Cl **00** *SC* **0** *P* *L* # 11

Anslow, Pete Ciena

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

Many sections of this draft are making changes to clauses that are also being modified by P802.3bj which is likely to be approved before P802.3bm.

SuggestedRemedy

Keep the base text of the draft in line with the 802.3 standard as modified by P802.3bj as it progresses. Also, bring any new instances of "CAUI" that are added to the P802.3bj draft in to the 802.3bm draft with changes to the name as appropriate.

Proposed Response *Response Status* **O**

Cl **00** *SC* **0** *P* *L* # 12

Anslow, Pete Ciena

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

P802.3bj D3.2 has added Table 93A-2 "Physical Layer specifications that employ COM". Since Annex 83D uses COM in 83D.4, this should be added to this table.

SuggestedRemedy

Bring Table 93A-2 into the P802.3bm draft and add a row for CAUI-4 chip-to-chip "CAUI-4 (Annex 83D), Table 83D–6"

Proposed Response *Response Status* **O**

Cl **01** *SC* **1.4** *P* **22** *L* **37** # 112

Zhao, Wenyu CATR

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

As in the sub-clasuse 95.7(page 106), there are two operating ranges illustrated for 100GBASE-SR£š"0.5m to 70m for OM3
and 0.5m to 100m for OM4". In the definition of 100GBASE-SR4, the distance is described as "IEEE 802.3 Physical Layer
specification for 100 Gb/s using 100GBASE-R encoding over four lanes of multimode fiber, with reach up to at least 100 m.".
In this definition, maybe it is not suitful for OM3 fiber,as the definition includes all type of multimode fiber.

SuggestedRemedy

The description is suggested to be described as "...with reach up to at least 70/100 m".

Proposed Response *Response Status* **O**

Cl **01** *SC* **1.4** *P* **22** *L* **44** # 113

Zhao, Wenyu CATR

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

As in the sub-clasuse 87.7(page 76), there are two operating ranges illustrated for 40GBASE-ER£š"2m to 30km, and 2m to 40km
", and and a note for the second case as "aLinks longer than 30 km for the same link power budget are considered engineered
links. Attenuation for such links needs to be less than the worst case specified forB1.1, B1.3, or B6_a single-mode fiber.".
In the definition of 40GBASE-ER4, the distance is described as "..., with reach up to at least 40km.".In this definition,
maybe it is not suitful for at least 30km case in this definition.

SuggestedRemedy

The description is suggested to be described as "...with reach up to at least 30/40 km".

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.7.4** *P* **31** *L* **40** # 15

Marris, Arthur Cadence

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

Shouldn't 100GBASE-SR4 be underlined in Table 45-9?

SuggestedRemedy

Underline 100GBASE-SR4 and link to 95.5.10

also do same correction for Table 45-10

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.7.4** *P* **31** *L* **40** # 9

Anslow, Pete Ciena

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

In Tables 45-9 and 45-10 the addition of the row for 100GBASE-SR4 is no longer shown with underline font.

SuggestedRemedy

Show the row for 100GBASE-SR4 in Tables 45-9 and 45-10 in underline font.

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.88c** *P* **34** *L* **53** # 8

Anslow, Pete Ciena

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

Clause 45 is generally structured to have a subclause describing each register contents and then a set of subclauses beneath that describe each bit or group of bits. 45.2.1.88c contains both a description of register 1.169 and also a description of bits 1.169.5:1.

SuggestedRemedy

Remove the second sentence of 45.2.1.88c
Add a new subclause 45.2.1.88c.1
with a title of "Recommended CTLE peaking (1.169.5:1)"
and content:
The value of these bits sets the CTLE peaking value recommended by a host that implements the optional CAUI-4 chip-to-module interface defined in Annex 83E (see 83E.3.1.6). The module may optionally use this information to adjust its CTLE setting.

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.88c** *P* **35** *L* **11** # 16

Marris, Arthur Cadence

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

Should this be 1.169.4:1?

SuggestedRemedy

Change 1.169.5:1 to 1.169.4:1
and 1.169.15:6 to 1.169.15:5

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.88c** *P* **35** *L* **11** # 7

Anslow, Pete Ciena

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

The recommended CTLE peaking value is a parameter that the host must communicate to the module. This needs to be done by the host writing this value into register 1.169 when a module is plugged in to the host.
Consequently, bits 1.169.5:1 should be R/W and not RO as shown.

SuggestedRemedy

Change bits 1.169.5:1 from RO to R/W

Proposed Response *Response Status* **O**

Cl **78** *SC* **78.1.3.3.1** *P* **41** *L* **19** # 14

Anslow, Pete Ciena

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

The base text for the last paragraph of 78.1.3.3.1 has been modified by P802.3bj D3.1. This modification makes the changes shown in P802.3bm D2.1 inappropriate.
However, the text as modified by P802.3bj D3.1 contains the sentence: "For some PHYs with an operating speed of 40 Gb/s or greater, deep sleep is optional as shown in Table 78–1." which is rather confusing.
A comment has been submitted against P802.3bj D3.1 to change this to: “Deep sleep is optional for PHYs with an operating speed of 40 Gb/s or greater that implement EEE.”

SuggestedRemedy

Once the comment against P802.3bj D3.1 has been resolved, bring the resulting text of this paragraph into P802.3bm and show appropriate modifications.
If the sentence is changed to “Deep sleep is optional for PHYs with an operating speed of 40 Gb/s or greater that implement EEE.”, then show it as changing to: “Deep sleep is optional for some PHYs with an operating speed of 40 Gb/s or greater that implement EEE (the exceptions are noted in Table 78-1).”

Proposed Response *Response Status* **O**

Cl **78** *SC* **78.1.3.3.1** *P* **41** *L* **20** # 17

Marris, Arthur Cadence

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

This text has been modified by 802.3bj draft 3.1

SuggestedRemedy

Reconcile this text with the latest draft of 802.3bj.

Consider adding this text to 802.3bm:
"Some PHYs with an operating speed of 40 Gb/s or greater that implement EEE do not support deep sleep mode (these are noted in Table 87-1). Other PHYs with an operating speed of 40 Gb/s or greater that implement EEE may optionally support deep sleep mode."

Or if the latest text in 802.3bj is sufficient remove the modification of 78.1.3 completely from 802.3bm.

Proposed Response *Response Status* **O**

Cl **83A** *SC* **83A** *P* **110** *L* **10** # 80

Dawe, Piers — Mellanox

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

Spot the odd one out:
Annex 83A 40 Gb/s Attachment Unit Interface (XLAUI) and 100 Gb/s ten-lane Attachment Unit Interface (CAUI-10)
Annex 83B Chip-to-module 40 Gb/s Attachment Unit Interface (XLAUI) and 100 Gb/s ten-lane Attachment Unit Interface (CAUI-10)
Annex 83D Chip-to-chip 100 Gb/s four-lane Attachment Unit Interface (CAUI-4)
Annex 83E Chip-to-module 100 Gb/s four-lane Attachment Unit Interface (CAUI-4)

SuggestedRemedy

83A should be called "Chip-to-chip ..." like 83D. This will remove some ambiguity and confusion.
Figure 83A-1 should say "chip-to-chip" by the arrows pointing at the interfaces, as Figure 83D-1 does.

Proposed Response *Response Status* **W**

[Editor's note: Subclause changed from 95.8.4 to 83A]

Cl **83D** *SC* **83D.** *P* **146** *L* **8** # 43

Dudek, Mike — QLogic

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

Typically signal flow is from left to right in drawings. The position of the TP0 and TP5 might be confusing as it is not obvious that the dashed line and test point nomenclature only applies to the bottom signal path flowing from right to left.

SuggestedRemedy

Add the TP0 and TP5 to the top of the picture as well as the bottom.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.1** *P* **145** *L* **31** # 46

Dudek, Mike — QLogic

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

The title of Figure 83D-1 is just CAUI-4 not CAUI-4 chip to chip. Typically one would expect that CAUI-4 chip to module would be used to connect to the PMA/PMD at the lower CAUI-4 instance not the CAUI-4 chip to chip shown (Although CAUI-4 chip to chip is technically possible.

SuggestedRemedy

Replace the lower instance with CAUI-4 chip-to-module. Or change to just CAUI-4, or change to CAUI-4 chip-to-chip or chip-to-module

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.1** *P* **145** *L* **53** # 100

Li, Mike — Altera

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

CAUI4 c2c interface has max diff voltage of 1.2 V, and therefore cannot be called differential low voltage lanes

SuggestedRemedy

remove the "low" from the sentences "Each data path contains four differential low voltage lanes which are AC coupled"

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1** *P* **147** *L* **21** # 81

Dawe, Piers — Mellanox

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

Subclause reference

SuggestedRemedy

Change to just "Reference", as in e.g. Table 83E-1. Adjust left and second column widths to suit contents.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1** *P* **147** *L* **43** # 35

Moore, Charles Avago Technologies

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

Annex 83D Tx jitter specification refers to Clause 93.8.1.7 which is written for a system using FEC which needs only operate at a raw BER of about 1e-5 while the PHY specified in 83D needs to work at a raw BER of better than 1e-15. Jitter specs should change to reflect this.

Also Table 83D-1 refers to Clause 93.8.1.7 for a specification and specifies Effective random jitter, while Clause 93.8.1.7 specifies effective total uncorrelated jitter instead. Need to change spec

SuggestedRemedy

Possible fixes:

A.

