Cl **00** *SC* **0** *P* *L* # 1

Anslow, Pete Ciena

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

Many sections of this draft are making changes to clauses that are also being modified by other projects which are likely to be approved before P802.3bm such as P802.3bk and P802.3bj.

SuggestedRemedy

Keep the base text of the draft in line with the 802.3 standard as modified by these other amendments as they progress. Also, bring any new instances of "CAUI" that are added to these drafts in to the 802.3bm draft with changes to the name as appropriate.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **45** *SC* **45.2.1** *P* **25** *L* **7** # 2

Anslow, Pete Ciena

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

As it has not been found necessary to create any new PMA/PMD registers, remove the Editor's note, editing instruction and Table 45-3

SuggestedRemedy

Remove the Editor's note, editing instruction and Table 45-3

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **45** *SC* **45.2.1.8** *P* **27** *L* **52** # 3

Anslow, Pete Ciena

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

In P802.3bj D2.2 a section of text in 45.2.1.8 has been replaced by Table 45-11a

SuggestedRemedy

In 45.2.1.8 show changes to Table 45-11a rather than changes to text.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment #37

Cl **78** *SC* **78.1** *P* **37** *L* **8** # 4

Anslow, Pete Ciena

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

In the third paragraph of 78.1, the text ", and optical fiber" has been added by the 802.3bm amendment, so it should be shown in underline font.

SuggestedRemedy

show ", and optical fiber" in underline font.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **78** *SC* **78.2** *P* **38** *L* **34** # 5

Anslow, Pete Ciena

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

In P802.3bj D2.2 the row for XLAUI/CAUI has been removed from Table 78-2 due to the changes associated with Comment #110 against P802.3bj D2.1 (see healey_3bj_01_0713.pdf). Consequently, there is no need for the P802.3bm draft to modify Table 78-2.

SuggestedRemedy

Remove Table 78-2 from the P802.3bm draft.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also Comment #14

Cl **78** *SC* **78.5** *P* **40** *L* **12** # 6

Anslow, Pete Ciena

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

In P802.3bj D2.2 new rows have been created in Table 78-4 for "40GBASE-R fast wake" and "100GBASE-R fast wake". This means that there is no need to add rows for the 40G or 100G optical PHYs.
Also, the treatment for XLAUI/CAUI has been changed to only include an increase in Tw_sys_tx of 1 us for each instance of XLAUI/CAUI present.

SuggestedRemedy

In Table 78-4, remove the rows for:
40GBASE-SR4, 40GBASE-FR, 40GBASE-LR4, 40GBASE-ER4, 100GBASE-SR10, 100GBASE-SR4, 100GBASE-LR4, 100GBASE-ER4.
Modify the row for XLAUI/CAUI and footnote a to change "CAUI" to "CAUI-n"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also Comments #15 and #16

Cl **83** *SC* **83.7.3** *P* **63** *L* **18** # 7

Anslow, Pete Ciena

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

Since no PHYs with un-retimed interfaces have been adopted, item PPIET does not need to be changed.

SuggestedRemedy

Remove item PPIET from the table in 83.7.3

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83D** *SC* **83D.5.3** *P* **156** *L* **3** # 8

Anslow, Pete Ciena

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

The item code "Data paths" is not in keeping with the item codes used elsewhere. Annexes 83A and 83B use "NOL" for Number Of Lanes

Same issue in 83E.5.3

SuggestedRemedy

Change the item code from "Data paths" to "NOL" here and in 83E.5.3

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **91** *SC* **91.7.4.2** *P* **88** *L* **35** # 9

Anslow, Pete Ciena

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

Item RF9 in P802.3bj D2.2 is the "Symbol error threshold for 100GBASE-CR4 and 100GBASE-KR4". This needs to be extended to 100GBASE-SR4

SuggestedRemedy

Bring item RF9 in to the draft and add 10GBASE-SR4

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **95** *SC* **95.1.1** *P* **96** *L* **36** # 10

Anslow, Pete Ciena

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

The text in 95.1.1 was revised by D1.0 comment #132 and discussed in connection with comments #67 and #188.
As a better way to specify the BER requirement for the PMD layer has not been identified, remove the Editor's note.

SuggestedRemedy

Remove the Editor's note.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **95** *SC* **95.1** *P* **95** *L* **16** # 11

Anslow, Pete Ciena

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

The title of Table 95-1 "Physical Layer clauses associated with the 100GBASE-SR4" is missing a "PMD" at the end

SuggestedRemedy

Add "PMD" at the end making the title:
"Physical Layer clauses associated with the 100GBASE-SR4 PMD"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **01** *SC* **1.1.3.2** *P* **20** *L* **11** # 12

Booth, Brad Independent

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

Sentence structure could be improved for understanding.

SuggestedRemedy

Change to read:
Two widths of CAUI-n are defined: a ten-lane version (CAUI-10) in Annex 83A and Annex 83B, and a four-lane version (CAUI-4) in Annex 83D and Annex 83E.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **01** *SC* **1.4.73** *P* **20** *L* **51** # 13

Booth, Brad Independent

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

List should be proceeded by a colon.

SuggestedRemedy

Change to read:
Two widths of CAUI-n are defined: a ten-lane version (CAUI-10), and a four-lane version (CAUI-4).

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **78** *SC* **78.2** *P* **39** *L* **15** # 14

Booth, Brad Independent

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

Values for CAUI-4 should be the same as those for 100GBASE-KR4.

SuggestedRemedy

Change TBDs to be the same values as used for 100GBASE-KR4.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to Comment #5

Cl **78** *SC* **78.5** *P* **40** *L* **12** # 15

Booth, Brad Independent

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

LPI timings for the 40G port types should be similar to those for 40GBASE-CR4 Case-1.

SuggestedRemedy

Update values for the 40G optical PHYs to be the same as 40GBASE-CR4 Case-1.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to Comment #6

Cl **78** *SC* **78.5** *P* **40** *L* **32** # 16

Booth, Brad Independent

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

Values for 100G optical ports and CAUI-4 should be the same as those used by 100GBASE-CR4 (and KR4, KP4, CR10, CAUI-10) Case-1.

SuggestedRemedy

Update values to be the same as those used by 100GBASE-CR4 Case-1.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #6

Cl **95** *SC* **95.7.1** *P* **102** *L* **43** # 17

King, Jonathan Finisar

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

Table 95-6 contains TBCs for values which are dependent on TDP being confirmed.

Table 95-7 also contains a TBC against the value for "Average recive power, each lane (min)" value which is dependent on TDP .

Table 95-8 also contains TBCs against the "Power budget (for max TDP" and "Allocation for penalties (for max TDP)" values which are dependent on TDP .

The value for TDP was studied during the MMF ad hoc meetings in August, and has been confirmed (see presentation petrilla_01_0813_mmf).

SuggestedRemedy

Remove the "TBC"s from Table 95-6, Table 95-7, and Table 95-8

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment 65

Cl **95** *SC* **95.7.1** *P* **102** *L* **43** # 18

King, Jonathan Finisar

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

"Optical Modulation Amplitude (OMA), each lane (min)" needs a note 'b' to state that this minimum value of OMA has to be met even when TDP is less than 0.9dB.

(Note: This comment and response was discussed and agreed in the MMF ad hoc, as documented in presentation "Clause_95_D1p1_TBDsnTBCs_post.pdf" available on the 8th August MMF ad hoc meeting materials page)

SuggestedRemedy

Insert note 'b' to spec line "Optical Modulation Amplitude (OMA), each lane (min)" : Even if the TDP < 0.9 dB, the OMA (min) must exceed this value.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment 64

Cl **95** *SC* **95.8.9** *P* **108** *L* **27** # 19

King, Jonathan Finisar

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

The receive jitter tolerance test should reference the BER required in section 95.1.1.

(Note: This comment and response was discussed and agreed in the MMF ad hoc, as documented in presentation "Clause_95_D1p1_TBDsnTBCs_post.pdf" available on the 8th August MMF ad hoc meeting materials page)

SuggestedRemedy

Change note item h) from
"The interface BER of the PMD receiver is the average of the BER of all receive lanes when stressed."

to
"The average of the BERs of all receive lanes while stressed (and at the specified receive OMA) is required to be less than the BER specified in 95.1.1."

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83D** *SC* **83D.1** *P* **141** *L* **44** # 20

Ran, Adee Intel

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

Note 1 refers to RS-FEC as optional or ommitted. RS-FEC is never optional - it is either persent or not depending on PHY type. In addition, RS-FEC is bundled with the PMA (4:4) below it; when RS-FEC is omitted the PMA should be omitted as well.

SuggestedRemedy

Add a reference to note 1 in the PMA (4:4) sublayer block.

