and is the approximate difference between the VEC at +/-0.11 UI with a 19.3 GHz bandwidth Rx and the VEC at +/-0.11 UI with a 12.6 GHz bandwidth Rx. Y is calculable using the spreadsheet model.*
  - *c) Add text to item ‘d’ to describe the measurement of VEC of the ref_Tx at +/0.11 UI into a 19.3 GHz bandwidth eye measurement system.*

Jonathan will draft text to address these notes for review by the MMF ad hoc.