In table 83D-1 change:

Output jitter Subclause reference from 93.8.1.7 to 83D.3.1.X
"Effective random jitter, RMS"
to "Effective total uncorrelated jitter, peak-to-peak"
and change the spec to 0.26 UI

Add subclause 83D.3.1.X:

"The conditions for the measurement of transmitter output jitter (jitter filter, test pattern, etc.) are defined in 92.8.3.9.

Even-odd jitter is defined in 92.8.3.9.1. Even-odd jitter shall be less than or equal to 0.035 UI regardless of the transmit equalization setting.

Effective bounded uncorrelated jitter and effective total uncorrelated jitter are measured as defined in 92.8.3.9.2 except that range for the fitting of CDFL_i and CDFR_i, as defined in 92.8.3.9.2 c), shall be from 1e-4 to 2.5e-3. The effective bounded uncorrelated jitter shall be less than or equal to 0.1 UI peak-to-peak regardless of the transmit equalization setting. The effective total uncorrelated jitter shall be less than or equal to 0.26 UI peak-to-peak regardless of the transmit equalization setting."

or

B.

In table 83D-1 change:

Output jitter Subclause reference from 93.8.1.7 to 92.8.3.9
"Effective random jitter, RMS"
to "Effective total uncorrelated jitter, peak-to-peak"
and change the spec to 0.26 UI

Add a note to table 83D-1:

Effective bounded uncorrelated jitter and effective total uncorrelated jitter are measurd as defined in 92.8.3.9.2 except that range for fitting CDFL_i and CDFR_i, as defined in 92.8.3.9.2 c), shall be from 1e-4 to 2.5e-3.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1** *P* **147** *L* **44** # 101

Li, Mike Altera

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

In comparison with the TX jitter of CEI-28G-MR, CEI-28G-VSR, and 83E (CAUI4 c2m host), the BUJ is reduced from 0.15 UI to 0.1 UI, and TJ is not specified. This is not a RS FEC protected interface, as such bj TX jitter spec does not apply here.

SuggestedRemedy

a.) change "Effective bounded uncorrelated jitter, peak-to-peak" to "bounded uncorrelated jitter (BUJ), peak-to-peak", and set its value to 0.15 UI.
b.) change "Effective random jitter, RMS", to "random jitter (RJ), peak-to-peak", and set its value to 0.15 UI
c.) Add total jitter (TJ) (at BER 1e-15) and set its value to 0.28 UI. (to allow BUJ, RJ, and EOJ trade-offs, and bounded correlated, but non-compensatable DJ)

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1** *P* **147** *L* **47** # 42

Dudek, Mike QLogic

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

It would be good to allow the trade off between bounded and un-bounded uncorrelated jitter that 802.3bj now has. Also to align the specification method with 802.3bj.

SuggestedRemedy

Change "Effecive random jitter rms" row to "Effective total uncorrelated jitter, peak to peak of 0.26UI With a footnote stating at 1e-15 probability.

Proposed Response *Response Status* **W**

[Editor's note: Comment type set to T]

Cl **83D** *SC* **83D.3.1** *P* **147** *L* **48** # 19

Ran, Adee Intel

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

Singular "State" with zero article is poor English.

SuggestedRemedy

Change "State" to "The state".

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1** *P* **147** *L* **49** # 102

Li, Mike Altera

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

Reference CRU definition is missing, leaving overestimation of low-frequency jitter below the CRU BW that otherwise would have been tracked by the CRU, potentially failing a good TX as bad and causing yield loss.

SuggestedRemedy

Add note b after note a at the end of Table 83D-1. Note b states "A clock recovery unit (CRU) shall be used for jitter measurement. The CRU should have a corner frequency of 10 MHz and a slope of 20 dB/decade"

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1.1** *P* **148** *L* **10** # 39

Healey, Adam LSI Corporation

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

The requirements for R_pre and R_pst are ambiguous. R_pre is affected by the by the value of c(1) and R_pst is affected by the value of c(-1). The text cites 72.7.1.11 which includes specific conditions for the measurement of R_pre (c(1) disabled or zero) and R_pst (c(-1) disabled or zero). However, Table 83D-2 states the R_pre requirement for 4 settings with no regard to the post-cursor equalization setting. Is it necessary to maintain the +/-12.5% tolerance on R_pre over all of the post-cursor equalization settings? This is not a requirement for 100GBASE-KR4 and should not be a requirement for CAUI-4 chip-to-chip.

Also, starting at page 148, line 11, it is stated that the "minimum pre-cursor equalization R_pre supported is shown in Table 83D-2..." Table 83D-2 specifies ranges and not minimum values.

SuggestedRemedy

Change the last two sentences of the first paragraph of 83D.3.1.1.

"The pre-cursor equalization ratio R_pre for each pre-cursor tap setting is shown in Table 83D–2 where R_pre is defined in Equation (72-8) and the post-cursor tap setting is 0. The post-cursor equalization ratio R_pst for each post-cursor tap setting is shown in Table 83D–3 where R_pst is defined in Equation (72-9) and the pre-cursor tap setting is 0."

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1.1** *P* **148** *L* **10** # 22

Ran, Adee Intel

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

The current text specifies minimum equalization support using two tables - one for pre-cursor and one for post-cursor - where the tables include 4 and 6 settings respectively. It is not clear how many settings are required altogether.

I assume the intent is that each of the 4 settings for c(-1) implied from table 83D-2 can be used with each of the 6 settings for c(1) implied from table 83D-3, with c(0) set to complement the peak-to-peak value. Tha would make exactly 24 possible settings.

This should be specified clearly.

The same combinations of settings should be used in calculation of COM, where tables 83D-7 and 83D-8 describe the actual coefficients in some of the settings.

SuggestedRemedy

Proposed remedy to be presented.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1.1** *P* **148** *L* **33** # 40

Healey, Adam LSI Corporation

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

Table 83D-1 now includes a limit on the signal-to-noise and distortion ratio. This metric limits uncorrelated noise and unequalizable distortion such as non-linearities and trailing echoes. The requirement that the "positive and negative voltages shall match" is redundant since excessive mismatch should appear as a degradation in the SNDR. SNDR also enables trade-offs between this and other impairments.

SuggestedRemedy

Delete the requirement that the "positive and negative voltages shall match".

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1.1** *P* **148** *L* **4** # 55

Richard, Mellitz intel Corporation

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

At 25Gb/s it it not likely that measurement will lend to reliable measurements of voltage to calculate Rpre and Rpost. procedure described in 72.7.1.11
Since clause 93.8.1.5.2 is being used to compiite Vf and SNDR use clause 85.8.3.3 to determine c(-1), c(0), and c(1)

SuggestedRemedy

Delete all the context in 83D.3.1.1 but keep figure 84D-4, Table 83D-2, Table 83D-3, and the first two sentences (in lines 6 to 8).
Change title to Transmitter equalization settings.

At the following text.
The transmitter output equalization is characterized using the procedure described clause 93.8.1.5.2. The precursor taps are shown in figure 83D-7 and post cursor taps setting are shown in figure 83D-8. The tap settings are limited by the tolerances shown in Table 83D-2 and Table 83D-3 where R_pre = (-c(-1)+c(0)+c(1))/ (c(-1)+c(0)+c(1)) and R_post= (c(-1)+c(0)-c(1))/ (c(-1)+c(0)+c(1)).

Proposed Response *Response Status* **W**

[Editor's note: Comment Type set to TR]

Cl **83D** *SC* **83D.3.1.1** *P* **148** *L* **9** # 36

Healey, Adam LSI Corporation

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

Now that the linear fit pulse is being used as a specification tool for CAUI-4 chip-to-chip, it is unclear what advantage there is to defining the equalization ratios using the square wave method defined in 72.7.1.11. The linear fit method provides a tighter coupling between transmitter requirements and COM and is capable or robustly extracting filter coefficients from even low bandwidth signals.

SuggestedRemedy

Extract c(-1), c(0), and c(1) using the linear fit method in 93.8.1.5.1. R_pre is defined to be (c(0)-c(-1))/(c(0)+c(-1)) assuming c(1) is 0 and R_pst is defined to be (c(0)-c(1))/(c(0)+c(1)) assuming c(-1) is 0. The nominal values and tolerances in Table 83D-2 and Table 83D-3 do not need to be changed.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1.1** *P* **149** *L* **14** # 41

Ran, Adee Intel

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

CAUI-4 C2C defines transmitter equalization settings. These settings should be programmed, in both transmit direction and receive direction of the stack (as defined in clause 83), according the the channel between the chips.

It would be beneficial to enable using MDIO to read/write the CAUI-4 equalization settings. This would enable standard centralized management and prevent vendor-specific interfaces or non-volatile memory. If each chip has information on its partner's setting, and can specify a requested setting, an out-of-band transmitter adaptation procedure can be implemented, e.g. by cantral management or in a stressed receiver test.

See also ran_01_0214_CAUI4 presented in the CAUI-4 ad hoc.

SuggestedRemedy

Use register allocation proposed in ran_01_0214_CAUI4. Specify addresses and add tables in Clause 45 as appropriate. Add text at the end of 83D.3.1.1 describing the MDIO interface.

