Cl **45** *SC* **45.2.3.47k.3** *P* **75** *L* **46** # r03-1

Anslow, Peter — Ciena Corporation

Comment Type **E** *Comment Status* **D**

"the value of the PCS FEC degraded SER activate threshold is less than the value of the PCS FEC degraded SER deactivate threshold (registers 3.806 and 3.807)." should be:
"the value of the PCS FEC degraded SER activate threshold (registers 3.806 and 3.807) is less than the value of the PCS FEC degraded SER deactivate threshold (registers 3.808 and 3.809)."

SuggestedRemedy

Change "the value of the PCS FEC degraded SER activate threshold is less than the value of the PCS FEC degraded SER deactivate threshold (registers 3.806 and 3.807)." to:
"the value of the PCS FEC degraded SER activate threshold (registers 3.806 and 3.807) is less than the value of the PCS FEC degraded SER deactivate threshold (registers 3.808 and 3.809)."

Proposed Response *Response Status* **O**

Cl **119** *SC* **119.6.3** *P* **179** *L* **24** # r03-2

Slavick, Jeff — Broadcom Limited

Comment Type **T** *Comment Status* **D**

The Major Capabilities section is used to indicate whether the device contains optional features. The PICS to confirm the functionality of the feature is placed into the appropriate Function section being dependent upon the presence of the optional feature. The PICS for FEC Degrade Detection is not following that layout.

SuggestedRemedy

In 119.6.3 change FDD to *FDD, delete the contents of the Value/Comment field.
Int 119.6.4.2 add a new PICS item: RF# | FEC decoder detects FEC degraded SER at a programmable threshold | 119.2.5.3 | | FDD:M | Yes [] N/A []

In 118.6.3 change FDD to *FDD, delete the contents of the Value/Comment field.
Int 118.6.4.2 add a new PICS item: RF# | FEC decoder detects FEC degraded SER at a programmable threshold | 119.2.5.3 | | FDD:M | Yes [] N/A []

Proposed Response *Response Status* **O**

Cl **119** *SC* **119.6.3** *P* **179** *L* **15** # r03-3

Slavick, Jeff — Broadcom Limited

Comment Type **G** *Comment Status* **D**

The Major Capabilities "Bypass Indication" is really Bypass Error Indication per 119.2.5.3 paragraph 3. Also, Cl108 and Cl91 both include the word error Feature name.

SuggestedRemedy

In 119.6.3
Change *BI to *BEI
Change "Bypass indication" to "Bypass error indication"

In 119.6.4.2 change *BI:M to *BEI:M

In 118.6.3
Change *BI to *BEI
Change "Bypass indication" to "Bypass error indication"

In 118.6.4.2 change *BI:M to *BEI:M

Proposed Response *Response Status* **O**

Cl **119** *SC* **119.2.4.4** *P* **152** *L* **48** # r03-4

Slavick, Jeff — Broadcom Limited

Comment Type **G** *Comment Status* **D**

The signaling of the FEC degrade status is a mandatory operation of the link. Identify if the link has degraded and asserting FEC_degraded_SER is optional. So the word optional here could be misleading.

SuggestedRemedy

Remove the word "optional"

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.7** *P* **220** *L* **29** # r03-5

Welch, Brian

Comment Type **T** *Comment Status* **D**

In table 121-6 propose reducing OMAouter each lane min from -2.5 dBm to -3.5 dBm, and revising note b to read "Even if the TDECQ < 0.9 dB, the OMAouter (min) must exceed this value". This allows for high bandwidth transmitters than can achieve lower TDECQ mins than the current stated minimum to operate at lower power, which can improve transceiver power consumtpion, yield, and cost. See supporting presentation for more details.

SuggestedRemedy

In table 121-6 propose reducing OMAouter each lane min from -2.5 dBm to -3.5 dBm, and revising note b to read "Even if the TDECQ < 0.9 dB, the OMAouter (min) must exceed this value".