Change note 1 to read

"The RS-FEC and PMA (4:4) sublayers are present only in specific PHY types".

Possibly name the PHY types that include these sublayers (a list which will probably expand in future amendments), or the ones that don't (a list of two which probably won't expand). This is left to editor's preference.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
If the RS-FEC sublayer is not present then a PMA (4:4) is required between CAUI-4 and the PMD.
Apply Note 1 to the PMA (4:20)
Change the note to be the same as used in P802.3bj D2.2:
NOTE 1-CONDITIONAL BASED ON PHY TYPE

Cl **83D** *SC* **83D.1** *P* **141** *L* **50** # 21

Ran, Adee Intel

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

Figure 83D-2 is supposed to be an insertion loss budget as in 83E-2 for example. But the only information included in it is the total loss, which is disclaimed in the paragraph below it; indeed, the concept of "loss budget" is unsuitable for dispersion-limited channels and was abandoned altogether in 802.3bj.

If an informative statement about loss is desired, it is present in Equation 83E-1 and Figure 83D-3. Note that these are referenced directly at the end of this Annex in 83D.4.1. They would better be closer to the text.

SuggestedRemedy

Delete the sentence
"Figure 83D-2 and Equation (83D-1) (illustrated in Figure 83D-3) depict a typical CAUI-4 application, and summarize the informative differential insertion loss budget associated with the chip-to-chip application".

Delete figure 83D-2.

Move Equation 83D-1, and figure 83D-3 which depicts it, to 83D.4.1.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Having an informative insertion loss early in the annex can be helpful to users

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **19** # 22

Ran, Adee Intel

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

The parameters listed in table 83D-1 are problematic in several aspects:

1. Total jitter and eye mask depend on equalization setting. The procedure for measuring TJ includes "optimal transmit equalizer setting" which seems to be an effort to minimize DDJ; but this "optimal setting" isn't going to be used and may not even exist.
2. Measuring TJ and eye mask at 1e-15 is not practical; for TJ, extrapolation is assumed and in fact the measured quantities are "effective DJ" and "effective RJ". TJ is a combination of the two, but it is more reasonable to limit the direct measured values, rather than their sum. The Eye mask method is currently TBD.
3. Extracting Dual-Dirac parameters with PRBS31 is very noisy since the bounding ISI sequences are rare events; to capture the Gaussian distribution correctly, the measurement should include a large number of these rare events, which may be impractical.
4. There is no established relation between the TX specs (especially eye mask parameters), channel specs, and receiver specs. The TX parameters seem arbitrary (or taken from old, optical, un-retimed specs) and there is no evidence that meeting them enables achieving the desired performance with reasonable margin.

P802.3bj discussed the TX specifications at length and eventually abandoned the concept of TJ measurement and specified BUJ measurement instead. This enables aligning and "closing" the TX, channel and RX specifications together. This concept holds regardless of RX equalization capabilities and can be used without a DFE as well.

TX output equalization and jitter parameters need to be aligned with COM parameters. COM includes channel-dependent selection of transmitter equalization; and the jitter parameters being used are effective RJ and effective BUJ, as a Dual-Dirac model, independent of equalization setting. Clause 92 specifies a measurement method for these parameters. "DDJ" is part of the channel and has an altogether different effect from BUJ and RJ.

It is suggested that CAUI-4 leverages the work done in P802.3bj. If it is found that the TX parameters used in clause 93 are too loose to enable the desired operation, then stricter values can be chosen; but the methods these parameters represent are more suitable for specifying an electrical link than the current content of annex 83D.

SuggestedRemedy

Change Table 83D-1 to have the same parameters as in Table 93-4, specifically without total jitter and eye mask parameters; use the same values as in Table 93-4.

Change text in 83D.3.1 (especially 83D.3.1.4 and 83D.3.1.5) accordingly, to use methods defined in clause 92, with similar values.

Change relevant PICS items accordingly.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Change:
The test pattern for jitter measurements is PRBS31.
to
The test pattern for jitter measurements is PRBS9.

1. Eye mask allows users to measure the quality of the output eye without assuming DFE compensation in the Rx. This helps users isolate the performance of the Tx
2. See latchman_01_082713_CAUI for eye mask method
4. Relationship between Tx, channel, and Rx has been simulated.
ghiasi_01_082313_CAUI, latchman_01_080613_CAUI, li_01_0313_optx as examples

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Cl **83D** *SC* **83D.3.1.2** *P* **144** *L* **40** # 23

Ran, Adee Intel

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

The RL limit in equation 83D-2 isn't continuous at f=6.

Comment also applies to equation 83D-5 used for RX input RL.

See also accepted comment #151 on D2.1 of 802.3bj by Ali Ghiasi.

SuggestedRemedy

Change to 6.5-0.075*f for 6<f<=19 (as in Equation 93-2) in both cases.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #25

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **28** # 24

Ran, Adee Intel

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

Values and method for transmitter equalization are currently TBD. A suitable method in included in the similar clause 93 (which is based on clause 85, but with notable and neccessary changes, see moore_3bj_01_0713).

It is suggested to use the same method and avoid having different procedures for measuring same entities.

It is also suggested to use the same range and step size specs as in clause 93, to allow good tuning of the TX equalization.

If a few predefined sets (presets) of coefficients are desired in addition, they can be added in the future by specifying ratios of coefficients, as done in 93.8.1.5.3 for the "initialize" setting.

SuggestedRemedy

In the first paragraph of 83D.3.1.6, delete the last sentence.
Delete the second paragraph of 83D.3.1.6.

Add:
"The transmitter output equalization is characterized using the procedure described in 93.8.1.5.1."

Add a subclause for coefficient presets, using the definitions from 93.8.1.5.3, currently including two presets: (1) no equalization (where both ratios are 1 +/- 10%) and (2) with the values in 93.8.1.5.3.

Add subclauses for coefficient step size and range, used in addition to the preset values. Use the same values as in 93.8.1.5.4 and 93.8.1.5.5 respectively.

Add a note stating that selection between presets, and fine-tuning by steps, are vendor-specific management functions.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #123

Cl **83D** *SC* **83D.3.1.2** *P* **145** *L* **1** # 25

Ran, Adee Intel

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

Equation 83D-3 for common-mode RL is not aligned with the similar equation 93-3. All other return loss specifications seem to be aligned, and I see no reason that this one shouldn't be.

I assume that 93-3 is correct as it is the result of accepted comment #151 on D2.1 of 802.3bj.

SuggestedRemedy

Change equation 83D-3 to align with 93-3, and update figure 83D-6 accordingly.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change equations 83D-3 and 83D-5 to align with Equation 93-3, and update figures 83D-6 and 83D-9 accordingly.
See also comments #23 and #80

Cl **83D** *SC* **83D.3.2.2** *P* **149** *L* **47** # 26

Ran, Adee Intel

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

Receiver interference tolerance defined in this clause attempts to tune the eye width and height which a reference receiver would achieve. This reference receiver does not include a package, and therefore will experience a much better signal (and "eye") than any realistic receiver (assuming realistics receivers have non-transparent packages and are limited to using CTLEs with a few poles and zeros).

It has not been demonstrated that this performance gap can be bridged even by setting the eye height and width to "very optimistic" values.

In addition, the test setup does not include transmitter equalization and the procedure does not describe how it should be set. If it is set, it is likely that the optimum value for the DUT will not result in the maximum eye opening on the reference receiver. It is not clear which setting should be used.

An alternative approach, used in 802.3bj, is to concatentate reference packages to the channel measurement. The resulting channels are then combined with additive broad-band noise set to yield the desired COM value, which is an alternative to the minimum eye height. Eye width is not calibrated, but it is affected by the additive BBN.

Since annex 83D does not use a back channel for TX equalization, the tuning of TX coefficient during the test has to be performed in other means, as was suggested in annex 69A.2.4.

SuggestedRemedy

Invoke annex 93C for receiver tolearnce test, with parameters similar to the ones used in 93.8.2.3, except the following

1. Use BER < 1e-15 instead of RS-FEC symbol error ratio
2. TX noise parameter TBD (unless SNDR is adopted for annex 83D)
3. Test pattern is PRBS31 or RS-FEC encoded scrambled idles
4. No requirement of RSS_DFE4
5. Fitted insertion loss coefficients TBD

Add a note that transmitter equalization settings can be controlled by any means as long as the coefficients are valid for a compliant transmitter.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Not including a receiver package for calibration allows for implementation flexibility. 93C also uses a scope to calibrate the transmitter.
Change:
Broadband noise is added via the interference generator and is added such that the eye opening using the reference receiver and optimal CTLE setting is ...
To:

Broadband noise is added via the interference generator and is added such that the eye opening using the reference receiver and optimal CTLE and transmit equalizer setting (see 83D.3.1.6) is .