I may submit an updated and more detailed proposal.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.1.6** *P* **148** *L* **41** # 56

Dawe, Piers Mellanox

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

The disadvantage of no training is tolerancing the transmitter emphasis. As there can be a significant loss between silicon and TP0a that is not under the silicon designer's control (particularly package loss, these tolerances are a bit tight. Response to D2.0 comment 142 wanted to keep the tight tolerancing for 83D (with a relatively sophisticated receiver, although for 20 dB loss) while response to comment 160, which said that the tolerancing of 83E (for a non-adaptive receiver, although 10 dB loss) is not adequately controlled, asked for more information. We should establish what tolerancing is really needed - I have not yet seen a reason why these pre-cursor equalization settings should have so little overlap. Because Rpre is not linear in dB, tuning an IC for package loss could be more fiddly than it looks.

SuggestedRemedy

Increase to 12.5% to 15%.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.2** *P* **149** *L* **23** # 110

Dawe, Piers Mellanox

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

Has anyone chcked to see if the special alert signal is really needed with "only" up to 20 dB of loss? The regular scrambled signal contains significant low frequency energy, and this special signal adds complexity.

SuggestedRemedy

Review if it's necessary, remove if not.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.3** *P* **150** *L* **10** # 103

Li, Mike Altera

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

Jitter tolerance is referenced to the bj which is a RS FEC encoded interface and reference CRU is not defined and used for the TX jitter measurement in bj. So this "borrowing" from bj bears no good base.

SuggestedRemedy

Change "93.8.2.4" of the subclause reference column to "88.8.10", and change "Table 93-7 " of the value column to "Table 88-13"

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.3.3.1** *P* **150** *L* **15** # 25

Ran, Adee Intel

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

"The interference tolerance test leverages the method described in 93.8.2.3..."

The method is fully specified to Annex 93C.2 (it may help the reader to refer to the annex). As a part of this method, in step 2, the transmitter tap coefficients are tuned adaptively by the receiver using the training sequence. This part cannot be used in CAUI-4 since, as 83D.3.1 specifies - no transmitter training or back-channel communication is assumed and the state of the transmit equalizer is controlled by management interface.

The coefficients should either be specified, e.g. using the chosen setting in the COM procedure, or left to be optimized by the tester in an unspecified manner.

Since the values generated in COM may not be adequate for an actual receiver, and assuming that in a real system the settings will be programmed in an implementation-dependent way, the latter option is preferred.

SuggestedRemedy

Change the first paragraph to the following text:

The interference tolerance test leverages the method described in Annex 93C, as specified by 93.8.2.3, with the following exceptions:

a. The parameters in Table 83D-5 replace the parameters in Table 93-6.

b. The transmitter taps are set via management to one of the transmitter valid settings. The bit error ratio has to be achieved with at least one valid transmitter setting.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **16** # 38

Healey, Adam LSI Corporation

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

Table 83D-7 and Table 83D-8 leave some ambiguity as to how the transmitter equalizer may be configured. Is it required that a CAUI-4 chip-to-chip transmitter use either pre-cursor or post-cursor equalization but not both? Assuming that this is not the case, if one wants to configure the transmitter to use pre-cursor setting 2 and post-cursor setting 4, c(-1) cannot be simultaneously -0.1 and 0, c(1) cannot be simultaneously 0 and -0.2, and what should c(0) be?

Table 83D-7 and Table 83D-8 simply implement the rule that c(0) = 1-|c(-1)|-|c(1)|. This is already stated in 93A.1.4.2 and does not need to be repeated here.

SuggestedRemedy

Delete Table 83D-7 and Table 83D-8. Change Table 83D-6 as follows.

Transmitter equalizer, pre-cursor coefficient | c(-1)
Minimum value | -0.15 | --
Maximum value | 0 | --
Step size | 0.05 | --

Transmitter equalizer, post-cursor coefficient | c(1)
Minimum value | -0.25 | --
Maximum value | 0 | --
Step size | 0.05 | --

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **20** # 105

Li, Mike Altera

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

fmax is not defined in this table. Note d for Table 83D-5 defines the fmax, along with fmin, and delta f. Table 83D-6 should be consistent with Table 83D-5 in this regarding.

SuggestedRemedy

Add one row after line 20 for fmax with the following column values

Maximum end frequency fmax 25.78125 GHz

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **20** # 104

Li, Mike — Altera

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

It is min frequency, NOT max frequency

SuggestedRemedy

Change "Maximum start frequency" to "Minimum start frequency"

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **32** # 98

Slavick, Jeff — Avago Technologies

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

The number of entries in the Units column for Transmitter equalizer, pre-cursor coefficient and post-cursor, and Continuous time filter is excessive. In general we have one entry per item in the Symbol column and each of these rows only has 1 symbol, but 3 unit lines.

SuggestedRemedy

Remove the extraneous Unit entries

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **40** # 106

Li, Mike — Altera

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

CTLE stands for "Continuous time linear equalizer"

SuggestedRemedy

Change: ""Continuous time time filter" to "Continuous time linear equalizer" to be consistent with CTLE acronym used.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **7** # 34

Moore, Charles — Avago Technologies

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

Annex 93A referenced in this annex was changed to allow the same CTLE model to be used in both 93A and 83D. Please update clause 83D.4

SuggestedRemedy

On page 151, first paragraph of 83D.4 CAUI-4 chip-to-chip channel characteristics delete:

"(with the exception that the continuous time filter (CTLE) is as defined in Equation (83D-2)"

On page 152, delete equation 83D-2 including definitions of quantities.

on page 153, change Table 83D-9 to

Peaking(dB)	g_DC	f_p1	f_p2	f_z
1	-1	18.6	14.1	9.385
2	-2	18.6	14.1	8.937
3	-3	15.6	14.1	8.018
4	-4	15.6	14.1	7.861
5	-5	15.6	14.1	7.750
6	-6	15.6	14.1	7.670
7	-7	15.6	14.1	7.609
8	-8	15.6	14.1	7.566
9	-9	15.6	14.1	7.531
10	-10	15.6	14.1	7.503
11	-11	15.6	14.1	7.483
12	-12	15.6	14.1	7.466

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **7** # 37

Healey, Adam — LSI Corporation

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

The continuous time filter defined by Equation (83D-2) is simply a re-arranged form of the filter defined in Annex 93A (refer to IEEE P802.3bj/D3.1 Equation (93A-20)). Equation (93A-20) is a function of g_DC, f_z, f_p1, and f_p2. The mapping between the parameters in Table 83D-9 the parameters in Annex 93A is:

g_DC = 20*log10(G)
f_z = Z_1/(2*pi*G)
f_p1 = P_1/(2*pi)
f_p2 = P_2/(2*pi)

As a result, a more direct definition of this filter is now available.

SuggestedRemedy

Remove the following phrase from the first sentence of 83D.4: "(with the exception that the continuous time filter (CTLE) is as defined in Equation (83D–2) and with coefficients given in Table 83D–9)"

Remove Equation (83D-2).

Change Table 83D-9 to specify the values of the continuous time filter already defined in Annex 93A (g_DC, f_z, f_p1, and f_p2) using the mapping defined in the comment. Note that P_1 and P_2 are already defined in these terms, and "Peaking (dB)" is already -g_DC.

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **7** # 13

Anslow, Pete — Ciena

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

P802.3bj D3.1 has changed the capitalization of the expansion of COM to be "Channel Operating Margin"

SuggestedRemedy

Change the capitalization of "channel operating margin" to be "Channel Operating Margin" here, in the title of Table 83D-6 and in PICS item CC1

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **151** *L* **8** # 53

Dudek, Mike — QLogic

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

With the change to using a DFE it would be better to align the CTLE in the reference receiver with the one used by 802.3bj.

SuggestedRemedy

Change "(with the exception that the continuous time filter (CTLE) is as defined in Equation (83D–2) and with coefficients given in Table 83D–9)" to "with coefficients given in Table 83D–9"

Change the characteristics of the CTLE in table 83D-6 to match Clause 93. (Delete equation 83D-2.)

Proposed Response *Response Status* **O**

Cl **83D** *SC* **83D.4** *P* **152** *L* **7** # 107

Li, Mike — Altera

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

RJ rms of 0.01 is not consistent with RJ 0.15 UI at 1e-15. The RJ rms should be: 0.15 UI/15.8827 =0.00944 (UI)

SuggestedRemedy

Change the RJ rms value from 0.01 UI to 0.00944 UI

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.** *P* **169** *L* **28** # 44

Dudek, Mike — QLogic

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

It is strange to reference the existing section.

SuggestedRemedy

Change the reference from 83E.3.3.3 to 83E.3.3.3.1 or delete the sentence.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.1** *P* **157** *L* **46** # 99

Slavick, Jeff — Avago Technologies

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

Comment #27 against D2.0 was rejected stating that Figure 83-1 is an Example. However, unlike the other clause 83 annexes the word "example" does not appear in the title of the figure or the text referencing the diagram.

SuggestedRemedy

Add the word "Example" to the title of Figure 83E-1

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.1** *P* **158** *L* **3** # 108

Li, Mike — Altera

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

x4 and two AC coupling caps are missing for Figure 83E-2

SuggestedRemedy

Add x4 indicator and 2 AC coupling caps in the TX and RX signal paths, between connector and module, for Figure 83E-2.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.2** *P* **159** *L* **10** # 32

Latchman, Ryan — MACOM

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

change:
The
output of the Module Compliance Board (MCB) verifies the module electrical output signal at TP4
to
The output of the Module Compliance Board (MCB) is used to verify the module ...

SuggestedRemedy

change:
The
output of the Module Compliance Board (MCB) verifies the module electrical output signal at TP4
to
The output of the Module Compliance Board (MCB) is used to verify the module ...