Proposed Response *Response Status* **O**

Cl **122** *SC* **122.7** *P* **252** *L* **22** # r03-6

Welch, Brian

Comment Type **T** *Comment Status* **D**

In table 122-9 propose reducing OMAouter each lane min from -0.7 dBm to -1.7 dBm for 200GBase-FR4, reducing OMAouter each lane min from 0.1 dBm to -0.9 dBm for 200GBase-LR4, and revising note b to read "Even if the TDECQ < 0.9 dB for an extinction ratio of >=4.5 dB or TDECQ < 0.8 dB for an extinction ration of < 4.5 dB, the OMAouter (min) must exceed this value". This allows for high bandwidth transmitters than can achieve lower TDECQ mins than the current stated minimum to operate at lower power, which can improve transceiver power consumtpion, yield, and cost. See supporting presentation for more details.

SuggestedRemedy

In table 122-9 propose reducing OMAouter each lane min from -0.7 dBm to -1.7 dBm for 200GBase-FR4, reducing OMAouter eacn lane min from 0.1 dBm to -0.9 dBm for 200GBase-LR4, and revising note b to read "Even if the TDECQ < 0.9 dB for an extinction ratio of >=4.5 dB or TDECQ < 0.8 dB for an extinction ration of < 4.5 dB, the OMAouter (min) must exceed this value".

Proposed Response *Response Status* **O**

Cl **124** *SC* **124.7** *P* **298** *L* **32** # r03-7

Welch, Brian

Comment Type **T** *Comment Status* **D**

In table 124-6 Propose reducing OMAouter each lane min from -0.3 dBm to -1.3 dBm, and revising note b to read "Even if the TDECQ < 0.9 dB, the OMAouter (min) must exceed this value". This allows for high bandwidth transmitters than can achieve lower TDECQ mins than the current stated minimum to operate at lower power, which can improve transceiver power consumtpion, yield, and cost. See supporting presentation for more details.

SuggestedRemedy

In table 124-6 Propose reducing OMAouter each lane min from -0.3 dBm to -1.3 dBm, and revising note b to read "Even if the TDECQ < 0.9 dB, the OMAouter (min) must exceed this value".

Proposed Response *Response Status* **O**

Cl **122** *SC* **122.7** *P* **253** *L* **27** # r03-8

Welch, Brian

Comment Type **T** *Comment Status* **D**

In table 122-10 propose reducing OMAouter each lane min from 0 dBm to -1.0 dBm for 400GBase-FR8, reducing OMAouter eacn lane min from 0.7 dBm to -0.3 dBm for 400GBase-LR8, and revising note b to read "Even if the TDECQ < 0.9 dB for an extinction ratio of >=4.5 dB or TDECQ < 0.8 dB for an extinction ration of < 4.5 dB, the OMAouter (min) must exceed this value". This allows for high bandwidth transmitters than can achieve lower TDECQ mins than the current stated minimum to operate at lower power, which can improve transceiver power consumtpion, yield, and cost. See supporting presentation for more details.

SuggestedRemedy

In table 122-10 propose reducing OMAouter each lane min from 0 dBm to -1.0 dBm for 400GBase-FR8, reducing OMAouter each lane min from 0.7 dBm to -0.3 dBm for 400GBase-LR8, and revising note b to read "Even if the TDECQ < 0.9 dB for an extinction ratio of >=4.5 dB or TDECQ < 0.8 dB for an extinction ration of < 4.5 dB, the OMAouter (min) must exceed this value".

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.4** *P* **363** *L* **17** # r03-9

Hidaka, Yasuo Fujitsu Laboratories of

Comment Type **E** *Comment Status* **D**

The symbol f_z1 is not a COM parameter. It should be f_z.

SuggestedRemedy

Change f_z1 to f_z.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.1.6** *P* **373** *L* **42** # r03-10

Hidaka, Yasuo Fujitsu Laboratories of

Comment Type **T** *Comment Status* **D**

It is not obvious that a reference receiver with a reference CTLE is not used for calibration of the crosstalk. For instance, the box at TP4 in figure 120E-8 is labeled just with crosstalk calibration omitting the detail. A scope is definitely there. However, it is not clear whether a reference receiver drawn at TP1a is also in the box of the crosstalk calibration. I suppose that a reference receiver is not used for the crosstalk calibration, but it is not obvious. We should cleary state it in the text, because the same paragraph referes to a reference receiver for eye measurement.