Cl **83D** *SC* **83D.3.2.2** *P* **150** *L* **28** # 27

Ran, Adee Intel

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

(Comment may be overtaken by events if my comment to use annex 93C interference tolerance test method is accepted).

Equation 83D-7 involves log10 of a complex quantities which is clearly incorrect. The transfer function of a CTLE is complex and its phase is important; its magnitude can be converted to dB if desired.

In addition, the CTLE described by the argument of the log10 can be non-passive if the parameters are not chosen correctly. To ensure passivity, it is preferable to characterize the CTLE by its poles and its DC gain instead of its peaking, and use the same format as Equation 93A-20:

H(f) = (10^(G_DC/20) + j(f/fp1)) / ((1+j(f/fp1)) * (1+j(f/fp2))

This way, the zero value is implied by the DC gain, passivity is guaranteed as long as DC gain is non-positive, and the G parameter is eliminated. If it is expected that CTLE setting is optimized based on a signal-to-noise figure of merit (as done in Annex 93A and Annex 83E) then the G parameter has no effect anyway.

For compatibility with COM and 100GBASE-KR4, it is suggested that the CTLE model be the same as used in clause 93, as long as it hasn't been demonstrated that any other parameters are perferred.

In addition, figure 83D-11 which describes the CTLE has an incorrect y-axis label ("CTLE gain", labeled G, is not frequency dependent) and includes the text "Meets equation constraints" which is out of place.

SuggestedRemedy

Change Equation 83D-7 as described above.

Change the text below this equation to

"Where

H(f) is the complex CTLE transfer function
f is the frequency in GHz
fp1, fp2 are the CTLE pole frequencies in GHz
G_DC is the CTLE DC gain in dB
j is the square root of -1"

In table 83D-4, change column headings to G_DC, fp1, fp2; optionally, add a "setting number" column. Peaking is a calculated value, rather than a physical parameter of the CTLE; it can be included for information, but please change heading to "calculated peaking (dB)".

Use f_b for fp2 and f_b/4 for fp1 throughout the table.

Change figure 83D-11 to fit the CTLE equation; change y-axis title to "CTLE transfer function magnitude (dB)"; Remove the text "Meets equation constraints".

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Remove 20xlog10 from equation 83D-7
On line 33 change:
"is the CTLE transfer function in dB" to:
"is the CTLE transfer function"
Remove "Meets equation constraints" from Figure 83D-11
Make similar change to equation 83E-4,
Also see comment 125, 51, 85, 105, 96

Cl **83D** *SC* **83D.3.2.2.2** *P* **152** *L* **4** # 28

Ran, Adee Intel

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

(Comment may be overtaken by events if my comment to use annex 93C interference tolerance test method is accepted).

The procedure attempts to calibrate two values (eye height and eye width) by tuning one parameter (BBN amplitude). The relation between eye height and width is dictated by signal slopes which depend on the given channel pulse response, and there is no guarantee that both targets can be achieved by adding noise (simply based on degrees of freedom). Thus, a test will seem either under-stressed (e.g. if EH is at target by EW is higher than target) or over-stressed (e.g. if EH is at target by EW is lower than target), which will cause confusion.

It is suggested that eye height be calibrated directly to a target, since it is more directly affected by BBN amplitude; eye width should be removed from the specifications.

Also, for this test the pattern generator amplitude is not defined. It is suggested that twop test cases be defined: one with a high loss channel and the minimum valid TX amplitude, and one with a low loss channel and the maximum valid TX amplitude.

SuggestedRemedy

Delete "and 0.45 UI (TBC) eye width".

In table 83D-3:
Delete "Minimum eye width after reference CTLE" entry.
Create two test case columns, test 1 and test 2.
Set channel insertion loss at 12.89 GHz to 6 dB for test 1 and 15 dB for test 2.
Add a row for pattern generator peak amplitude; in test 1, set to 500 mV; in test 2, set to 400 mV.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Latchman_02_082713 allows for pattern generator amplitude to be adjusted along with BBN

Cl **83D** *SC* **83D.3.2.2** *P* **150** *L* **6** # 29

Ran, Adee Intel

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

Table 83D-3 defines SJ by referring to table 88-13; but table 88-13 eventually refers to 87.8.11.4, which deals with a jitter tolerance test, rather than an interference tolerance test (and includes no added interference).

JTT is done separately from ITT in many standards, since it practically tests CDR bandwidth.

Even if taken only for jitter stressing, table 88-13 does not define a finite number of SJ combinations (amplitude and frequency). Thus the test is under-specified and a receiver can never be fully tested for compliance. Note that verifying BER<1e-15 for many SJ profiles might be prohibitively long.

It is suggested to use a single SJ setting for interference tolerance testing. To check for sufficient CDR bandwidth, a separate jitter tolerance test can be added (with frequencies within the assumed tracking bandwidth). Note that this test only verifies CDR bandwidth so it need not exercise maximum ISI or noise; in such a test, since SJ is the dominant stress and since its period is short, a fast test verifying only BER<1e-9 may suffice. The test pattern needs to have a short period to prevent non-repeatable results; PRBS9 is suggested.

SuggestedRemedy

Replace reference to table 88-13 with a fixed value SJ ptp = X UI (e.g. 0.1 UI; align with TX max DJ spec).

Add a subclause and a table for Receiver jitter tolerance test and its parameters, as in 93.8.2.4 and table 93-7; for this test eye height is not calibrated (no BBN added) and the maximum BER is 1e-9; test pattern is PRBS9.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
88-13 is part of a stressed receiver sensitivity test.
The low frequency jitter tolerance can be part of a stressed receiver test per other sections of 802.3ba

Cl **83D** *SC* **83D.4** *P* **153** *L* **52** # 30

Ran, Adee Intel

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

COM minimum value is TBD.

Channels specified for 100GBASE-KR4 are required to have COM > 3 dB; this is the allocated receiver margin, and its need was demonstrated by an example showing the effects of CDR self-jitter and DFE quantization.

Since CAUI-4 receivers are expected to be simpler (e.g. lower gain requirements, no DFE) and operate at a much lower probaility of error (meaning more open eye and much lower noise for closed loops e.g. CDR), they can require lower margins.

it is suggested to set COM target at 2 dB.

SuggestedRemedy

Change TBD to 2 dB.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

See comment 40

Cl **83D** *SC* **83D.4** *P* **153** *L* **1** # 31

Ran, Adee Intel

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

In order to invoke annex 93A, Table 83D-5 COM parameters and symbols should be aligned with changes in D2.2 of 802.3bj.

SuggestedRemedy

Include new and modified entries from Table 93-8: symbols A_v, A_fe, A_ne (changed symbols), R_LM, SNR_TX (new parameters - use same values as in 93-8).

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See latchman_03_082713_caui for chip-chip COM parameters
Modify symols per 802.3bj D2.2
Add NEW parameters using same values in 93-8
comments 111, 36, 41, 42, 35

Cl **83D** *SC* **83D.3.1.4** *P* **146** *L* **14** # 32

Ran, Adee Intel

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

This is a test definition, and for the counter-propagating signals the "s" word is out of place. The resulting PICS item is even more out of place.

SuggestedRemedy

Change "shall be" to "are". Delete PICS item TC9.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83D** *SC* **83D.3.2.3** *P* **152** *L* **42** # 33

Ran, Adee Intel

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

Subclause heading says amplitude, but text describes ptp swing and voltage, which are both not amplitudes: maximum differential voltage for operation (which seems to be ptp, and should be amplitude instead) and maximum differential voltage without damage (which is clearly not ptp). This is confusing.

Also, for a normative specification, the minimum tolerance should be specified, rather than the maximum (currently, a receiver that tolerates only 500 mV, which is below the maximum, is compliant).

Also, the word "is" is missing.

SuggestedRemedy

Change this paragraph to read

"A compliant CAUI-4 chip-to-chip receiver is defined to operate with a maximum differential input amplitude of at least +/-500 mV. The receiver shall be able to tolerate without damage exposure to a differential voltage of at least +/- 600 mV".

Change PICS items RC5 value/comment to "operational with input amplitude at least +/-500 mV".

Change PICS items RC6 value/comment to "tolerates input voltage at least +/-600 mV without damage".

Proposed Response *Response Status* **W**

PROPOSED REJECT.
"Input voltage" is consistent with "output voltage" spec. "is" added by comment #98

Cl **83D** *SC* **83D.4** *P* **153** *L* **37** # 34

Ran, Adee Intel

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

It has not been demonstrated so far that a receiver with no DFE and a technically feasible package can meet the BER objective with a 15 dB loss channel and a worst-case transmitter which also has a technically feasible package.

According to rabinovich_01_0513_optx, even the current 15 dB loss objective of CAUI-4 chip-to-chip does not fully answer market needs; so the current assumptions don't create a wide market potential.