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.2** *P* **159** *L* **35** # 47

Dudek, Mike — QLogic

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

It would be better to place the TP1 and TP4 closer to the module compliance board. Also have boxes for the Host and Module showing that these encompass more than the "components"

SuggestedRemedy

Shorten the lines and move the TP1 and TP4 to be just on the edge of the MCB. Move the MCB label on top of the MCB block. Add dotted line boxes for the host and the module encompassing half the connector, the traces and the components.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.2** *P* **159** *L* **6** # 31

Latchman, Ryan — MACOM

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

Change:
The output of the Host Compliance Board (HCB) verifies the host electrical output signal at TP1a.
To:
The output of the Host Compliance Board (HCB) is used to verify the host electrical output signal at TP1a.

SuggestedRemedy

Change:
The output of the Host Compliance Board (HCB) verifies the host electrical output signal at TP1a.
To:
The output of the Host Compliance Board (HCB) is used to verify the host electrical output signal at TP1a

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1** *P* **160** *L* **22** # 82

Dawe, Piers — Mellanox

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

Table layout

SuggestedRemedy

Make left column wider to suit contents. Also Table 83E-3.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.3** *P* **161** *L* **29** # 48

Dudek, Mike — QLogic

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

With the return loss specifications for the integrated circuits at TP0a/TP5a in clause 93 and the return loss and insertion loss specifications for the mated compliance boards it is not possible to meet the host return loss specifications. (see presentation being given in 802.3bj). A comment has been made to 802.3bj to make this same change. It is expected that the module IC will be a smaller chip and therefore will be able to be made less reflective and therefore no change is recommended for it.

SuggestedRemedy

Change equation 83E-2 to use 8.5-0.35*f from 0.01 to 8GHz and 3.9-7.4*log(f/14) from 8 to 19GHz. Make the same change to 83E-5 and corresponding changes to figure 83E-7 and figure 83E-12. Copy existing equations 83E-2 and 83E-5 and corresponding figures to new equations and figures that are referenced by the module differential return loss specifications.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.3** *P* **161** *L* **44** # 84

Dawe, Piers — Mellanox

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

In the last meeting we changed the limit for common to differential output conversion return loss to be compatible with the compliance boards in P802.3bj D3.0. Meanwhile, they relaxed the mixed-mode specs on the compliance boards. If this change is not reverted, we will need to further relax the common to differential output conversion return loss spec (83E–3) and differential to common mode input return loss (83E-6).

SuggestedRemedy

Obtain improved compliance board specs (e.g. as in P802.3bj D3.0), or impose them in this annex, or relax equations (83E–3) and (83E-6).

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.3** *P* **161** *L* **44** # 54

Dudek, Mike — QLogic

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

With the relaxations in the common mode to differential conversion return losses of the mated compliance board in clause 92 which are used in this clause by reference it will not be possible to meet the host and module common mode to differential conversion return loss specifications.

SuggestedRemedy

Change equation 83E-3 and equation 83E-6 to match 802.3bj equation 92-2.

22-20*(f/25.78) from 0.01 to 12.89 GHz and 15-6*(f/25.78) from 12.89 to 25.78 GHz

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.6** *P* **163** *L* **18** # 109

Li, Mike — Altera

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

The signal arrow at TP1, between MCB and terminations is wrong as TP1 is an inflow port/pin

SuggestedRemedy

Change the signal flow at TP1, between MCB and terminations to be opposite as the current, indicating an inflow port/pin.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.6** *P* **163** *L* **40** # 49

Dudek, Mike — QLogic

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

The test configuration shown in figure 83E-9 is for more than eye width and eye height. (it includes the VNA and scope for other test)

SuggestedRemedy

Change the figure title to "Example host output test configuration"

Also change the title of Figure 83E-11 to "Example module output test configuration."

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.6** *P* **166** *L* **11** # 87

Dawe, Piers Mellanox

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

The host provides the recommended CTLE peaking value. For a minimally compliant host, the further this value is from the truth the more rapidly the eye opening will collapse with CTLE tuning and tolerancing in the module. There is more than one way to control this; however, it needs to be quantified. The proponents of this scheme should do their homework and determine if the solution below is adequate: maybe 1 dB could be a different number.

SuggestedRemedy

Add text: The recommended CTLE peaking value shall be within 1 dB of the optimum CTLE peaking value.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.6.1** *P* **163** *L* **38** # 10

Anslow, Pete Ciena

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

83E.3.1.6.1 "Reference receiver for host output eye width and eye height evaluation" ends with the sentence:
"Any of the nine equalizer settings may be used to meet the output eye width and eye height requirement."

However, as defined in 83E.4.2 2), this is only true for the module compliance test.

SuggestedRemedy

Delete "Any of the nine equalizer settings may be used to meet the output eye width and eye height requirement."

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.6.1** *P* **163** *L* **48** # 86

Dawe, Piers Mellanox

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

Not just any of nine settings now.

SuggestedRemedy

The recommended CTLE peaking value or +/- 1 dB if present. But see another comment about tolerancing.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.1.6.1** *P* **164** *L* **38** # 83

Dawe, Piers Mellanox

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

Unfortunate page layout.

SuggestedRemedy

If you remove the blank lines at 13 14, 19, 21, 37+, 1-3 on next page, you should get the graph on the same page as the equation and table it illustrates.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.2.1** *P* **166** *L* **25** # 57

Dawe, Piers Mellanox

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

The transition time of 10 ps is the fastest a host is allowed. But the worst case for which we want the module's output to perform is with a high loss host trace, where the crosstalk transition time will be greater. Also, it's not feasible to get 10 ps out of the mated compliance boards without using emphasis in the crosstalk generators, which is an unnecessary expense and not representative of real CAUI-4 signals.

We keep the spec consistent by using the same crosstalk in output spec as in the corresponding stressed input spec - whatever that crosstalk is.

SuggestedRemedy

Change 10 ps to what would be obtained from a reasonable pattern generator without emphasis, through the mated compliance boards and the usual observation filter. It seems the compliance boards dominate and 21 ps would be a suitable choice.
Change the 10 ps in 83E.3.3.3.1 similarly.

For the 9.5 ps in 83E.3.1.6 - a module doesn't need to use emphasis, so applying emphasis in this test is not representative. To reduce test costs, change this also to the same number. Change the 9.5 ps in 83E.3.4.2.1 similarly.

Change "transition time" to "target transition time" in the same four places.

Alternatively, we might delete all four transition time specifications.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3** *P* **167** *L* **12** # 50

Dudek, Mike QLogic

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

As some of the test points are not TP4a this sentence needs modification

SuggestedRemedy

Either add "or TP4", or better delete ""if measured at TP4a" as the test points are now explicit in the table.

Make the equivalent change to line 10 on page 171.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.2** *P* **169** *L* **1** # 65

Dawe, Piers Mellanox

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

Three blank lines.

SuggestedRemedy

Remove them, or trim the top of the figure.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **169** *L* **44** # 28

Ben-Artsi, Liav Marvell

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

Looking at:
"A reference CRU with a corner frequency of 10 MHz and slope of 20dB/decade is used to calibrate the stress signal..."

This CRU specification may be somewhat ambiguous to the some lab test implementors.
It is clear that the important corver frequency is that of the high pass function applied on the jitter (the observed jitter transfer function) and idealy the -3dB point of BOTH the CRU jitter transfer function and the observed jitter transfer function are at 10MHz.
However, skew between the data path and the recovered clock path may influence the observed jitter transfer function while maintaining the same jitter transfer function (Golden PLL function).

SuggestedRemedy

Change "A reference CRU with a corner frequency of 10 MHz and slope of 20dB/decade is used to calibrate the stress signal..."
To:
A reference CRU which applies an effect of a single-pole high-pass filter with 3 dB frequency of 10 MHz to the jitter is used to calibrate the stress signal..."
This is also aligned with bj specification of applying a single pole 10MHz high pass filter to the jitter.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **169** *L* **45** # 69

Dawe, Piers — Mellanox

Comment Type **ER** *Comment Status* **D**

This says "Pattern 4 (PRBS9) as defined in Table 86-11" yet as it says itself, Table 86-11 doesn't define it: it says "Pattern defined in 83.5.10", and 83.5.10 says "a PRBS9 pattern (as defined in Table 68-6)".
Likewise in 83E.3.1.6, "Patterns 3 and 5 are defined in Table 86-11.", but Table 86-11 says they are defined in 83.5.10 and 82.2.10 (and that's not right for RS-FEC encoded Pattern 5 anyway): 83.5.10 says PRBS31 is defined in 49.2.8. At least we should not mislead the reader.

SuggestedRemedy

At least change
Pattern 4 (PRBS9) as defined in Table 86-11
to
Pattern 4 (PRBS9, see Table 86-11)
5 times.
Change
Patterns 3 and 5 are defined in Table 86-11.
to
Patterns 3 and 5 are identified in Table 86-11.
4 times.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **169** *L* **47** # 33

Latchman, Ryan — MACOM

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

Low pass + Limiting function should be updated to Bounded Uncorrelated Jitter. Updates required for the module stress input as well as host stress input.

SuggestedRemedy

Implement changes in latchman_01_022814_caui

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **169** *L* **52** # 51

Dudek, Mike — QLogic

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

The return loss of the test system should be defined as a poor return loss could false fail devices.

SuggestedRemedy

Add a sentence. "The return loss of the test sytem as measured at TP4 meets the specification in equation 83E-2."