SuggestedRemedy

Add the following statement at the end of the first paragraph of 120E.3.1.6, at the end of the first paragraph of 120E.3.2.1, at the end of the third paragraph of 120E.3.3.2.1, and at end of the third paragraph of 120E.3.4.1.1:

A reference receiver with a CTLE is not used for the calibration of the crosstalk generator.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.4.1.1** *P* **382** *L* **45** # r03-11

Hidaka, Yasuo Fujitsu Laboratories of

Comment Type **T** *Comment Status* **D**

The target pattern generator 20% to 80% transition time in the module stressed input test is specified as 9.5ps. It is not clear where this transition time is measured. If it is measured at TP1a after frequency-dependent attenuator and reference receiver, it may be difficult to meet the specification. If it is measured directly at the pattern generator without reference receiver, it should be clearly stated. Besides, it is probably not necessary to specify the transition time of the pattern generator, because the eye height and the eye width are specified. For the host stressed input test, the transition time of pattern generator is not specified.

SuggestedRemedy

Remove the requirement of the target pattern generator 20% to 80% transition time in the module stressed input test of 9.5ps.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.1.7** *P* **375** *L* **1** # r03-12

Hidaka, Yasuo — Fujitsu Laboratories of

Comment Type **T** *Comment Status* **D**

The CTLE in the reference receiver of 120E.3.1.7 does not provide sufficient bandwidth for PAM4 signals as reported recently in P802.3bs Electrical Ad Hoc conference call on June 28, 2017. The effective bandwidth of CTLE is restricted by the lowest pole which is not associated with any zero, because the effects of poles associated with zeroes may be cancelled by the associated zeroes.

In 120E.3.1.7, the pole of the CTLE effective bandwidth is specified as P1. In D3.3, P1 / 2pi is 15.6GHz (0.5873 fb) or 18.6GHz (0.7 fb) that is too low for PAM4. These values remained unchanged since 83E.3.1.6.1 which were chosen for NRZ. They are OK for NRZ, but not OK for PAM4. PAM4 requires higher effective bandwidth of CTLE than NRZ in order to amplify the third harmonics of the signal component. Otherwise, the top and bottom eyes degrade significantly due to the lack of third harmonics.

In COM, the pole of the CTLE effective bandwidth is specified as f_p2. In 120D (chip-to-chip), f_p2 is specified as 53.125GHz (2 fb), which was doubled since 83D.4. 2 fb is sufficiently high to cover the third harmonics which is 1.5 fb.

The requirement of the bandwidth of CTLE is even higher for C2M than C2C, because the device for C2M may not have a DFE. For C2C, DFE can relax the requirement for CTLE bandwidth. Besides, C2M and C2C will be implemented in the same generation of technology. Therefore, we should align the effective bandwidth of reference CTLE between C2M and C2C.

This comment is related to the comment r02-21 to D3.2.

SuggestedRemedy

Change P1 / 2pi in Table 120E-2 to 53.125GHz.
Adjust other columns to achieve the max gain of 0dB with the same DC gain.
Update Figure 120E-9 accordingly.

The details of the updates to Table 120E-2 will be provided as a presentation.

Proposed Response *Response Status* **O**

Cl **119** *SC* **119.2.5.3** *P* **164** *L* **19** # r03-13

Dudek, Michael — Cavium

Comment Type **E** *Comment Status* **D**

splitting "interval" and "codewords" with the section reference is confusing as codewords are the units to be used for the register.

SuggestedRemedy

Change "FEC_degraded_SER_interval (see 119.3.1) codewords" to "FEC_degraded_SER_interval codewords (see 119.3.1) "

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.7.3** *P* **221** *L* **41** # r03-14

Dudek, Michael — Cavium

Comment Type **TR** *Comment Status* **D**

The Power budget for other Ethernet clauses is equal to min OMA at maximum TDP minus Receiver Sensitivity. Due to having Receiver Sensitivity with SECQ at 0.9dB the equivalent equation doesn't hold. It would be good to clarify what the power budget is here.

SuggestedRemedy

In Table 121-8 Change parameter "Power budget (for max TDECQ)" to "Power budget (for max TDECQ and SECQ=0)". Make the same change in Tables 122-13 and 124-8.