It is suggested to assume a 1-tap DFE for the CAUI-4 chip-to-chip receiver. It can be demonstrated that this assumption enables significant improvement of COM, by reducing the linear equalization requirements, thereby increasing the available signal and reducing residual ISI, without increasing other noise sources.

A single tap DFE is relatively simple to implement, does not incur significant power penalty, and with the CAUI-4 BER objective, does not cause an MTTFPA problem even with strong error propagation.

Adding this asumption will enable a technically feasible solution with a wide market potential.

SuggestedRemedy

See accompanying presentation.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional material required from accompanying presentation
Also see comment 112

Cl **83D** *SC* **83D.4** *P* **153** *L* **1** # 35

Ran, Adee Intel

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

In P802.3bj it was shown that package model has a significant effect and that neither short nor long package traces are guaranteed to be "worst case" in terms of noise margin (COM). This does not rely on equalization assumptions and is relevant for this project as well.

If it is assumed that CAUI-4 chip to chip can be used to connect big chips to small chips, then effects of combinations of the packages should be tested, as done in clause 93.

SuggestedRemedy

In table 83D-5, include two values for z_p, 12 and 30.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Use z_p, 12
See comment 31, 36, 111, 41

Cl **83D** *SC* **83D.4** *P* **153** *L* **1** # 36

Ran, Adee Intel

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

A_dd is a parameter in COM that affects noise originating from high-probability changes of sampling position, unrelated to ISI. It is most appropriate to characterize Bounded Uncorrelated Jitter (BUJ). A_dd has a large impact on results and the current value limits the passing channels.

It can be assumed that BUJ is a component of DJ measured in previous methods, and is smaller than DJ.

In P802.3bj it was agreed to specify BUJ for the NRZ PMDs (as 0.1 UI ptp max) and accordingly set A_dd to 0.05. It is suggested to adopt this change for CAUI-4 as well.

SuggestedRemedy

Change A_dd in table 83D-5 to 0.05.

Change TX specifications to define, measure and limit BUJ as in D2.2 of 802.3bj, refer to subclause 92.8.3.10.2.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #31
BUJ is currently limited by TJ measurement

Cl **45** *SC* **45.2.1.8** *P* **27** *L* **53** # 37

Marris, Arthur — Cadence Design Syste

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

45.2.1.8 PMD transmit disable register. This has been converted to a table by 802.3bj.

SuggestedRemedy

Make this a table modification similar to the fault indication.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to Comment #3

Cl **85** *SC* **85.1** *P* **65** *L* **17** # 38

Marris, Arthur — Cadence Design Syste

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

Should CAUI-4 be added to Table 85-1?

SuggestedRemedy

Add the following row and corresponding PICS:
83D-CAUI-4 Not applicable Optional

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Since CAUI-4 with a reverse gearbox for 100GBASE-CR10 would be expected to operate satisfactorily:
Add a new row to Table 85-1:
83D-CAUI-4 Not applicable Optional
In 85-3 change:
"Similarly, the 100GBASE-CR10 PHY may be extended using CAUI-10. If XLAUI or CAUI-10 is instantiated, ." to:
"Similarly, the 100GBASE-CR10 PHY may be extended using CAUI-n. If XLAUI or CAUI-n is instantiated, ."
Add a new PICS item to the table in 85.13.3 for CAUI-4 in an equivalent manner to the item in 92.14.3
In Table 80-2a add an "O" in the 83D column for 100GBASE-CR10.

Cl **83D** *SC* **83D.3.2.2.2** *P* **152** *L* **9** # 39

Latchman, Ryan — Mindspeed

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

Amplitude for crosstalk source is TBD: Counter propagating crosstalk channels are asynchronous with target amplitude of TBD mV peak-to-peak differential.

SuggestedRemedy

change TBD to 1200 mV

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
Also see comment 97

Cl **83D** *SC* **83D.4** *P* **152** *L* **52** # 40

Latchman, Ryan — Mindspeed

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

COM value TBD

SuggestedRemedy

change TBD to 2dB

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
Also see comment 30

Cl **83D** *SC* **83D.4** *P* **153** *L* **18** # 41

Latchman, Ryan — Mindspeed

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

Transmit equalizer setting TBD

SuggestedRemedy

change TBD to align with latchman_01_082313_CAUI

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #31

Cl **83D** *SC* **83D.4** *P* **153** *L* **28** # 42
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Continuous time filter, DC gain TBD

SuggestedRemedy
change to align with latchman_02_082313_CAUI

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #31

Cl **83D** *SC* **83D.4** *P* **153** *L* **40** # 43
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
COM jitter/noise values TBD

SuggestedRemedy
Assume reference Rx with ideal package, RJ = 0.003UIrms

Proposed Response *Response Status* **W**
PROPOSED REJECT.
See response to comment #31

Cl **83D** *SC* **83D.1** *P* **142** *L* **4** # 44
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
CAUI-4 chip-to-chip channel loss still TBC

SuggestedRemedy
make text black, remove editor's note. 20dB channel material will be considered going forward but currently there is insufficient material in support of this reach.

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
Remove": ~15dB loss" since this is described in 83D-1
Rename figure 83D-2 to "Typical CAUI-4 chip-to-chip application

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **49** # 45
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Minimum transmit equalization TBD

SuggestedRemedy
see latchman_01_082313_CAUI
see slide 3 - transmit equalizer

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #77

Cl **83D** *SC* **83D.3.1.4.2** *P* **146** *L* **33** # 46
Latchman, Ryan Mindspeed

Comment Type **E** *Comment Status* **D**
Text is pink

SuggestedRemedy
make text black

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
See latchman_01_082713_CAUI

Cl **83D** *SC* **83D.3.1.5** *P* **146** *L* **51** # 47
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Eye mask measurement methodology TBD

SuggestedRemedy
add section which contains content from latchman_01_082313_CAUI slide 7

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
See latchman_01_082713_CAUI slide 6 with editorial license

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **28** # 48
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Pre-cursor and post-cursor equalizer range TBD

SuggestedRemedy
see latchman_01_082313_CAUI slide 3

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.

See response to comment #123

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **30** # 49
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Transmit equalization characterization method TBD

SuggestedRemedy
see latchman_01_082313_CAUI slide 4

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
latchman_01_082713_CAUI with editorial license
Also see comment 82

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **8** # 50
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Parameters for Receiver interference tolerance parameters still TBD or TBC

SuggestedRemedy
See latchman_02_082313_CAUI slide 16

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #124

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **23** # 51
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Reference receiver equalizer settings TBD

SuggestedRemedy
See latchman_02_082313_CAUI slide 6

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #85

Cl **83D** *SC* **83D.3.2.2.2** *P* **152** *L* **4** # 52
Latchman, Ryan Mindspeed

Comment Type **T** *Comment Status* **D**
Interference tolerance test target eye opening is TBC: 40 mV (TBC) eye height and 0.45 UI (TBC) eye...

SuggestedRemedy
delete TBCs

Proposed Response *Response Status* **W**
PROPOSED ACCEPT.
Note, proposed values are also updated in latchman_02_082713

Cl **83E** *SC* **83E.1** *P* **159** *L* **46** # 53
Petrilla, John Avago Technologies

Comment Type **E** *Comment Status* **D**
In Fig 83E-1, a vertical line, perhaps a change bar, appears. If not a change bar, please delete.

SuggestedRemedy
In Fig 83E-1, if not a change bar, please delete the vertical line.

Proposed Response *Response Status* **W**
PROPOSED ACCEPT IN PRINCIPLE.
The vertical line is a change bar. This will disappear in D1.2.

Cl **83E** *SC* **83E.3.1** *P* **162** *L* **23** # 54

Petrilla, John — Avago Technologies

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

In Table 83E-1 the parameter associated with Eq 83E-3 is, "Common to differential mode conversion (min)". However in 83E.3.1.3 the term, "Common to differential output conversion return loss", appears and RLdc is defined as, "the CAUI-4 chip-to-module host transmitter common to differential mode conversion". Further the vertical axis in Fig 83E-8 is labeled, "common to differential mode conversion". If these all refer to the same attribute, one name should be used to avoid confusion. It seems this attribute is a conversion and not a return loss. If a conversion, the values are likely negative as positive values imply a gain larger than 1 which leads to also changing the signs of the values on the vertical axis of Fig 83E, the sign in Eq 83E-3 and min to max in Table 83E-1
Also see

SuggestedRemedy

In Table 83E-1 change the parameter, "Common to differential mode conversion (min)" to "Common to differential mode conversion (max)" & repeat in table 83E-3
In 83E.3.1.3 change the term, "Common to differential output conversion return loss", to "Common to differential mode conversion"
Change "RLdc is the CAUI-4 chip-to-module host transmitter common to differential mode conversion" to "MCdc is the CAUI-4 chip-to-module host transmitter common to differential mode conversion".
Change "RLdc" to "MCdc", two places.
Change the vertical axis values of Fig 83E-8 to negative and change equation 83-3 to yield negative values.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change to be consistent
Table 83E-1:
Common to differential mode conversion return loss (min)
Change RLdc:
the CAUI-4 chip-to-module transmitter common to differential mode conversion return loss
Also see comment 55

Cl **83E** *SC* **83E.3.3.2** *P* **170** *L* **32** # 55

Petrilla, John — Avago Technologies

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

In Table 83E-4, the attribute, "Differential to common mode input return loss (min)" is associated with Eq 83E-6. This appears to be a conversion and not a return loss. Regardless terminology should be consistent with that used for the attributes associated with Eq 83E-3.