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **170** *L* **13** # 67

Dawe, Piers — Mellanox

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

This test setup takes effort to set up so, to contain costs, it should be consistent with CEI-28G-VSR where appropriate.
CEI-28G-VSR doesn't have the low pass filter or limiter but has a UBHPJ source: see another comment. Also, without the pulse shrinkage from the filter and limiter, we may still need a low pass filter to obtain the VEC "in the range of 4.5 dB to 5.5 dB with a target value of 5 dB".

SuggestedRemedy

Determine if OIF's simplified host stressed input test is practical without a low pass filter; if needed, use one.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **170** *L* **42** # 91

Ghiasi, Ali — Ghiasi Qauntum LLC

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

TP4a rise and fall times are missing

SuggestedRemedy

Add 20% to 80% transition time of 8 ps for forward propagating TP4a signal.

Proposed Response *Response Status* **W**

[Editor's note: Subclause changed from 3.3.3.1 to 83E.3.3.3.1]

Cl **83E** *SC* **83E.3.3.3.1** *P* **170** *L* **44** # 71

Dawe, Piers Mellanox

Comment Type **ER** *Comment Status* **D**

This says "The crosstalk signal is calibrated with Pattern 4 (PRBS9) as defined in Table 86-11. The pattern is changed to Pattern 5 (with or without FEC encoding), Pattern 3 or a valid 100GBASE-R signal for the
stressed input test."
This isn't quite right. While transition time should be calibrated with PRBS9 (if it's worth mentioning at all), the peak-to-peak differential voltage should be calibrated with one of the long patterns e.g. 3 or 5.

SuggestedRemedy

Change
peak-to-peak differential and 20% to 80% transition time of 10 ps as measured at TP1a. The crosstalk signal is calibrated with Pattern 4 (PRBS9) as defined in Table 86-11. The pattern is changed to Pattern 5 (with or without FEC encoding), Pattern 3 or a valid 100GBASE-R signal for the stressed input test.
to
peak-to-peak differential (calibrated with Pattern 3 or a valid 100GBASE-R signal) and 20% to 80% transition time of 10 ps as measured at TP1a with Pattern 4 (PRBS9, see Table 86-11). Pattern 5 (with or without FEC encoding), Pattern 3 or a valid 100GBASE-R signal is used for the stressed input test.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.3.3.1** *P* **177** *L* **9** # 70

Dawe, Piers Mellanox

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

We don't usually allow any valid signal for the signal (or lane) under test. It may be OK with FEC (in Clause 95), but CAUI-4 may have to stay with the patterns specified for BER-related items in 100GBASE–LR4 and 100GBASE–ER4.

SuggestedRemedy

Either change
Pattern 5 (with or without FEC encoding), Pattern 3 or a valid 100GBASE-R signal
to
Pattern 5 (with or without FEC encoding) or Pattern 3
or
Pattern 5 (with or without FEC encoding), Remote Fault (with or without FEC encoding) or Pattern 3;
Or, in Table 95-10, change "3 or 5" to "3, 5 or valid 100GBASE-SR4 signal", 3 times.
or

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.4** *P* **171** *L* **30** # 89

Ghiasi, Ali Ghiasi Qauntum LLC

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

TP1 rise and fall times are missing

SuggestedRemedy

Add 20% to 80% transition time of 8 ps for forward propagating TP4a signal.

Proposed Response *Response Status* **W**

[Editor's note: Subclause changed from 3.4 to 83E.3.4]

Cl **83E** *SC* **83E.3.4.1** *P* **171** *L* **41** # 96

Petrilla, John Avago Technologies

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

Since CAUI-4 modules, e.g. 100GBASE-SR4 transceivers with a CAUI-4 electrical interface, are not required to include an error detector and counter, the requirement, "The CAUI-4 module input is defined to operate at a bit error ratio (BER) better than 10-15 for an input signal defined by 83E.3.4.2" is problematic. Perhaps the intention of this subclause is to define the BER of the stressed input signal. If so, that is accomplished in Table 83E-9 and 83E.3.4.2.1 and 83E.3.4.1 can either be deleted or simply refer to table 83E-9. If the intention is to specify the output performance of the module, then it's appropriate to refer to the output requirements of the module, e.g. "A module with a CAUI-4 electrical interface shall meet it output requirements for an input signal defined by 83E.3.4.2."

SuggestedRemedy

If the intention of 83E.3.4.1 is to define the BER of the stressed input signal, delete 83E.3.4.1 since the definition is provided with more detail in 83E.3.4.2.1.

If the intention is to specify the output performance of the module, the output performance of the module must be left to the clause that defines the module output, therefore change "The CAUI-4 module input is defined to operate at a bit error ratio (BER) better than 10-15 for an input signal defined by 83E.3.4.2" to "A CAUI-4 module shall meet its output requirements for an input signal defined by 83E.3.4.2"

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.4.2.1** *P* **172** *L* **38** # 88

Ghiasi, Ali — Ghiasi Qauntum LLC

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

Frequency dependent attenuator characteristics are missing

SuggestedRemedy

Add Frequency dependent attenuator target characteristics. Frequency dependent attenuator target return loss should be
SDD11, SDD22 < -20+f dB for 1 MHz f<4 GHz
SDD11, SDD22 = -18+f/2 dB for 4 GHz<f<20 GHz

Frequency dependent attenuator target insertion loss should be 1.025*(0.3144-1.5953*sqrt(f)-0.09232*f-0.0204*f^2), where f is given in GHz over the range of 1 MHz to 20 GHz

Proposed Response *Response Status* **W**

[Editor's note: Subclause changed from 3.4.2.1 to 83E.3.4.2.1]

Cl **83E** *SC* **83E.3.4.2.1** *P* **172** *L* **45** # 52

Dudek, Mike — QLogic

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

The return loss of the test system should be specified as a poor return loss could cause false failures.

SuggestedRemedy

Add the sentence "The return loss of the test system as measured at TP1 meets the specification given in equation 83E-2.

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.3.4.2.1** *P* **172** *L* **7** # 68

Dawe, Piers — Mellanox

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

This test setup takes effort to set up so, to contain costs, it should be consistent with CEI-28G-VSR, which doesn't have the low pass filter or limiter but has a UBHPJ source.

SuggestedRemedy

If UBHPJ is a lower cost and acceptable substitute for the low pass filter and limiter, follow CEI-28G-VSR.
Do we need to give guidance for the signal transition time for the low loss case? If so, it could be defined at the input to the HCB (the transition time after the mated compliance boards will be strongly affected by the HCB).

Proposed Response *Response Status* **O**

Cl **83E** *SC* **83E.4.2** *P* **174** *L* **3** # 29

Ben-Artsi, Liav — Marvell

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

Looking at:
"Capture Pattern 4 using a clock recovery unit with a corner frequency of 10 MHz and slope of 20 dB/decade and a minimum sampling rate of 3 samples per bit."

This CRU specification may be somewhat ambiguous to the some lab test implementors. It is clear that the important corver frequency is that of the high pass function applied on the jitter (the observed jitter transfer function) and idealy the -3dB point of BOTH the CRU jitter transfer function and the observed jitter transfer function are at 10MHz.
However, skew between the data path and the recovered clock path may influence the observed jitter transfer function while maintaining the same jitter transfer function (Golden PLL function).

SuggestedRemedy

Change:
"Capture Pattern 4 using a clock recovery unit with a corner frequency of 10 MHz and slope of 20 dB/decade and a minimum sampling rate of 3 samples per bit."
to:
"Capture Pattern 4 using a clock recovery unit which applies a single pole 10MHz -3dB bandwidth highpass filter on the jitter and a minimum sampling rate of 3 samples per bit."

This is also aligned with bj specification of applying a single pole 10MHz high pass filter to the jitter.

Proposed Response *Response Status* **O**

Cl **91** *SC* **91.5.3.3** *P* **91** *L* **54** # 85

Dawe, Piers — Mellanox

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

Note b of Table 95-1 says "The option to bypass the Clause 91 RS-FEC correction function may not be used." This needs to be stated in the RS-FEC clause. With shalls and PICS if feasible. Also need to clarify: is the option to bypass the error indication feature allowed to be used?

SuggestedRemedy

Add text to 91.5.3.3 to make these points clear to the RS-FEC implementer. With shalls and PICS if feasible.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95** *P* **99** *L* **4** # 64

Dawe, Piers — Mellanox

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

We have found and corrected some items copied from Clause 87 that don't apply. We need to check if there are any more.

Here are three examples:
86.5.8 transmitter in each lane
95.5.8 transmitters in each lane
There's only one transmitter in a lane.

86.7 The required operating range Table 86-2 Required operating range
95.7 The operating range Table 95-5 Required operating range
As an over-achieving PMD is compliant, "required operating range" is correct.

86.7.1 specifications of Table 86–6 per the definitions in 86.8.
95.7.1 specifications defined in Table 95–6 per the definitions in 95.8.
Table doesn't define, it limits. 95.8 defines.

SuggestedRemedy

Compare Clause 95 against Clause 86, correct unwanted discrepancies.
In 95.5.8, change "transmitters" to "transmitter" (also remove a space after "disabled."?
In 95.7, change "The operating range" to "The required operating range".
In 95.7.1 change "specifications defined in Table 95–6" to "specifications of Table 95–6" (or "given in"). Similarly in 95.7.2.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.1** *P* **99** *L* **41** # 45

Dudek, Mike — QLogic

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

The new footnote does not provide adequate warning of the situation. "may not be used" is open to mis-interpretation. Is it May "not be used" or "may not" "be used"

SuggestedRemedy

Change the footnote to say. "This clause does not support the option to bypass the Clause 91 RS-FEC correction function"

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.1.1** *P* **100** *L* **35** # 72

Dawe, Piers — Mellanox

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

Wrong font.