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.8.8** *P* **229** *L* **22** # r03-15

Dudek, Michael — Cavium

Comment Type **TR** *Comment Status* **D**

On this draft the Receiver sensitivity was changed to be with an SECQ of 0.9, but here it is defined to be for an ideal input signal. There appears to be a conflict here.

SuggestedRemedy

Change "Receiver sensitivity, which is defined for an ideal input signal", to "Receiver sensitivity, which is defined for an ideal input signal without overshoot", Make the same change in clauses 122.8.8 and 124.8.8

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.8.9.1** *P* **231** *L* **11** # r03-16

Dudek, Michael Cavium

Comment Type **TR** *Comment Status* **D**

With this calibration method for stressed receiver sensitivity a receiver with wider bandwidth than Nyquist will have an improved stressed sensitivity. (around 0l.9dB if at 0.75*Baud rate). This may encourage vendors of receivers to have receiver bandwidths wider than Nyquist. However Transmitters are tested for TDECQ with the Nyquist filtered reference equalizer so that Energy above Nyquist is not "aliased" degrading their TDECQ. There will be an interoperability issue between Transmitters with bad high frequency content and Receivers which have wider bandwidth.

SuggestedRemedy

In Figure 121-6 move the sinusoidal amplitude interferer after the Low-pass filter. On page 299 line 54/page 230 line 1. Change " to "The sinusoidal amplitude interferer is set to 0.71*Baud rate. On page 213 line 10 change "Any remaining SECQ must be created with a combination of sinusoidal jitter, sinusoidal interference, and Gaussian noise" to "0.1dB SECQ is created with th sinusoidal interference and any remaining SECQ must be created with a combination of sinusoidal jitter, and Gaussian noise"

Alternatively change the bandwidth of the reference receiver used for TDECQ back to 0.75*Baud rate and change the numbers back to what they were on earlier revisions. Or add an additional test for the transmitter where TDECQ is measured with a 0.75*Baud rate filter and has to be <2.5dB

Make the equivalent changes in clauses 122 and 124 . (Note that if 0.71*Baud rate is changed to an exact frequency then another exception needs to be added in 124.8.9)

Proposed Response *Response Status* **O**

Cl **119A** *SC* **119A** *P* **324** *L* **23** # r03-17

Dudek, Michael Cavium

Comment Type **E** *Comment Status* **D**

Font appears inconsistent

SuggestedRemedy

fix it

Proposed Response *Response Status* **O**

Cl **120C** *SC* **120C.1** *P* **341** *L* **53** # r03-18

Dudek, Michael Cavium

Comment Type **E** *Comment Status* **D**

Normally things are "shown" in figures not in sections

SuggestedRemedy

Change "shown" to "described" Make the same change in annex 120E on page 368 line 54.

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.1.1** *P* **352** *L* **54** # r03-19

Dudek, Michael Cavium

Comment Type **E** *Comment Status* **D**

This is the Transmitter return loss section. It would be better to refer to the transmitter return loss section in clause 93

SuggestedRemedy

Change 93.8.2.1 to 93.8.1.1

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.4** *P* **362** *L* **23** # r03-20

Dudek, Michael Cavium

Comment Type **TR** *Comment Status* **D**

The changes made in this draft, changing the die and package trace impedances , having a tight specification for the return loss of the interference tolerance test set up, and having a channel return loss specification have significantly improved inter-operability however due to impedance mis-matches it is still possible to have a Transmitter that passes its specification that won't interop with a channel and Rx that pass their specifications. A presentation will be made.

SuggestedRemedy

Change the COM value from 3dB to 3.2dB

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.4.1** *P* **364** *L* **11** # r03-21

Dudek, Michael Cavium

Comment Type **E** *Comment Status* **D**

"Illustrated in" is consistent with the rest of the document rather than "illustrated by"

SuggestedRemedy

Change "illustrated by" to "illustrated in"

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.5.4.3** *P* **367** *L* **36** # r03-22

Dudek, Michael Cavium

Comment Type **TR** *Comment Status* **D**

Section 120D.4.1 was added with a normative requirement for return loss for channels with COM less that 4.0dB

SuggestedRemedy

Add a PICS for "Return loss for channels with COM less than or equal to 4dB" Subclause 120D.4.1 Value Meets equation (120D-12) constraints

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.5.4.1** *P* **388** *L* **28** # r03-23

Dudek, Michael Cavium

Comment Type **TR** *Comment Status* **D**

The PICS values don't match the spec requirements

SuggestedRemedy

Change TH6 to 0.22UI, TH7 to 32mV, TM5 to 70mV.