SuggestedRemedy

Make terminology, equations, vertical axis labels and value consistent with those associated with 83E-3.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change
RLdc is the CAUI-4 chip-to-module host transmitter differential to common mode conversion
RLdc is the CAUI-4 chip-to-module receiver differential to common mode conversion input return loss
Also see comment 54

Cl **83E** *SC* **83E.3.3.3.1** *P* **171** *L* **52** # 56

Petrilla, John — Avago Technologies

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

Would it be better to refer to Pattern 4 instead of, a PRBS9 pattern? If so add a reference to Table 86-11. The term PRBS9 occurs 6 times in 83E.

SuggestedRemedy

In first occurrence of PRBS9 in 83E (i.e. 83E.3.3.3.1, page 171, identify it as Pattern 4, reference Table 86-11 and thereafter when appropriate use Pattern 4.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Make similar change in 83D

Cl **83E** *SC* **83E.3.3.3.1** *P* **172** *L* **14** # 57

Petrilla, John — Avago Technologies

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

In Table 83E-6, there's a Max DCD parameter. Unfortunately there's no definition of DCD nor reference to a definition found in 802.3bm D1.1. Since in common usage there are at least two definitions and these differ by a factor of two in effect, a specific definition is required. Clause 92.8.3.10.1 has a definition for even-odd jitter that may be useful. See also Table 83-9.

SuggestedRemedy

Check Clause 92.8.3.10.1 even-odd jitter definition for applicability and apply if appropriate. Repeat in Table 83-9

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change to Max even-odd jitter (pk-pk) with note stating: as defined in 92.8.3.10.1.
Repeat in table 83-9

92.8.3.10.1 Even-odd jitter
Even-odd jitter is measured on two repetitions of a repeating pattern with an odd number of bits and at least
two transitions between one and zero or zero and one. PRBS9 is such a pattern. The deviation of the time of
each transition from an ideal clock at the signaling rate is measured. Even-odd jitter is defined as the magnitude
of the difference between the average deviation of all even-numbered transitions and the average deviation
of all odd-numbered transitions, where determining if a transition is even or odd is based on possible
transitions but only actual transitions are measured and averaged.
Even-odd jitter shall be less than or equal to 0.035 UI regardless of the transmit equalization setting.
NOTE-Even-odd jitter has been referred to as duty cycle distortion by other Physical Layer specifications
for operation over electrical backplane or twinaxial copper cable assemblies (see 72.7.1.9). The term evenodd
jitter is used here to distinguish it from the duty cycle distortion referred to by Physical Layer specifications
for operation over fiber optic cabling.

Cl **83E** *SC* **83E.3.4.2.1** *P* **174** *L* **46** # 58

Petrilla, John — Avago Technologies

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

"patter" should be "pattern"

SuggestedRemedy

Change "patter" to "pattern"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change "patters" to "patterns"
[Editor's note: Subclause changed from 83E.4.2.1 to 83E.3.4.2.1 and Page changed from 172 to 174]

Cl **83E** *SC* **83E.3.3.3** *P* **171** *L* **43** # 59

Petrilla, John — Avago Technologies

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

For consistency within 802.3bm and to reduce confusion, the format of jitter tolerance conditions in Table 95-7 should be adopted. Se also table 83E-8

SuggestedRemedy

In Table 83E-5, change
"Applied pk-pk sinusoidal jitter Table 88-13"
to
"Jitter frequency and peak-to-peak amplitude (190, 5) kHz, UI
Jitter frequency and peak-to-peak amplitude (950, 1) kHz, UI"
repeat in Table 83E-8

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Table 88-13 is consistent with 802.3ba and OIF VSR

Cl **95** *SC* **95.5.1** *P* **99** *L* **31** # 60

Petrilla, John Avago Technologies

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

There's a vertical line, perhaps a change bar, between the text blocks, MDI and Optical fiber cable. If not a change bar, please delete.

SuggestedRemedy

If not a change bar, please delete the vertical line between the text blocks, MDI and Optical fiber cable.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The vertical line is a change bar which shows that a label on the figure has been truncated. This will disappear in D1.2.

See also comment: 74

Cl **95** *SC* **95.5.4** *P* **100** *L* **33** # 61

Petrilla, John Avago Technologies

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

(compliant 100GBASE-R signal input) should be (compliant 100GBASE-SR4 signal input)

SuggestedRemedy

Change(compliant 100GBASE-R signal input) to (compliant 100GBASE-SR4 signal input)

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **95** *SC* **95.5.8** *P* **101** *L* **17** # 62

Petrilla, John Avago Technologies

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

The heading for 95.5.8 should include the word, optional

SuggestedRemedy

Change "95.5.8 PMD lane-by-lane transmit disable function" to "95.5.8 PMD lane-by-lane transmit disable function (optional)"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **95** *SC* **95.7.1** *P* **102** *L* **38** # 63

Petrilla, John Avago Technologies

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

In table 95-6, the attribute "Lane wavelength" should be "Center wavelength, each lane" which is a better match for multimode, e.g. see Table 86-6. See also comments on Table 95-7 and 95.8.2

SuggestedRemedy

In table 95-6, change "Lane wavelength" to "Center wavelength".

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **95** *SC* **95.7.1** *P* **102** *L* **47** # 64

Petrilla, John Avago Technologies

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

In Table 95-6, the attribute, Optical Modulation Amplitude (OMA), each lane (min), is missing the usual 'Even if ...' note, see e.g. note b in Table 86-6.

SuggestedRemedy

Insert the usual note and reference, "Even if the TDP < 0.9 dB, the OMA (min) must exceed this value."

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment 18

Cl **95** *SC* **95.7.1** *P* **102** *L* **50** # 65

Petrilla, John Avago Technologies

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

In Table 95-6, the value of 5 for the attribute, Transmitter and dispersion penalty (TDP), is marked TBC. Per petrilla_01_0813_mmf, the value, 5, has been confirmed.

SuggestedRemedy

In Table 95-6, for the attribute, Transmitter and dispersion penalty (TDP), delete the TBC.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment 17 which proposes to remove the TBCs from the specs dependent on the TDP value being confirmed.

Cl **95** *SC* **95.7.1** *P* **103** *L* **7** # 66

Petrilla, John Avago Technologies

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

In Table 95-6, the attribute Extinction Ratio, ER, as the measurement (95.8.6) and test pattern (3, 5 or valid 100GBASE-R signal) are defined, due to ISI, can be problematic for 100GBASE-SR4 transmitters that would otherwise be acceptable and, further, the attribute ER may not be necessary. In the referenced test method,IEC 61280-2-2, the example eye diagram, Figure 6, shows an eye with a flat region between 0.4 and 0.6 of the unit interval. An SR4 Tx, before considering the effect of a ref Rx, would need 20% to 80% transition times between 11 ps and 13 ps, to produce such an eye. But the Tx Eye mask and TDP defined for SR4 will accept transition times somewhat greater than 21 ps where such a device measured with the square wave pattern yielding an ER of 3 dB according to the present definition could have an ER < 2.5 dB. Since the TDP and Tx Eye mask requirements ensure inter-op with the worst case Rx, an ER test does not seem needed to guard against slow transition times and the OMA test ensures sufficient signal amplitude. Therefore to avoid discarding otherwise acceptable SR4 transmitters ER should be 1) redefined to use the Square wave test pattern to avoid the ISI impact on the ER measurement, or 2) redefined to accommodate the ISI impact on the ER measurement, i.e. lowering the min. ER to < 2 dB, or 3) deleted since it provides no necessary interop protection beyond that provided by the OMA, TDP and Tx eye mask requirements. See contribution petrilla_01_0913

SuggestedRemedy

In Table 95-6, 1) redefine ER to use the Square wave test pattern to avoid the ISI impact on the ER measurement, or 2) redefine ER to accommodate the ISI impact on the ER measurement, e.g. set min ER to 2 dB, or 3) delete ER since interop protection provided by the OMA, TDP and Tx eye mask requirements is suficient.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Implement changes as reviewed and agreed in the MMF ad hoc as documented in "Clause_95_D1p1_TBDsnTBCs_post.pdf"

Cl **95** *SC* **95.7.2** *P* **103** *L* **30** # 67

Petrilla, John Avago Technologies

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

In table 95-7, the attribute "Lane wavelengths, each lane" should be "Center wavelength, each lane" which is a better match for multimode, e.g. see Table 86-8.