SuggestedRemedy

Remove override. Also 95.8.6. Any more?

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.10** *P* **113** *L* **51** # 4

Swanson, Steven — Corning Incorporated

Comment Type **ER** *Comment Status* **D**

I would prefer to reference the latest edition of a standard.

SuggestedRemedy

Replace: "...IEC 61280-4-1:2009..."

With: "...IEC 61280-4-1..."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.11.3.2** *P* **115** *L* **48** # 5

Swanson, Steven Corning Incorporated

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

Clarify reference

SuggestedRemedy

Replace: "The MDI adapter or receptacle shall meet the dimensional specifications of IEC 61754-7-1 interface 7-1-3: MPO adapter interface - opposed keyway configuration, or interface 7-1-10: MPO active device receptacle,flat interface."

With: "The MDI adapter or receptacle shall meet the dimensional specifications Interface 7-1-3: MPO adapter interface - opposed keyway configuration, or Interface 7-1-10: MPO active device receptacle,flat interface as defined in IEC 61754-7-1."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.11.3.2** *P* **115** *L* **50** # 6

Swanson, Steven Corning Incorporated

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

Clarify reference

SuggestedRemedy

Replace: "The plug terminating the optical fiber cabling shall meet the dimensional specifications of IEC 61754-7-1 interface 7-1-4: MPO female plug connector, flat interface for 2 to 12 fibres."

With: The plug terminating the optical fiber cabling shall meet the dimensional specifications of Interface 7-1-4: MPO female plug connector, flat interface for 2 to 12 fibres as defined in IEC 61754-7-1."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **34** # 63

Dawe, Piers Mellanox

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

The minimum launch power of -9.1 dB is based indirectly on the 5 dB TDP and a 0.9 dB offset in footnote b. When we correct TDP, this should be changed too. At the moment it seems out of line with other specifications anyway: 10GBASE-SR and 40GBASE-SR4 both -7.6. There's more noise bandwidth at 25G so one would expect a similar or higher limit, not much lower.
If a transmitter with -9.1 dBm OMA were used, a power meter or 10GBASE-SR or 40GBASE-SR4 receiver could report "no signal", causing confusion in network maintenance and diagnostics.

SuggestedRemedy

Increase minimum launch power of -9.1 dB to e.g. -8.1 dB following change to TDP.
Increase the minimum average receive power in Table 95-7 by the same amount.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **38** # 62

Dawe, Piers Mellanox

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

The minimum OMA of -7.1 dB is based on the 5 dB TDP and a 0.9 dB offset in footnote b. When we correct TDP, this should be changed too. At the moment it seems out of line with other specifications anyway: 10GBASE-SR -4.3, 40GBASE–SR4 -5.6. There's more noise bandwidth at 25G so one would expect a similar or higher limit, not much lower.

SuggestedRemedy

Increase minimum OMA of -7.1 dB to at least -6.1 dB following change to TDP.

Make consequent changes in receiver specs.
Increase the minimum average powers by the same amount.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **40** # 94

Petrilla, John — Avago Technologies

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

The ability of TDP to adequately predict link margin for MMF links is questionable and, consequently, basing the min OMA requirement on TDP measurements is problematic. For more detail see petrilla_01_0314. Another metric, TxVEC (Tx Vertical Eye Closure), provides a better correlation with link margin and has the advantages of not requiring a reference Tx and being easier and lower cost to implement while capturing all the Tx impairments that TDP captures. Fortunately, the value for TxVEC(max) is close enough to the the value for TDP(max) in draft 2.1 so that no change in values are required for TDP and the values that are dependent on TDP.

SuggestedRemedy

In Table 95-6, replace "Transmitter and dispersion penalty" with "Transmitter vertical eye closure", and TDP with TxVEC 3 times including footnote b.
In Table 95-8, change 'Power budget (for max TDP)' to 'Power budget (for max TxVEC)' and change 'Allocation for penalties (for max TDP)' to 'Allocation for penalties (for max TxVEC)'.
In Table 95-10, change 'Transmitter and dispersion penalty (TDP)' to 'Transmitter vertical eye closure(TxVEC)'
In 95.8.1.1 delete the first sentence of the first paragraph, "TDP is defined for each lane, at the BER specified in 95.1.1 on that lane." and the 4th sentence of the second paragraph, "To allow TDP measurement with Pattern 5, unstressed lanes for the error detector may be created by setting the power at
the reference receivers well above their sensitivities, or by copying the contents of the transmit lanes not under BER test to the error detector by other means."
Replace the subclause 95.8.5 Transmitter and dispersion penalty (TDP) with a new subclause 95.8.5 Transmitter Vertical Eye Closure found in petrilla_01_0314.
If any of the above values are updated they will be found in petrilla_01_0314.
In 95.12.4.4 replace "Transmitter and dispersion penalty" with "Transmitter vertical eye closure".

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **41** # 111

Dawe, Piers — Mellanox

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

Following up another comment: it appears that the TDP limit should be about 3.5 dB, corresponding to a worst bit TDP estimate of 4.7 or higher, depending on the waveform, and a link penalty about 4.6. dB

SuggestedRemedy

Change TDP limit to 3.5 with consequent changes.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **41** # 75

Dawe, Piers — Mellanox

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

As the link penalty is about 20% more than TDP (in dB), a TDP limit of 5 dB is too high.
Note that for this PMD, TDP as defined and measured is lower than that calculated in the spreadsheet model (see presentation to MMF ad hoc, 25 Feb, or later presentation).
TDP of 5 is near to a "cliff" (see dawe_01_0513_optx.pdf and presentation for January).
We need to allow 0.2 dB more in the budget for modal noise (see mmfadhoc/meetings/nov6_13/ModalNoiseIn100GBASE-SR4v3a_mmf.pdf).

SuggestedRemedy

Change 5 dB to 4 dB TBC.
Consequent changes:
Change OMA-TDP from -8 dB to -7 dB TBC.
See another comment for average power.
In receive specs, change Stressed receiver sensitivity (OMA), each lane (max) may need a small change.
See another comment for power budget and allocation for penalties.
Any other consequent changes?

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **50** # 73

Dawe, Piers — Mellanox

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

This improved eye mask may need revision following revision of the TDP limit. Also, a 10 sided mask will provide a statistically better measurement (reduced false positives or negatives for the same mask margin) than a hexagon.

SuggestedRemedy

Revise the mask if appropriate considering the range of acceptable transmitters that pass an appropriate TDP limit.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **54** # 2

Swanson, Steven Corning Incorporated

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

In Table 95-6, there is a footnote tied to Encircled flux; the footnote says "If measured....." whereas I thought this was a requirement that the transmitter must meet.

SuggestedRemedy

Replace: "c If measured into type A1a.2 50 um fiber in accordance with IEC 61280-1-4."

With: "c As measured into type A1a.2 or A1a.3 50 um fiber in accordance with IEC 61280-1-4."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.1** *P* **106** *L* **54** # 1

Swanson, Steven Corning Incorporated

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

In Table 95-6, there is a footnote tied to Encircled Flux; the editor has copied the same text that was originally included in IEEE 802.3ba. However, both the ba standard and the bm standard now include OM4 in addition to OM3 and this should be added to the footonote.

SuggestedRemedy

Replace: "c If measured into type A1a.2 50 um fiber in accordance with IEC 61280-1-4."

With:
"c If measured into type A1a.2 or A1a.3 50 um fiber in accordance with IEC 61280-1-4."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.2** *P* **107** *L* **28** # 77

Dawe, Piers Mellanox

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

The requirements for VECP, J2 and J9 don't have to apply to each lane at the same time: the aggressor lanes can be different.

SuggestedRemedy

Change "each lane" to "lane under test" (or "victim lane"), for these three rows.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.2** *P* **107** *L* **3** # 74

Dawe, Piers Mellanox

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

This says "Each lane of a 100GBASE-SR4 receiver shall meet the specifications..." but as stated in 95.1.1 Bit error ratio, 95.8.1.1 Multi-lane testing considerations, and 95.8.8 Stressed receiver sensitivity, the lanes aren't independent: the interface BER is specified, and the overriding criterion is frame loss ratio for the interface (all lanes together). Correlation between the lanes can be important.

For information: these tables were meant to say "each lane" for signalling rate and optical powers that can be summed across the lanes, and not for other things.

SuggestedRemedy

Change "Each lane of a 100GBASE-SR4 receiver" to "A 100GBASE-SR4 receiver".