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.7.2** *P* **221** *L* **17** # r03-24

Dawe, Piers J G Mellanox Technologie

Comment Type **T** *Comment Status* **D**

Clashing definions of unstressed sensitivity: this says "Receiver sensitivity (OMAouter), each lane (max) is informative and is defined for a transmitter with SECQ of 0.9 dB", while 121.8.8 says "Receiver sensitivity, which is defined for an ideal input signal ... the test signal should have negligible impairments such as intersymbol interference (ISI), rise/fall times, jitter and RIN".

SuggestedRemedy

It would be better to say in 121.8.8 that we expect such a signal would have a SECQ of 0.9 dB; better still to use a scale of SECQ that does not depend on our arbitrary choice of reference receiver bandwidth.

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.8.1** *P* **222** *L* **46** # r03-25

Dawe, Piers J G Mellanox Technologie

Comment Type **T** *Comment Status* **D**

For SRS testing, while Table 138-12 following 802.3by Table 95-10 allows PRBS31Q, scrambled idle (with FEC) or valid 50GBASE-SR, 100GBASE-SR2, or 200GBASE-SR4 signal, but this Table 121-10 (following the older 802.3ba?) allows only PRBS31Q and scrambled idle. The 58-bit scrambler is so long that we can't tell the statistics of RS-FEC encoded scrambled idle from any other valid 50GBASE-R signal. RF, which is a valid 50GBASE-R signal, is often more convenient than scrambled idle. Table 89-10 (40GBASE-FR) also allows PRBS31, scrambled idle or valid 40GBASE-R signal.

SuggestedRemedy

Change "3 or 5" to "3, 5 or valid 50GBASE-R signal". Also in tables 122-15 and 124-10.

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.8.5.3** *P* **228** *L* **23** # r03-26

Dawe, Piers J G — Mellanox Technologie

Comment Type **T** *Comment Status* **D**

We need some constraints to exclude crazy transmitters and to reduce the search space for the TDECQ equalizer and for real receivers.

SuggestedRemedy

Require the cursor to be early in the equalizer, e.g. first to second tap.
Also, do we want to exclude very over-emphasized signals, e.g. by requiring that the cursor must be at least some value?
These rules could go here or in 121.8.5.4 TDECQ reference equalizer.

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.8.5.3** *P* **228** *L* **43** # r03-27

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

It seems that it is possible to make a bad transmitter (e.g. with a noisy or distorted signal), use emphasis to get it to pass the TDECQ test, yet leave a realistic, compliant receiver with an unreasonable challenge (up to 2.5/2 dB worse than the SRS test?) With some of the changed low-bandwidth TDECQ being used to equalize the reference receiver's own bandwidth, this issue becomes more apparent.
D3.0 comment 140, D3.2 r02-35

SuggestedRemedy

Define TDECQrms = 10*log10(A_RMS/(s*3*Qt*R)) where A_RMS is the standard deviation of the measured signal after the 13.28125 GHz filter response. We choose s, which is close to the standard deviation of a fast clean signal with OMA=0.5 and without emphasis, observed through the 13.28125 GHz filter response, according to what level of dirty-but-emphasised signal we decide is acceptable. Qt and R are as in Eq 121-12. Require that TDECQrms shall not exceed the limit for TDECQ.

Proposed Response *Response Status* **O**

Cl **124** *SC* **124.8.5** *P* **302** *L* **6** # r03-28

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Most of the definitions in 121 and 124 identify the pattern to use by reference to Table 121-10 or Table 121-10. 124.8.5 (TDECQ) and 124.8.9 (SRS) don't, leaving the associated rows in the table without effect. For consistency, they should identify the pattern too.
802.3cd made a similar change just after the 802.32bs meeting (but with "a test pattern" for TDECQ).