SuggestedRemedy

In table 95-7, change "Lane wavelengths, each lane" to "Center wavelength, each lane".

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment 69
Give editorial licence to change 'wavelength' to 'center wavelength' where appropriate.

Cl **95** *SC* **95.7.2** *P* **104** *L* **11** # 68

Petrilla, John Avago Technologies

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

In Table 96-7, shouldn't the value (940, 1) for Jitter frequency and peak-to-peak amplitude be (950, 1) for a 5:1 ratio with (190, 5) as in clause 68?

SuggestedRemedy

In Table 96-7, change (940, 1) for Jitter frequency and peak-to-peak amplitude to (950, 1).

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The values (940, 1) and (190, 5) for Jitter tolerance test frequency and peak-to-peak amplitude were discussed and agreed in the MMF ad hoc as documented in king_02_0613_mmf_SRS, and is aligned with jitter values in clause 93 (Table 93-7).

Cl **95** *SC* **95.8.2** *P* **106** *L* **24** # 69

Petrilla, John Avago Technologies

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

Wavelength should be center wavelength to avoid confusion

SuggestedRemedy

Change wavelength to center wavelength.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See also comment 67
Give editorial licence to change 'wavelength' to 'center wavelength' where appropriate.

Cl **95** *SC* **95.8.6** *P* **107** *L* **13** # 70

Petrilla, John Avago Technologies

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

An explicit Extinction ratio measurement is not required since sufficient signal quality is assured by explicit min OMA, max TDP and Tx Eye mask requirements. See contribution petrilla_01_0913

SuggestedRemedy

Delete clause 95.8.7 and the Extinction ratio attribute from Table 95-6

Proposed Response *Response Status* **W**

PROPOSED REJECT.
See response to comment 66

Cl **95** *SC* **95.8.7** *P* **107** *L* **25** # 71

Petrilla, John Avago Technologies

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

In the Tx eye text is a ref to clause 86, "according to the methods specified in 86.8.4.6.1 with the exception that the clock recovery unit's high-frequency corner bandwidth is 10 MHz". Unfortunately there is no mention of a CRU in 86.8.4.6.1. Text in 52.9.7 may be used as a guide.

SuggestedRemedy

In 95.8.7 change, "according to the methods specified in 86.8.4.6.1 with the exception that the clock recovery unit's high-frequency corner bandwidth is 10 MHz" to "according to the methods specified in 86.8.4.6.1 with the addition that a clock recovery unit (CRU) should be used to trigger the scope for mask measurements as shown in Figure 86-4. The CRU should have a high-frequency corner bandwidth of less 10 MHz and a slope of -20 dB/decade."

Proposed Response *Response Status* **W**

PROPOSED REJECT.
86.8.4.6.1 contains "Further requirements are given in 86.8.3.2." and 86.8.3.2 includes "A clock recovery unit (CRU) is used to trigger the oscilloscope for mask measurements, as shown in Figure 52-9"
So no change is needed.

Cl **95** *SC* **95.8.6** *P* **107** *L* **22** # 72

Petrilla, John Avago Technologies

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

95.8.6 should include a reference to the eye mask coordinates in Table 95-6

SuggestedRemedy

Change "The required optical transmitter pulse shape characteristics are specified in the form of a mask of the transmitter eye diagram as shown in Figure 86-4 and defined by the Transmitter eye mask coordinates in Table 95-6."

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change to "The required optical transmitter pulse shape characteristics are specified in the form of a mask of the transmitter eye diagram as shown in Figure 86-4 with the Transmitter eye mask coordinates in Table 95-6."

Cl **95** *SC* **95.8.5** *P* **106** *L* **41** # 73

Petrilla, John Avago Technologies

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

The TDP measurement of clause 95.8.5 refers to 52.9.10 and lists exceptions. In 52.9.10.1 Reference transmitter requirements, item b reads, "The output optical eye is symmetric and passes the eye mask test of 52.9.7". The eye mask defined in 95.8.7 should be used instead.

SuggestedRemedy

To the list of exceptions in 95.8.5 add, 'The reference transmitter passes the eye mask test of 95.8.7.'

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
In the list of exceptions in 95.8.5 change
" d) The reference transmitter rise/fall times should be less than 12 ps at 20% to 80%"
to
"d) The reference transmitter rise/fall times should be less than 12 ps at 20% to 80%, and passes the eye mask test of 95.8.7."

Cl **95** *SC* **95.11.3.2** *P* **112** *L* **21** # 74

Petrilla, John Avago Technologies

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

In Fig 95-5 a vertical line, perhaps a change bar, appears. If not a change bar, please delete.

SuggestedRemedy

In Fig 95-5, if not a change bar, please delete the vertical line.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The vertical line is a change bar which shows that a label on the figure has been truncated. This will disappear in D1.2.

See also comment: 60

Cl **83D** *SC* **83D.1** *P* **142** *L* **18** # 75

Ghiasi, Ali Broadcom

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

COM may get evvolved to meet CAUI4 C2C applications but currenlty it requrie more work, using commerical channel SIM can also deliver and gurnateee TP5 compliance.

SuggestedRemedy

For now repalce" The normative channel compliance is thorugh statistical channel sim to deliver compliant eye opening at TP5". Actual chanel loss could be higher or lower die to channel ILD, return loss, and crosstalk.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Per latchman_03_082713_CAUI channel definition will continue to use COM as the normative specification

[Editor's note: Subclause changed from 1 to 83D.1]

Cl **83D** *SC* **83D.1** *P* **142** *L* **24** # 76

Ghiasi, Ali Broadcom

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

Repalce editor note

SuggestedRemedy

CAUI-4 C2C informative insertion loss

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Remove editors note
[Editor's note: Subclause changed from 1 to 83D.1]

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **48** # 77

Ghiasi, Ali Broadcom

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

Minimum transmit equalization TBD

SuggestedRemedy

Repalce post-cursor with value of 2.5
(Per definition equation 72-9 Rpost = v1/v2) measured at TP0a
Repalce pre-cursor with value of 1.5
(Per definition equation 72-8 Rpre=v3/v2) measured at TP0a

per definition of 72.7.1.11

see ghiasi_01_0913

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
see latchman_01_082713_CAUI
with editorial license

Also see comment 122, 45

[Editor's note: Subclause changed from 3.1 to 83D.3.1]

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **16** # 78

Ghiasi, Ali Broadcom

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

Add waveform for transmit pre and post cursor measurement

SuggestedRemedy

Waveform similar to 72-12, see ghiasi_01_0913
V2 is peak positive VMA and V5 is peak negative VMA
Waveform VMA p-p= V2-V5
DeltaV2=DeltaV5=VMA/10

Proposed Response *Response Status* **W**

PROPOSED REJECT.

See latchman_01_082713_CAUI. Also, if a change is to be made, consider 802.3bj definitions.

[Editor's note: Subclause changed from 3.1 to 83D.3.1]

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **48** # 79

Ghiasi, Ali Broadcom

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

Minimum VMA missing

SuggestedRemedy

With Post-cursor and pre-curosr at max value minimum VMA = 200 mV differential (p-p)

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Transmitter eye mask and Tx equalization settings helps ensure minimum VMA

[Editor's note: Subclause changed from 3.1 to 83D.3.1]

Cl **83D** *SC* **83D.3.1.2** *P* **145** *L* **2** # 80

Ghiasi, Ali Broadcom

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

Common mode return loss is tighter than differential return loss and nont consistent 93-3

SuggestedRemedy

Please common mode return loss per 93-3
9.05-f from 0.05 to 6 GHz
3.45-0.075 from 6 to 19 GHz

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See comment 25

[Editor's note: Subclause changed from 3.1.2 to 83D.3.1.2]

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **28** # 81

Ghiasi, Ali Broadcom

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

Minimum pre and post cursor are TBD

SuggestedRemedy

The minimum pre-curosr C(-1)=1.5.

The minimum pst curosr equalization C(1)=2.5.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

See response to comment #123

[Editor's note: Subclause changed from 3.1.6 to 83D.3.1.6]

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **31** # 82

Ghiasi, Ali Broadcom

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

Transmitter output equaliztion is characterized using procedure is TBD

SuggestedRemedy

Transmitter equalization pre-cursor and post cursor is measured at TP0a. The test pattern for the transmitter output waveform is the square wave test pattern with (8 ones, 8 zeros) of 83.5.10. The scope is set to waveform lock and waveform averaging is set to 32. The waveform is observed through a fourth-order Bessel-Thomson response with a bandwidth of 40 GHz.

