

Implementation of changes related to 10Log10Ceq (Comment #56)

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Background

Based on a straw poll taken on the 3/17 interim conference call (see below), the majority position was to maintain the decision made at the 802.3cu TF meeting in Geneva to remove “TDECQ-10Log10(Ceq) and to clean up the draft to correctly reflect this decision (including among other changes to remove “SECQ-10Log10(Ceq)” from the receiver specifications).

The intent of this presentation is to capture all of the necessary changes to D2.0 to reflect this decision.

Straw Poll #1: With regards to the inclusion of TDECQ-10log(Ceq) parameter, I support:

a) Full removal from both Tx and Rx tables: 27

b) Reinstate for both Tx and Rx tables: 9

(17 Abstain)

Table 140-7

Table 140-7—100GBASE-DR, 100GBASE-FR1, and 100GBASE-LR1 receive characteristics

| Description | Value 100GBASE-DR | 100GBASE-FR1 | 100GBASE-LR1 | Unit |
|--|----------------------|------------------|--------------|----------------|
| Signaling rate (range) | | 53.125 ± 100 ppm | | GBd |
| Modulation format | | PAM4 | | — |
| Wavelengths (range) | | 1304.5 to 1317.5 | | nm |
| Damage threshold ^a | 5 | <u>5</u> | <u>5.8</u> | dBm |
| Average receive power (max) | 4 | <u>4</u> | <u>4.8</u> | dBm |
| Average receive power ^b (min) | -5.9 | <u>-6.9</u> | <u>-8.3</u> | dBm |
| Receive power (OMA _{outer}) (max) | 4.2 | <u>4.2</u> | <u>5</u> | dBm |
| Receiver reflectance (max) | -26 | <u>-26</u> | <u>-26</u> | dB |
| Receiver sensitivity (OMA _{outer}) ^c (max) | Equation (140-1) | <u>-4.5</u> | <u>-6.1</u> | dBm |
| Stressed receiver sensitivity (OMA _{outer}) ^d (max) | -1.9 | <u>-2.5</u> | <u>-4.1</u> | dBm |
| Conditions of stressed receiver sensitivity test: ^e | | | | |
| Stressed eye closure for PAM4 (SECQ) | 3.4 | <u>3.4</u> | <u>3.4</u> | dB |
| SECQ - 10log ₁₀ (C _{eq}) ^f (max) | 3.4 | <u>=</u> | <u>=</u> | dB |

Note. Changes highlighted in blue text

140.7.5 (Import from IEEE Std 802.3cd-2018)

Change 140.7.5 as follows:

140.7.5 Transmitter and dispersion eye closure for PAM4 (TDECQ)

~~The~~ TDECQ, and for 100GBASE-DR only $TDECQ - 10\log_{10}(C_{eq})$, shall be within the limits given in Table 140–6 if measured using the methods specified in 121.8.5.1, 121.8.5.2, and 121.8.5.3 using a reference equalizer as described in 140.7.5.1, with the following exceptions:

- The optical return loss of the transmitter compliance channel is 15.5 dB.
- The signaling rate of the test pattern generator is as given in Table 140–6 and uses a test pattern specified for TDECQ in Table 140–10.
- There are no interfering optical lanes and therefore the delay requirement of at least 31 UI between test pattern on one lane and any other lane, as specified in 121.8.5.1, is redundant.

140.7.10 (Import from IEEE Std 802.3cd-2018)

Change 140.7.10 as follows:

140.7.10 Stressed receiver sensitivity

Stressed receiver sensitivity shall be within the limits given in Table 140–7 if measured using the method defined in 121.8.9, using the test pattern specified for SRS in Table 140–10, with the following exceptions:

- The SECQ of the stressed receiver conformance test signal is measured according to 140.7.5, except that the test fiber is not used. The transition time of the stressed receiver conformance test signal is no greater than the value specified in Table 140–6.
- With the Gaussian noise generator on and the sinusoidal jitter and sinusoidal interferer turned off, the $RIN_{15.5OMA}$ of the SRS test source should be no greater than the value specified in Table 140–6.
- An example stressed receiver conformance test setup is shown in Figure 139–7; however, alternative test setups that generate equivalent stress conditions may be used.
- The signaling rate of the test pattern generator and the extinction ratio of the E/O converter are as given in Table 140–6 using test patterns specified in Table 140–10.
- The required values of the “Stressed receiver sensitivity (OMA_{outer}) (max)”, “Stressed eye closure for PAM4 (SECQ)”, and [for 100GBASE-DR only](#) “SECQ – $10\log_{10}(C_{eq})$ (max)” are as given in Table 140–7.
- The restriction that at least half of the dB value of the SECQ is due to the frequency response of the combination of the low-pass filter and the E/O converter in 121.8.9.1 and 121.8.9.2 does not apply.