SuggestedRemedy

In 124.8.5 change "The signaling rate of the test pattern generator is as given in Table 124-6." to "The signaling rate of the test pattern generator is as given in Table 124-6 and uses the test pattern specified for TDECQ in Table 124-10."
In 124.8.9 change "The signaling rate of the test pattern generator and the extinction ratio of the E/O converter are as given in Table 124-6." to "The signaling rate of the test pattern generator and the extinction ratio of the E/O converter are as given in Table 124-6 using test patterns specified in Table 124-10."
Possible similar changes in 122, 123.

Proposed Response *Response Status* **O**

Cl **120B** *SC* **120B.1** *P* **335** *L* **33** # r03-29

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Why doesn't the new text added to 120C.1 and 120E.1 appear in 120B.1 and 120D.1?

SuggestedRemedy

Add equivalent text here and in 120D.1. This is the text in 120C.1: The sublayers (including the PCS and associated FEC) of each PHY that can optionally include a 200GAUI-8 C2M or 400GAUI-16 C2M are summarized in the tables in 116.1.4 and are specified in the corresponding PMD clause. The positioning of the 200GAUI-8 C2M or 400GAUI-16 C2M relative to other sublayers is shown in 120.1 with further examples in Annex 120A.

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.1.1** *P* **353** *L* **24** # r03-30

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

Signal-to-noise-and-distortion ratio (min), increased to 31.5 dB for all Tx emphasis settings, is too high: see dawe_3bs_04_0717 and dawe_3cd_02a_0717 - can barely measure the IC through the test fixture. It seems SNDR depends on emphasis, while COM assumes the spec limit at all emphasis settings which is pessimistic and not realistic. Also I suspect there is double counting of jitter in SNDR and as jitter, in COM.
D3.2 r02-42

SuggestedRemedy

Either apply the SNDR spec for no emphasis only, and adjust eq 93A-30 for the way sigma_e varies with emphasis (not much, the equation might get simpler), or apply a SNDR limit that accounts for the way sigma_e varies with emphasis: SNDR0+20log10(Pmax_equalized/Pmax_unequalized)

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.1.1** *P* **353** *L* **26** # r03-31

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

Transmitter output residual ISI SNR_ISI (min) 34.8 dB is still too high see dawe_3bs_04_0717 and dawe_3cd_02a_0717 - can barely measure the IC through the test fixture. The warning NOTE in 120D.3.1.7 shows the issue, but doesn't solve it.
D3.1 comments 22 and 36, D3.2 comment 43

SuggestedRemedy

In 120D.3.1.7, change "The SNR_ISI specification shall be met for all transmit equalization settings" to "The SNR_ISI is measured with Local_eq_cm1 and Local_eq_c1 set to zero".

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.1.1** *P* **353** *L* **36** # r03-32

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

The low frequency RL at 14.25 dB is insignificant for signal integrity compared with the 8.7 dB at 6 GHz. This RL is much tighter than CEI-56G-MR at low (and high) frequency (although apparently looser between 4 and 9 GHz). Also it is tighter at low frequencies than the new channel return loss limit, which seems wrong.
Following D3.1 comment 41, D3.2 r02-44

SuggestedRemedy

Particularly now we have a channel return loss limit, we can change 14.25 - f to 12 -0.625f

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.1.1** *P* **353** *L* **24** # r03-33

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Please make the spec easier to use by including short names in the tables as the optical clauses do for OMAouter, SMSR and TDECQ

SuggestedRemedy

Signal-to-noise-and-distortion ratio (SNDR) (min)

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.2** *P* **359** *L* **36** # r03-34

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

Changing the return loss spec for the receiver was a mistake, because the effects of receiver reflections to a nominal-impedance channel and transmitter are in the receiver interference tolerance test, and the extra reflections to a channel and transmitter with different impedances are controlled/accounted for by the channel COM, now based on nominal impedances, the new channel return loss spec and the transmitter return loss spec. From the simple formula for reflection at an impedance mismatch, one can see that these effects are close to additive, so controlling/accounting for them separately is OK. In other words, the receiver pays for its own reflections in the interference tolerance test, soi we don't have to tell the receiver designer how to do his job in this regard.

SuggestedRemedy

Revert 120D.3.1.1, Equation (120D-2) to 93.8.1.4, Equation (93-3).

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.2.1** *P* **360** *L* **25** # r03-35

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

It's not a NOTE, and if we did not want the reader to note it we would not write it.