Post cursor is defiend as ratio of
C(1)=(v1-v4)/(v2-v5)
Post cursor is defiend as ratio of
C(1)=(v3-v6)/(v2-v5)

The post cursor C(1) measured at TP0a shall be adjustable from 1 to 2.5 in 0.5 steps with variation of +/-0.25

The pre cursor C(-1) measured at TP0a shall be adjustable from 1 to 1.5 in 0.25 steps with variation of +/-0.125

see ghiasi_01_0913

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See comment 49
[Editor's note: Subclause changed from 3.1.6 to 83D.3.1.6]

Cl **83D** *SC* **83D.3.2** *P* **148** *L* **20** # 83

Ghiasi, Ali Broadcom

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

Missing TP5 table

SuggestedRemedy

Add TP5 table with paramters similar to Table 83E-1
Singlaing rate = same
Unit Inverval = same
DC common mode = -0.3 to 1.5 V
Common mode AC output volatage = same
Eye Width= same
Eye height = 45 mV
Differential output return loss = same
Common to differential mode conversion = same
Differential termination mismatch =same
Trnasition time=same

Proposed Response *Response Status* **W**

PROPOSED REJECT.
TP5 specification is redundant with use of COM

[Editor's note: Subclause changed from 3.1.6 to 83D.3.2]

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **13** # 84

Ghiasi, Ali Broadcom

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

Table 83-5-3 repalce TBD and TBC

SuggestedRemedy

To accomodate for the TP5a to TP5 need to slight adjustment to the eye width and eye height
Eye height= 50 mV
Eye width = 0.48 UI
Channel insertion loss = 15 dB
Repalce COM with VEC= 12 dB (target)
Adjust applied broadband nosie and random jitter till eye height and eye width is met.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #124

[Editor's note: Subclause changed from 3.2.2.1 to 83D.3.2.2.1]

Cl **83D** *SC* **83D.3.2.2.1** *P* **151** *L* **10** # 85

Ghiasi, Ali Broadcom

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

Reference CTLE CTLE table should be updated with coefficent up to 12 dB assuming channel loss is 15 dB

SuggestedRemedy

For coeficent please see ghiasi_01_0913

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Populate Table 83D-4 from ghiasi_01_0913_optx slide 9 with values up to 12 dB of peaking. Update Figure 83D-11 accordingly. On Page 150, line 23 change "TBD" to "12".

Also see comment 51

[Editor's note: Subclause changed from 3.2.2.1 to 83D.3.2.2.1]

Cl **83D** *SC* **83D.4** *P* **152** *L* **50** # 86

Ghiasi, Ali Broadcom

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

With COM not ready for CAUI4 C2C plus the fact the fact commerical tool can readily determine eye opening at TP5

SuggestedRemedy

Remvove table 83D-5
CAUI-4 C2C channel compliance is delivering through the channel an eye opening of 45 mV, 0.45 UI eye opening, and VEC of <12 dB.

These are the parameters in the TP5 table, which can be referenced

Proposed Response *Response Status* **W**

PROPOSED REJECT.
It is difficult to standardize compliance with "comercial tools"
[Editor's note: Subclause changed from 4 to 83D.4]

Cl **83E** *SC* **83E.3.1.6.1** *P* **167** *L* **24** # 87

Ghiasi, Ali Broadcom

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

It has been brought up that some time domain simulator are sensitive to any positive (passivity),in few of the filters cases there is slight +gain at 14 GHz.

SuggestedRemedy

Will provide coefficent with higher reolution to make sure all coefficent are passive
see ghiasi_01_0913

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
[Editor's note: Subclause changed from 3.1.6.1 to 83E.3.1.6.1]

Cl **83E** *SC* **83E.1** *P* **159** *L* **19** # 88

Ghiasi, Ali Broadcom

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

Missing section on CAUI-4 chip to module application operation

SuggestedRemedy

Host transmitter and module transmitter are adjusted for best eye opening respectivley at host output (TP1a) and module output (TP4) with the reference CTLE. A module or host with adpative CTLE will adopt to best fitler setting. Module or host not using adpative filter the CTLE can be adjusted or pre-configured but they are outside the scope of this standard.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Host and module transmitter adjustment is not discussed in 83E.
[Editor's note: Clause changed from 83 to 83E and subclause changed from E.1 to 83E.1]

Cl **95** *SC* **95.8.5** *P* *L* # 89

King, Jonathan Finisar

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

In the definition of TDP the ref_Rx has a bandwidth restriction (12.6 GHz) which adds stress equivalent to 100 m OM4, including the deterministic effects of worst case chromatic dispersion.
In practice, the ref_Tx is expected to have rise-fall times of up to 12 ps, which, in combination with the 12.6 GHz ref_Rx, will result in significant ISI penalty, and a reference sensitivity measurement which is higher than for a similar Rx with 0.75 x bitrate bandwidth.
To align the TDP spec value in Table 95-6 and the measured values of TDP (as currently defined), the effect of ISI introduced by the 12.6 GHz ref Rx should be corrected for in the reference sensitivity measurement.

SuggestedRemedy

Make changes to section 95.8.5 , items d and g as shown in slide 4 of the presentation king_01_0813_mmf_TDP.
This topic was discusses and the proposed remedy agreed in the MMF ad hoc, 22nd August 2013, and is documented in king_01_0813_mmf_TDP.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **95** *SC* **95.7.1** *P* **102** *L* **51** # 90

King, Jonathan Finisar

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

On Table 95-6 TDP is marked TBC. TDP was confirmedto be 5 dB in the MMF ad hoc, see presentation petrilla_01_0813_mmf

SuggestedRemedy

Remove the TBC from TDP in Table 95-6

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
See response to comment 65

Cl **80** *SC* **80.1.5** *P* **45** *L* **15** # 91

Dudek, Mike QLogic

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

Per table 95-1 CAUI-10 (clause 83B for chip to module) is optional for 100GBASE-SR4. I think this is correct as even though CAUI-10 cannot be used below the RS-FEC a module containing the RS-FEC is still a module and could use clause 83B.

SuggestedRemedy

Add CAUI-10 clause 83B (for chip to module) as optional for 100GBASE-SR4 in table 80-2b

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
In Table 80-2b add an "O" in the 83B column for 100GBASE-SR4.
In Table 95-1 add a footnote to "83B-Chip-to-module CAUI-10" to say:
"This option requires the RS-FEC sublayer to be within the module. See 91.3."

Cl **83D** *SC* **83D.2** *P* **143** *L* **5** # 92

Dudek, Mike QLogic

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

"can be seen" is too weak a statement for these normative requirements

SuggestedRemedy

Change "can be seen" to "are defined"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change "can be seen" to "are defined" on line 5 and line 6

Cl **83D** *SC* **83D.3.1.4** *P* **146** *L* **28** # 93

Dudek, Mike QLogic

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

Incomplete normative requirement.

SuggestedRemedy

change "is than" to "is less than"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83D** *SC* **83D.3.1.5** *P* **146** *L* **51** # 94

Dudek, Mike QLogic

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

We shouldn't be allowing the transmitter to be set differently to optimize the jitter and to optimize the eye diagram to pass these specifications

SuggestedRemedy

add to the end of the paragraph "however the same equalizer settings should be used to measure both jitter and the transmitter output waveform.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **24** # 95

Dudek, Mike QLogic

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

This is not a test of a transmitter.

SuggestedRemedy

Replace "transmitter" with "interference tolerance signal"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83D** *SC* **83D.3.2.2.1** *P* **151** *L* **8** # 96

Dudek, Mike QLogic

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

The reference CTLE coefficients are blank.

SuggestedRemedy

Add the CTLE coefficients making them the same as those in Table 83E-2 (and maybe including higher gain CTLE values.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #85

Cl **83D** *SC* **83D.3.2.2** *P* **152** *L* **9** # 97

Dudek, Mike QLogic

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

There is a TBD in the draft. The counter propagating lanes should have the maximum amplitude that the transmitters have and it should also match the value being used in COM.

