Presentation supporting Comment #87

Submitted by Tom Palkert with comment on December 20, 2015

122**.8.1.1 Multi-lane testing considerations**

Stressed receiver sensitivity is defined for an interface at the BER specified in122.1.1. The interface BER is the average of the four BERs of the receive lanes when they are stressed.

Measurements with Pattern 4 (PRBS13Q) allow lane-by-lane BER measurements. The BER is diluted by the three unstressed lanes, and the BER for that stressed lane alone must be found, e.g., by multiplying by four if the unstressed lanes have low BER. In stressed receiver sensitivity measurements, unstressed lanes may be created by setting the power at the receiver under test well above its sensitivity and/or not stressing those lanes with ISI and jitter, or by other means. Each receive lane is stressed in turn while all are operated. All aggressor lanes are operated as specified. To find the interface BER, the BERs of all the lanes when stressed are averaged.

Where relevant, parameters are defined with all co-propagating and counter-propagating lanes operational so that crosstalk effects are included. Where not otherwise specified, the maximum amplitude (OMA or VMA) for a particular situation is used, and for counter-propagating lanes, the minimum transition time is used. Alternative test methods that generate equivalent results may be used. While the lanes in a particular direction may share a common clock, the Tx and Rx directions are not synchronous to each other. If the lanes not under test use a common clock, there shall be at least 13 UI delay between the PRBS13Q patterns on one lane and any other lane.

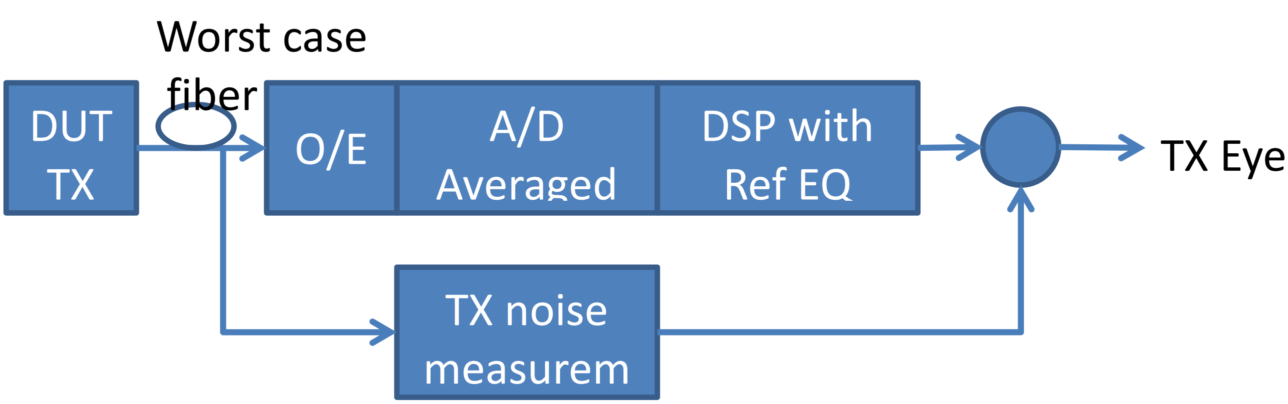
122.8.5 Transmitter eye closure (TEC)

TEC of each lane shall be within the limits given in Table 122–6 if measured using the methods specified in 122.8.5.1 and 122.8.5.2.

TEC is a measure of each optical transmitter’s vertical and horizontal eye closure; it is based upon histogram data from an eye diagram measured through an optical to electrical converter (O/E) with a reference receiver and worst case optical channel. Table 122–10 specifies the test patterns to be used for measurement of TEC.

122.8.5.1 TEC conformance test setup

A block diagram for the TEC conformance test is shown in Figure 122–3. Other measurement implementations may be used with suitable calibration.



• Fig. 122-3: TEC conformance

Each optical lane is tested individually with all other lanes in operation. The optical splitter and variable reflector are adjusted so that each transmitter is tested with an optical return loss of 26 dB.

The combination of the O/E and the oscilloscope used to measure the optical waveform has a fourth-order

Bessel-Thomson filter response with a bandwidth of 40 GHz. Compensation may be made for any deviation from an ideal fourth-order Bessel-Thomson response.
The clock recovery unit (CRU) has a corner frequency of 10 MHz and a slope of 20 dB/decade. Eye opening is optimized using 5 tap T/2 spaced FFE.

122.8.5.2 TEC measurement method

The oscilloscope is set up to accumulate samples of the optical eye diagram for the transmitter under test, as illustrated in Figure 122–4.
OMA is measured according to 122.8.4.
The noise of the O/E and oscilloscope combination, *S*, is determined with no optical input signal and the same settings as used to capture the histograms described below.
The average optical power (P_{ave}), the crossing points of the eye diagram, and the four vertical histograms used to calculate TEC, are all measured using the same test pattern selected from those identified for TEC in Table 122–10. The 0 UI and 1 UI crossing points are determined by the average of the eye diagram crossing times, as measured at P_{ave}, as illustrated in Figure 122–4. Measure BER of reconstructed eye at +/-0.05 UI timing points, with thresholds optimized for each eye.