SuggestedRemedy

Delete "Note that" here and in 120D.3.2.2 item d.
Could simplify the sentences a little: "As this requirement can be somewhat more stringent than using the scrambled idle test pattern and measuring FEC symbol error ratio, failing..."

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.2.1** *P* **360** *L* **53** # r03-36

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

The COM in the calibration of the receiver interference tolerance test is not a maximum, because then any arbitrarily bad COM would be allowed in the test, so all receivers could fail.

SuggestedRemedy

Move the 3 dB COM back from the Max columns to the Target columns. Or "Specification value" as in 86A.
With regard to comment r02-11: there could be an informative note saying that a pass with lower COM implies a pass with 3 dB COM.

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.2.2** *P* **361** *L* **36** # r03-37

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Untidy table layout

SuggestedRemedy

Using the full width, make the first column wider and other columns such as the last narrower so that the parameter cells each take just one row. E.g. shrink to contents then make full width.

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.4** *P* **362** *L* **21** # r03-38

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Subclause structure needs adjustment for the new channel spec

SuggestedRemedy

Insert a new heading 120D.4.1 Channel Operating Margin. 120D.4.1 Channel return loss becomes 120D.4.2.
Alternatively, remove the heading 120D.4.1 Channel return loss

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.4** *P* **362** *L* **23** # r03-39

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

Because the COM package and termination impedances have been moved to nearly neutral (a good move), there needs to be a small difference between the channel COM and the COM in the receiver interference tolerance test, to allow for the range of transmitter-channel reflections that are not included in either. Comments i-73, r02-56.

SuggestedRemedy

Increase the COM limit here, maybe to 3.2 dB, or reduce the COM limit in Table 120D-6, Receiver interference tolerance parameters.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.1** *P* **372** *L* **20** # r03-40

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

The host is allowed to output a signal with 900 mV peak-to-peak amplitude but only 32 mV eye height - a very bad signal. If the module is exactly like the reference receiver, that would work, but with a good but slightly different receiver the eye will collapse with not enough margin for e.g. temperature changes causing mistuning. The module can't inconvenience the host in the same way because its peak-to-peak output voltage is measured before most of the loss.
D3.0 comment 119, D3.2 r02-46.

SuggestedRemedy

Add a vertical eye closure spec to protect the module from such unexpected signals. VEC defined as largest of three ratios for the three sub-eyes, limit in the low teens of dB.

Proposed Response *Response Status* **O**

Cl **120D** *SC* **120D.3.1.3** *P* **355** *L* **3** # r03-41

Dawe, Piers J G — Mellanox Technologie

Comment Type **T** *Comment Status* **D**

This says "The following test procedure shall be followed to determine the linear fit pulse response, linear fit error, and normalized transmitter coefficient values." It provides information for the linear fit pulse response and normalized transmitter coefficient values, but nothing for linear fit error.

SuggestedRemedy

Define linear fit error, which is needed in 120D.3.1.6.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.2** *P* **376** *L* **51** # r03-42

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

Following up D3.2 comment r02-47: Meeting the five module output specs simultaneously (near and far end eye height and width, far-end pre-cursor ratio) requires finer resolution (+/-2.5% required) than the C2C transmitter may have (steps on a 5% grid with tolerances), which doesn't seem sensible or necessary. Meeting all five means doing worse on the important ones and may not be feasible in some cases. Setting up for the highest loss is the important thing, then lower loss hosts will naturally have an easier task. For module input testing, high loss now includes the host package loss; this should apply here also.

SuggestedRemedy

Decrease the limit for far-end eye height from 70 mV to 60 mV.
Widen the pre-cursor ratio limit from +/-2.5% to +/-3.5%.
Increase the loss in the software channel (moving the "far end" to after a reasonable package loss), reducing the far-end eye height and width to account for the extra loss.
Review the way this works for a reasonable variety of channels.
Review what range of CTLE peaking is consistent with the insertion loss budget.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.2.1** *P* **337** *L* **21** # r03-43

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Making the structure of the subclauses align with the contents: far-end pre-cursor ISI ratio is not a separate measurement to far-end eye height and width.