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.2** *P* **107** *L* **36** # 90

Ghiasi, Ali — Ghiasi Qauntum LLC

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

Clause 95 deviates from clause 52, 87, and 88 which have comprehensive receiver stress test, but creating a test for recevier sensitivity test and a 2nd test for CDR tracking only at two frequencies with increase level of SJ. What are the problem by creating two seperate test as currenlty defined:
o. Adding small amount of SJ as allowed by the Golden PLL better represent actual link
o. The Golden PLL as defined in Cluase 95.8.5 allow any SJ componnet from 100 KHz to 10 MHz with -20 dB/dec filter into the link
o. Cluase 95 recevier only needs to track 190 and 940 KHz SJ, where the actual transmitter can generate any SJ from 100 KHz to 10 MHz with -20 dB/dec
o. Clause 95 receiver as defined may not track the full SJ range
o. The implementation of Clause 95 will consist of TX SerDes - TX Retiemr- Optics - RX Retimer- RX SerDes, CAUI-4 portion of link here will allow the full SJ range from 100 KHz to 10 MHz where the RX retimer may break and further there is risk introducing excess SJ at 190 KHz and 940 KHz may result in breaking RX SerDes
o. Cluase 95.7.2 specification as defiend is not reliable and conflicts with CAUI-4 specification

SuggestedRemedy

Please add SJ tracking over the full range of Golden PLL from (100 Khz, 5 UI) to (10 MHz, 0.05) and up to (80 MHz, 0.05 UI) to the receiver stress sensitivity test similar to Claue 87 and 88.

Addressing unsatisfied comment #45 from D2.0

Also see ghiasi_01_0314

Proposed Response *Response Status* **W**

[Editor's note: Subclause changed from 7.2 to 95.7.2]

Cl **95** *SC* **95.7.2** *P* **107** *L* **40** # 30

Arumugham, Vinu — Cisco

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

SJ only test applies too little stress and is not useful. Also how were the 190/940 KHz points chosen and why is the spec. different from Clause 88 LR4/ER4?

SuggestedRemedy

See Comment 45 on D2.0. Combine stressed receiver sensitivity test with jitter tolerance test. Use requirements in Table 88-13 instead of point frequencies. 802.3 in general seems to take a lax attitude towards SJ specifications. With more implementations that cascade multiple individually specified segments, we are increasing the risk of end-to-end failures due to SJ accumulation. Please also see: http://www.ieee802.org/3/bm/public/cuadhoc/meetings/dec10_13/arumugham_00_121013.pdf

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.2** *P* **109** *L* **27** # 76

Dawe, Piers — Mellanox

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

The VECP, J2 and J4 values for SRS need review for consistency with the transmitter specs. (Any use of VECP needs careful scrutiny anyway - see another comment.)

SuggestedRemedy

Review these values in light of changes to TDP and definition of VECP.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.7.3** *P* **108** *L* **12** # 78

Dawe, Piers — Mellanox

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

The allocation for penalties, and therefore the power budget (for max TDP), are subject to change as we clarify our TDP/VECP specs. Also, with the change to allow a very low extinction ratio, we need to allow an additional 0.2 dB in the budget for modal noise (see mmfadhoc/meetings/nov6_13/ModalNoiseIn100GBASE-SR4v3a_mmf.pdf).

SuggestedRemedy

Change allocation for penalties following other changes. Change power budget to be 1.9 dB more than allocation for penalties.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8** *P* **106** *L* **9** # 93

Petrilla, John — Avago Technologies

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

Some of the definitions in 95.8 refer to the spec tables 95-6 or 95-7 and some do not. This may lead to confusion. Further, since it is not the intention to mandate specific tests and test methods but only to require specified results if tested according to the methods defined in the subclauses of 95.8 such a statement should be included in the test method definition.

SuggestedRemedy

In 95.8.4, change "OMA shall be as defined ..." to "OMA shall be within the limits given in Table 95-6 if measured as defined ...".
In 95.8.5, change "Transmitter and dispersion penalty (TDP) shall be as defined ..." to "Transmitter and dispersion penalty (TDP) shall be within the limits given in Table 95-6 if measured as defined ...".
In 95.8.7, change "The transmitter optical waveform of a port transmitting the test pattern specified in Table 95–10 shall meet specifications according to the methods ..." to "The transmitter optical waveform of a port if measured transmitting the test pattern specified in Table 95–10 shall meet specifications according to the methods ...".
In 95.8.9 change "Receive jitter tolerance shall be as defined ..." to "Receive jitter tolerance shall be within the limits of Table 95-7 if measured as defined ..."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.1** *P* **109** *L* **18** # 79

Dawe, Piers — Mellanox

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

Table 95-10, Test-pattern definitions and related subclauses, has two rows for OMA:
Optical modulation amplitude (OMA) Square wave or 4 95.8.4; and
Calibration of OMA for receiver tests Square wave or 4 52.9.9.
95.8.4 says "OMA shall be as defined in 52.9.5 for measurement with a square wave (8 ones, 8 zeros) test pattern or 68.6.2.."; and
52.9.9.3 (part of 52.9.9) says "OMA is measured per the method in 52.9.5 using the square wave pattern",
contradicting Table 95-10 which allows Pattern 4. Having decided long ago to allow the two patterns, we should be consistent, and allow both (including the preferable one for use with CDRs, Pattern 4) for receiver tests as well as other purposes.
In the last meeting we tried to find out where this discrepancy came from, and did not succeed. It seems that at one point early in 802.3ba there was a intentional difference, which seems to have gone away.
Both Table 95–10 and 95.8.8 refer to 52.9.9, so the reader will not be deprived of a reference.

SuggestedRemedy

In Table 95-10, Test-pattern definitions and related subclauses, delete the row "Calibration of OMA for receiver tests Square wave or 4 52.9.9" so that the earlier row "Optical modulation amplitude (OMA) Square wave or 4 95.8.4" applies.
In 95.8.8 a), insert as second sentence "Optical modulation amplitude (OMA) is defined in 95.8.4."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.1.1** *P* **109** *L* **29** # 21

Ran, Adee Intel

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

If Pattern 5 is used in the SRS test, the only suitable error counters are at the RS-FEC sublayer, as I noted in another comment.

The RS-FEC counters are per-lane, and errors in one lane do not affect or "dilute" error counters in other lanes, so the following text from this subclause is incorrect:

"Measurements with Pattern 5 (RS-FEC encoded scrambled idle) give the interface BER if all lanes are stressed at the same time. If each lane is stressed in turn, 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."

Since BER measurements are inherently lane-by-lane regardless of the pattern being used, there is no need to address lane-by-lane vs. interface BER at all, and this text is unnecessary.

Note that specifying only pattern 3 for SRS (as suggested in another comment) also makes the text above unnecessary.

See also ran_01_0214_mmf presented at the MMF ad hoc.

SuggestedRemedy

Delete the first three sentences in the second paragraph of 95.8.1.1 (up to and including "if the unstressed lanes have low BER").

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.2** *P* **109** *L* **53** # 3

Swanson, Steven Corning Incorporated

Comment Type **ER** *Comment Status* **D**

In previous editions of the standard, we decided to reference International Standards if available and eliminate the referencing both regional and international standards.

SuggestedRemedy

Delete "...TIA/EIA-455-127-A or..."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.5** *P* **110** *L* **19** # 20

Ran, Adee Intel

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

The test pattern transmitted in TDP measurement should enable error detection in a BERT as defined in the reference method. Transmitting TP5 requires a 4-lane receiver with RS-FEC functionality, unlikely to be available in test equipment.

For simplicity's sake and to avoid inconsistent results, it is suggested that pattern 3 be used as the normative test method. People testing with any modified test method should ensure that their results are representative of the normative test.

See also ran_01_0214_mmf presented at the MMF ad hoc.

SuggestedRemedy

In Table 95-10, specify using Pattern 3 for TDP.

Delete the sentence starting with "To allow TDP measurement with Pattern 5" in the second paragraph of 95.8.1.1.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.5** *P* **110** *L* **23** # 58

Dawe, Piers Mellanox

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

This says "VECP, as defined in Equation (52-4)", which defines it as 10 log10(OMA/AO) where AO is the amplitude of the eye opening from the 99.95th percentile of the lower histogram to the 0.05th percentile of the upper histogram.
However, in spite of its name, VECP isn't a true penalty: it's a good estimate for the penalty at BER=1e-12 but significantly in error for BER=1e-5. This introduces a large error into TDP (the error is the difference between the reference transmitter's VECP and its transmitter penalty). See presentation. Also it ruins the calibration of the stressed receiver sensitivity test in 95.8.8.

SuggestedRemedy

Options under consideration at time of writing included:
1. Use a more appropriate percentile (under study), more than 1e-3. This would still rely on extrapolation. It could be implemented as shown in another comment.
2. Use transmitter penalty instead of VECP. This would be far more reliable and could be measured with a scope
3. Use a combination of VECPq and Qsq to estimate the transmitter penalty.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.5** *P* **110** *L* **23** # 59

Dawe, Piers — Mellanox

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

This says "VECP, as defined in Equation (52-4)", which defines it as 10 log10(OMA/AO) where "OMA is the normal amplitude without ISI, as shown in Figure 52-11" and the figure shows "Approximate OMA (difference of means of histograms)". This creates two definitions of OMA: the regular one and what the figure shows. But Figure 52-11 should not be used to define OMA: 52.9.9.3 says "OMA can be approximated with histograms as suggested in Figure 52–11. However, the normative definition for OMA is as given in 52.9.5." and 52.9.5 says, "A method of approximating OMA is shown in Figure 52-11." These warnings get lost when we refer to Equation (52-4).

SuggestedRemedy

VECP as in Clause 52 is unusable for this clause anyway, because this uses FEC and 52 doesn't. If we stay with something like VECP, define it afresh for this clause in a new subclause 95.8.5, as 10 log10(OMA/AO) where AO is the amplitude of the eye opening from the 1-Xth percentile of the lower histogram to the Xth percentile of the upper histogram, and OMA is as defined in 95.8.4 (and illustrated in Figure 68-4, if we need an illustration). (X is under study).
Refer to this VECP from 95.8.5 Transmitter and dispersion penalty (TDP), and from 95.8.8 Stressed receiver sensitivity.
In Table 95-10, Test-pattern definitions and related subclauses, change the row:
Vertical eye closure penalty calibration 3 or 5 52.9.9
to
Vertical Eye Closure Penalty (VECP) 3 or 5 [new subclause] 95.8.5
(Note the capitals because this phrase doesn't have the common English meaning of the words: it's not a true penalty. Alternatively we could create a new name e.g. VEC2.)