Table 151-8

Table 151-8—400GBASE-FR4 and 400GBASE-LR4-6 receive characteristics

| Description | 400GBASE-FR4 | 400GBASE-LR4-6 | Unit |
|---|--|----------------|------|
| Signaling rate, each lane (range) | 53.125 ± 100 ppm | | GBd |
| Modulation format | PAM4 | | — |
| Lane wavelengths (range) | 1264.5 to 1277.5 1284.5 to 1297.5 1304.5 to 1317.5 1324.5 to 1337.5 | | nm |
| Damage threshold ^a , each lane | 4.5 | 6.6 | dBm |
| Average receive power, each lane (max) | 3.5 | 5.6 | dBm |
| Average receive power, each lane ^b (min) | -7.3 | -9.1 | dBm |
| Receive power (OMA _{outer}), each lane (max) | 3.7 | 4.4 | dBm |
| Difference in receive power between any two lanes (OMA _{outer}) (max) | 4.1 | 4.3 | dB |
| Receiver reflectance (max) | -26 | | dB |
| Receiver sensitivity (OMA _{outer}), each lane ^c (max) | -4.6 | -6.8 | dBm |
| Stressed receiver sensitivity (OMA _{outer}), each lane ^d (max) | -2.6 | -4.7 | dBm |
| Conditions of stressed receiver sensitivity test: ^e | | | |
| Stressed eye closure for PAM4 (SECQ), lane under test | 3.4 | 3.5 | dB |
| SECQ - 10log ₁₀ (C _{eq}), lane under test (max) | 3.4 | 3.5 | dB |
| OMA _{outer} of each aggressor lane | 1.5 | -0.4 | dBm |

Note. Changes highlighted in blue text (in this case the complete row will be removed from Table 151-8)

151.8.5

151.8.5 Transmitter and dispersion eye closure for PAM4 (TDECQ)

The TDECQ, ~~TDECQ~~ $10\log_{10}(C_{eq})$, and ~~TDECQ~~ $TECQ$ of each lane shall be within the limits given in Table 151-7 for 400GBASE-FR4 and 400GBASE-LR4-6 if measured using the methods specified in 121.8.5.1, 121.8.5.2, and 121.8.5.3.

TDECQ is a measure of each optical transmitter's vertical eye closure when transmitted through a worst case optical channel (specified in 151.8.5.2), as measured through an optical to electrical converter (O/E) with a bandwidth equivalent to a reference receiver, and equalized with the reference equalizer (as described in 151.8.5.4). The reference receiver and equalizer may be implemented in software or may be part of the oscilloscope.

Table 151-11 specifies the test patterns to be used for measurement of TDECQ.

151.8.11.2

151.8.11.2 Stressed receiver conformance test signal characteristics and calibration

The stressed receiver conformance test signal characteristics and calibration methods are as described in 121.8.9.2 with the following exceptions:

- The SECQ of the stressed receiver conformance test signal is measured according to 151.8.5, except that the test fiber is not used. The transition time of the stressed receiver conformance test signal is no greater than the value specified in Table 151–7.
- An example stressed receiver conformance test setup is shown in Figure 151–7; however, alternative test setups that generate equivalent stress conditions may be used.
- With the Gaussian noise generator on and the sinusoidal jitter and sinusoidal interferer turned off, the $RIN_{xx,x}$ OMA of the SRS test source shall be no greater than the value specified in Table 151–7 for 400GBASE-FR4 and 400GBASE-LR4-6.
- The signaling rate of the test pattern generator and the extinction ratio of the E/O converter are as given in Table 151–7 for 400GBASE-FR4 and 400GBASE-LR4-6.
- The required values of the “Stressed receiver sensitivity (OMA_{outer}), each lane (max)”, “Stressed eye closure for PAM4 (SECQ), lane under test”, ~~“SECQ $10\log_{10}(C_{eq})$ (max), lane under test”~~, and “ OMA_{outer} of each aggressor lane” are as given in Table 151–8 for 400GBASE-FR4 and 400GBASE-LR4-6.

Thanks !