SuggestedRemedy

Change: 120E.3.2.1 Module output eye width and eye height to 120E.3.2.1 Module output eye width, eye height and pre-cursor ISI ratio
120E.3.2.1.1 Reference receiver for module output eye width and eye height evaluation to 120E.3.2.1.1 Reference receiver for module output evaluation
120E.3.2.2 Far-end pre-cursor ISI ratio to 120E.3.2.1.2 Far-end pre-cursor ISI ratio

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.2.2** *P* **377** *L* **52** # r03-44

Dawe, Piers J G — Mellanox Technologie

Comment Type **E** *Comment Status* **D**

Removing ambiguity

SuggestedRemedy

Change "for which the eye width and height satisfy" to "for which the far-end eye width and height satisfy".

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.4.1.1** *P* **383** *L* **9** # r03-45

Dawe, Piers J G — Mellanox Technologie

Comment Type **T** *Comment Status* **D**

The module output is measured with a 10.5 dB channel (part mated compliance boards, part software channel) plus module's own loss with EW, EH 0.2, 30. The module stressed input signal is measured after a 14.2 dB hardware channel, plus pattern generator's own loss, with EW, EH 0.22, 32 - not very different. Although the host and pattern generator are expected to have more sophisticated outputs than the module, it is said that the stressed signal EW is not feasible - this may be because of the extra loss.

SuggestedRemedy

Reduce the 14.2 dB loss because some of the loss is already in the pattern generator and the 14.2 dB represents all the loss including a long host IC package path. We could choose to let the max trace loss, max package loss host look after itself to an extent and target something between 10.5 (no package) and 14.2 (max package). Equivalently, don't connect the longest package trace to the longest PCB trace! Some other metric such as (unequalized) pulse height that takes the pattern generator into account may be better than test channel loss.

Proposed Response *Response Status* **O**

Cl **120E** *SC* **120E.3.4.1.1** *P* **383** *L* **9** # r03-46

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **D**

The high loss module stressed input signal can be set up with relatively strong Tx emphasis, with a low optimum CTLE peaking. This gives a test signal that is like the low loss one, and doesn't test the receiver for abilty to equalize. We could impose a minimum CTLE peaking for calibrating the high loss signal, but that signal could be easier to receive with a lower CTLE peaking, so we want a signal for which the best peaking is say 8 to 9 dB.

SuggestedRemedy

Add another requirement, that the optimum CTLE peaking (given by worst of three eye width * eye height, similar to 83E) must be at least 8 dB. This can be done by adjusting the pattern generator's output.

Proposed Response *Response Status* **O**

Cl **121** *SC* **121.8.5.3** *P* **225** *L* **29** # r03-47

King, Jonathan — Finisar Corporation

Comment Type **T** *Comment Status* **D**

The current definition for time centre of eye ("0.5 UI") is based on the time average of the centre crossing points.
This was OK for T/2 spaced reference equalizers, which would effectively optimize the equalized eye time-centre for best TDECQ.
But it is not sufficient for a T spaced reference equalizer, which cannot optimize the time-centre of the equalized eye.
PHYs with T-spaced equalizers are expected to optimize their sampling point, equivalent to optimizing the timing position of the histograms used to measure TDECQ.
Therefore, the TEDCQ method should be allowed to optimize the timing position when measuring transmitter eyes, to avoid penalizing or excluding transmitters which have open eyes which are offset from the time average of the centre crossing points.
See http://www.ieee802.org/3/bs/public/17_09/king_3bs_01_0917.pdf

SuggestedRemedy

In 121.8.5.3, replace the paragraph "Two vertical histograms are measured through the eye diagram, centered at 0.45 UI and 0.55 UI. Each of the histogram windows spans all of the modulation levels of the eye diagram, as illustrated in Figure 121-5. " with "Two vertical histograms are measured through the eye diagram, nominally centered at 0.45 UI and 0.55 UI. Each of the histogram windows spans all of the modulation levels of the eye diagram, as illustrated in Figure 121-5. The precise time position of the 0.45 UI and 0.55 UI histograms may be adjusted (e.g. to minimize TDECQ), but the histograms must be spaced 0.1 UI apart."

Proposed Response *Response Status* **W**

[Editor's note: This comment was sent after the close of the comment period]