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.5** *P* **110** *L* **29** # 26

Ben-Artsi, Liav — Marvell

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

Looking at:
f) The clock recovery unit (CRU) used in the TDP measurement has a corner frequency of 10 MHz and a slope of 20 dB/decade.
This CRU specification may be somewhat ambiguous to the some lab test implementors. It is clear that the important corver frequency is that of the high pass function applied on the jitter (the observed jitter transfer function) and idealy the -3dB point of BOTH the CRU jitter transfer function and the observed jitter transfer function are at 10MHz.
However, skew between the data path and the recovered clock path may influence the observed jitter transfer function while maintaining the same jitter transfer function.

SuggestedRemedy

Recommend to change to:
The clock recovery unit (CRU) used in the TDP measurement has a corner frequency of 10 MHz and a slope of 20 dB/decade, which is expected to apply a high pass filter on the jitter with 10MHz corner frequency and 20dB/decade slope.
That way the right emphasis is given to the observed jitter transfer function which is the important measure of the CRU unit.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.5** *P* **110** *L* **34** # 66

Dawe, Piers — Mellanox

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

In giving a detailed normative recipe for how to calibrate out the reference transmitter's impairments, we are building in errors known and unknown that it would take a maintenance action to remove. We don't need to do that: for a definition, we can specify the intent rather than the method.

SuggestedRemedy

Between "a correction is required to calculate S." and "S is equal", insert: "S is the sensitivity that would be recorded if all reference signal impairments and the ISI caused by the receiver's bandwidth were removed. One suggested way of determining S follows."

See another comment for better ways (use another metric or reform VECP).

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.5** *P* **110** *L* **38** # 18

Ran, Adee Intel

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

This is a list of exceptions, but item h is not an exception - Figure 52-12 refers to the method in 52.9.10.

SuggestedRemedy

Move the text in item h to the first paragraph of this subclause.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.7** *P* **110** *L* **6** # 60

Dawe, Piers Mellanox

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

This refers to 86.8.4.6.1 which uses a mask hit ratio limit of 5e-5. This was found suitable for PMDs without FEC. Studies of VECP effectiveness indicate that it would be remarkable if 5e-5 were the appropriate hit ratio limit for a PMD with FEC. Improving this is expected to improve the correlation between the mask test and performance in the field, improve eye measurement accuracy and/or reduce test time (which will become more necessary if we have 16-lane 400G!).

SuggestedRemedy

Following the TDP/VECP work, optimise the mask hit ratio limit, and it, the mask coordinates and TDP consistent. Add text here:
methods specified in 86.8.4.6.1 with the exceptions that limit of hits per sample is given in Table 95-6, and the clock recovery...
Add the hit ratio to the Table 95-6 as we have in Table 52-7 or 86-6.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.7** *P* **111** *L* **6** # 27

Ben-Artsi, Liav Marvell

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

The CRU observed jitter transfer function (the high pass behavior applied on the jitter and not the "golden PLL" behavior is not specified clearly at:
"...with the exception that the clock recovery unit's high-frequency corner bandwidth is 10 MHz."

SuggestedRemedy

Recommend changing to:
"...with the exception that the clock recovery unit's observed jitter transfer function high-frequency corner bandwidth is 10 MHz."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.8** *P* **111** *L* **13** # 92

Petrilla, John — Avago Technologies

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

Stressed receiver sensitivity, 95.8.8, and Receiver jitter tolerance, 95.8.9, refer to earlier clauses for part of their definition, e.g Figure 52-10 for the SRS test block diagram and Figure 68-14 for the jitter tolerance test block diagram. In these figures both tests are defined where the Rx is or is in a system-under-test and the error detector and/or counter is in the PHY stack. Unfortunately, the stacks in figures 52-10 and 68-14 do not include the clause 91 RS-FEC layer. Even worse, if a PHY stack that includes the RS-FEC layer is used as the error detector/counter, it may only be able to operate with RS-FEC signals while a test at the PMA or receiver module level using a BERT may only operate with a PRBS-31, i.e. TP3. Then, if the system error detector/counter operates after error correction then the BER will be different from one operating before error correction creating an issue of what BER to use as a limit.

Since it appears too difficult to define a method that accommodates both system level and PMA or component level testing of stressed Rx sensitivity and Rx jitter tolerance, defining a PMA or component level method is recommended.

SuggestedRemedy

In 95.8.8 add a new figure to replace figure 52-10, taking note of the exceptions in the exception list and adjusting the exception list accordingly, and add an exception to the exception list to refer to this new figure instead of 52-10. In the new figure replace the "System under test" in Figure 52-10 with a PMD and BERT or PMA.
In Table 95-10, change the Pattern column entry for Stressed receiver sensitivity from "3 or 5" to "3".
In 95.8.8, page 111, row 41, change, "For 100GBASE-SR4 the relevant BER is the interface BER" to "For 100GBASE-SR4 the relevant BER is the PMD-PMA interface BER"
In 95.8.9 add a new figure to replace figure 68-14, taking note of the difference list and adjusting the difference list accordingly, and add a difference to the difference list to refer to this new figure instead of Figure 68-14. In the new figure replace the "System under test" in Figure 68-14 with a PMD and BERT or PMA.
In Table 95-10, add a row for Receiver Jitter Tolerance (by the way although item b in the difference list calls for an entry in Table 95-10 no such entry is found) with the Pattern column entry of '3'.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.8** *P* **111** *L* **13** # 23

Ran, Adee — Intel

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

Stressed receiver sensitivity test method as specified in 52.9.9 (which uses the error counters in the PCS) cannot be used with a clause 95 receiver, since its PCS is hidden behind the RS-FEC sublayer which corrects most of the errors.

Assuming there is cosensus that SRS is intended to test the PMD and the retimer function of the PMA (e.g. an optical module), it should be defined in a way that allows counting bit errors either at the PMA (if it includes the optional error counting function) or with test equipment connected to the PMA. The test setup defined in Clause 87.8.11 enables this choice. In both cases, pattern 3 is more suitable than pattern 5.

If a BER test is performed with pattern 5 then the only suitable error counters are at the RS-FEC sublayer (which is the where the original bit stream is reconstructed; the PCS sees the corrected bits at a much lower BER). It is not specified or obvious that these counters should be used in the test.

For simplicity's sake and to avoid inconsistent results, it is suggested that pattern 3 be used as the normative test method. People testing with any modified test method should ensure that their results are representative of the normative test.

See also ran_01_0214_mmf presented at the MMF ad hoc.

SuggestedRemedy

1. In 95.8.8, remove the reference to clause 52. Instead, refer to the method defined in 87.8.11 (or its relevant subclauses), with exceptions if necessary.

2. for test patterns:
- Preferably: In Table 95-10, specify using Pattern 3 for SRS.
- Alternatively: Add a note/exception to the test method, that if Pattern 5 is transmitted, the error counters in the RS-FEC sublayer should be used.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.8** *P* **111** *L* **14** # 97

Ghiasi, Ali — Ghiasi Quantum LLC

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

Clause 95.8.8 should reference improve stress receiver sensitivity definition given in Clause 87

SuggestedRemedy

Instead of referencing clause 52.9.9 please reference Clause 87.8.11.1 and sinusoidal jitter definition of CL 88.8.10. See ghiasi_01_0314

Proposed Response *Response Status* **W**

[Editor's note: Subclause changed from 8.8 to 95.8.8]

Cl **95** *SC* **95.8.8** *P* **111** *L* **25** # 61

Dawe, Piers — Mellanox

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

The high TDP, lower VECP and use of non-FEC VECP mean that there is a large discrepancy between the situation in the SRS test and in service. This must be closed. Other comments address similar issues in the context of transmitter specification.

SuggestedRemedy

Following the transmitter specification work, use a reliable calibration metric instead of the present VECP. Choose an appropriate value consistent with the transmitter spec and worst channel.

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.8.1** *P* **111** *L* **48** # 95

Petrilla, John — Avago Technologies

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

The definitions for J2 and J4 do not include the optical power level for the measurement. This is different from 52.9.9.2 where the definition includes, "J is measured at the average optical power level"

SuggestedRemedy

Change, "J2 Jitter is defined as the time interval that includes ..." to "J2 jitter is defined as the time interval at the average optical power level that includes ..."

Change, "J4 Jitter is defined as the time interval that includes ..." to "J4 jitter is defined as the time interval at the average optical power level that includes ..."

Proposed Response *Response Status* **O**

Cl **95** *SC* **95.8.9** *P* **112** *L* **10** # 24

Ran, Adee — Intel

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

Item b states that the pattern to be received is specified in Table 95–10. But Table 95–10 has no reference to this subclause, so it is not clear which pattern should be used.

As noted in my other comment, for simplicity and consistency it is preferable to specify only Pattern 3, which is much more likely to be used that Pattern 5.

SuggestedRemedy

Add a line in Table 95-10 for Receiver jitter tolerance, subclause 95.8.9, specifying Pattern 3.

Proposed Response *Response Status* **O**