SuggestedRemedy

Replace TBD with 1200mV

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
Also see comment 39

Cl **83D** *SC* **83D.3.2.3** *P* **152** *L* **43** # 98

Dudek, Mike QLogic

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

poor English (missing a word)

SuggestedRemedy

Change "receiver defined" to "receiver is defined"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83E** *SC* **83E.3.1.2** *P* **163** *L* **16** # 99

Dudek, Mike QLogic

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

Clause 83E is for the host to module. For any host port there will be only one host transmit equalizer setting and the host needs to pass the max output amplitude with that setting. It does not need to pass the max output amplitude regardless of the transmit equalizer setting just at the setting being used by the

SuggestedRemedy

delete "regardless of the transmit equalizer setting"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **83E** *SC* **83E.3.3.2** *P* **170** *L* **4** # 100

Dudek, Mike QLogic

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

The differential to common mode definition is incorrect. (The equation is correct). (It appears to be a copy/paste error).

SuggestedRemedy

Replace "RLdc is the CAUI-4 chip-to-module host transmitter differential to common mode conversion" with "RLcd is the CAUI-4 chip-to-module module receiver common mode to differential conversion"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Replace "RLdc is the CAUI-4 chip-to-module host transmitter differential to common mode conversion" with "RLcd is the CAUI-4 chip-to-module receiver common mode to differential conversion" since this equation is used for both host and module

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Cl **83E** *SC* **83E.3.3.3.1** *P* **172** *L* **21** # 101

Dudek, Mike QLogic

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

It would be good to clarify that the amplitude of the counter propagating crosstalk channels is 900mV during stressed signal calibration. (The amplitude of the counter propagating channels during the test is set by the Host under test.)

SuggestedRemedy

Insert "during calibration of the stressed signal" between "crosstalk channels" and "are asynchronous"

Make the same change on page 174 line 41

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
[Editor's note: Subclause changed from 83E.3.3.1 to 83E.3.3.3.1]

Cl **83E** *SC* **83E.3.4.2.1** *P* **174** *L* **54** # 102

Dudek, Mike QLogic

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

We should clarify that the reference CTLE is set to its optimum value for the calibration of the stressed receiver signal.

SuggestedRemedy

At the end of the sentence add "at the optimum setting defined as the setting which givese the minimum value of the product of eye height and eye width".

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Minimum value will be 0
We also have the following:
Eye height and eye width are then measured at TP1a using the setting of the software CTLE
which maximizes the product of eye height and eye width based on the eye measurement methodology given
in 83E.4.2. Random jitter and variable gain are adjusted to result in the eye height and eye width given in
Table 83E-8 using the reference receiver.

Cl **80** *SC* **80.1.5** *P* **45** *L* **14** # 103

Dudek, Mike QLogic

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

Per table 86-1 CAUI-4 Clause 83E is optional for 100GBASE-SR10. Table 80-2b should be consistent with this.

SuggestedRemedy

Add Optional for CAUI-4 is optional for 100GBASE-SR10.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Tables 86-1 and 80-2b are consistent in showing only Annexes 83A, 83B and 83D as optional for 100GBASE-SR10.

Since there seems to be no reason to forbid a reverse gearbox in the module for 100GBASE-SR10:
In Table 80-2b add an "O" in the 83E column for 100GBASE-SR10.
Add a new row to Table 86-1:
83E-Chip-to-module CAUI-4 Not applicable Optional

Cl **83E** *SC* **83E.1** *P* **159** *L* **23** # 104

Ran, Adee Intel

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

Figure 83E-1 clearly shows two very different interfaces which are both called CAUI-4. These two CAUI-4 things aren't compatible with each other; connecting a 100GBASE-LR4/ER4 module to a host that includes RS-FEC won't interoperate with a compliant 100GBASE-LR4/ER4 partner. Same goes for the other way around, which will also have an excessive BER.

A module is either 100GBASE-SR4 or is not; so it only has to support one of the interfaces. A "chip" (host) may support both SR4 and LR4/ER4, but it should not be mandatory (existing hosts support only LR4, and future hosts may support only SR4).

The two interfaces can have very different electrical specifications; CAUI-4 without RS-FEC needs something like the current specs, but the RS-FEC protected interface can have a raw BER of about 1e-6 with negligible effect on the full link performance. This will make design much easier and testing much faster, so is likely to reduce cost of both modules and chips. In addition, signal integrity requirements can be loosened, which can reduce system cost further.

The current definitions reduce market potential and are likely to create confusion.

SuggestedRemedy

Designate different names for the two interfaces. I suggest CAUI-4p for the RS-FEC Protected interface and CAUI-4u for the Unprotected interface.

For CAUI-4p, change required BER to 1e-6 and change all electrical specs (TX jitter, RX stress and test limits) accordingly.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The CAUI-4 chip-module electrical interfaces shown are compatible with each other.
See response to comment #137

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **28** # 105

Mellitz, Richard Intel Corporation

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

Equation 83D-7 has no benefit with respect to signal to noise ratio over equation 93A-20

SuggestedRemedy

replace with equation (93A-20)

Proposed Response *Response Status* **W**

PROPOSED REJECT.
No benefit has been demonstrated for changing to the CTLE from Equation 93-20

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

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **37** # 106

Mellitz, Richard — Intel Corporation

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

In Table 83D-1, the jitter parameters do not seem to be a directly tie in between Tx jitter and receiver compliance test or channel compliance. In addition total Jitter is often cause a certain amount of disagreement on it validity. See: zivny_3bj_01_0713

SuggestedRemedy

Use jitter table 93-4 (d2.2) from clasue 93. (and associated text)

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Relationship between Tx, channel, and Rx has been simulated. ghiasi_01_082313_CAUI, latchman_01_080613_CAUI, li_01_0313_optx as examples.
Chip-to-chip should consider correlated jitter as well as uncorrelated jitter since the Rx equalization assumption is different between the two specifications.
The following aspecs of zivny_3bj_01_0713 do not apply to bm:
"The transmitter will always be used in a system with FEC which can convert BER=10-5 to BER=10-18. No need for TJ spec beyond 10-5 or anything beyond J6 for interpolation."
"Effective deterministic jitter excluding data dependent jitter" involve a direct subtractions of physical measurement on one pattern (DDJ, on PRBS9) with Dual-Dirac model of jitter (effective DJ) on a different pattern (PRBS31 or Scrambled Idles); there's little physical validity in subtraction of different measures. (See attachment A for more detail).

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **41** # 107

Mellitz, Richard — Intel Corporation

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

Eye Mask parameters are insufficient to characterize a transmitter chip. They do not seem to be a directly tied to receiver compliance test or channel compliance.

SuggestedRemedy

Use output waveform and SNDR from table 93-4 (d2.2) from clause 93. (and associated text)

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Relationship between Tx, channel, and Rx has been simulated. ghiasi_01_082313_CAUI, latchman_01_080613_CAUI, li_01_0313_optx as examples.
Chip-to-chip should consider correlated jitter as well as uncorrelated jitter since the Rx equalization assumption is different between the two specifications.

Cl **83D** *SC* **83D.3.2.2.1** *P* **149** *L* **53** # 108

Mellitz, Richard — Intel Corporation

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

The prescribed receiver compliance involves calibration a test channel to a specified eye mask. This can result in chips with pass RX compliance and do not work well in otherwise compliant system. Presentation will provide data to illustrated.

SuggestedRemedy

Incorporate Annex 93C with text from clause 93.8.2. Define parameters in table 93-6 to be included in 83D.3.2.2. Remove RSS_DFE4 and change to "RS-FEC symbol error ratio" to "bit error ratio".

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Rx test is defined to provide adquate level of stress after equalization to ensure operation with compliant transmitter and channel

Cl **83D** *SC* **83D.1** *P* **142** *L* **18** # 109

Mellitz, Richard — Intel Corporation

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

Figure 83D-2, 83-D and eq. (83D-1) seem like an objective. It paces the rest of the draft development work.
Suggesting more loss drives a different type of design. The IL limit should read more like an objective under the best possible conditions.

SuggestedRemedy

Change:
"Actual channel loss could be higher or lower due to the channel ILD, return loss, and crosstalk."
to
"Actual channel loss could be lower due to the channel ILD, return loss, and crosstalk."

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Reach can be higher if return loss, crosstalk is better than budgeted for the informative target. If this is to be a max, then we should zero channel crosstalk, and put in place ideal return loss etc.

Cl **83D** *SC* **83D.1** *P* **141** *L* **16** # 110

Mellitz, Richard — Intel Corporation

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

25cm of length is not consistent with a 15 dB IL goal

figure 1 dB per inch --> 15 inches -->[tilde]38cm

SuggestedRemedy

change "of approximately 25 cm in length"
to
of approximately 40 cm in length under very good electrical conditions"

If the objective changes to 20dB use 50cm

Proposed Response *Response Status* **W**

PROPOSED REJECT.

25cm is consistent with Annex 83A. Loss/inch is dependent on a number of factors. 15dB over 10 inches is in line with kochuparambil_01_0112, OIF VSR

[Editor's note: Tilde character changed to [tilde]]

Cl **83D** *SC* **83D.4** *P* **153** *L* **3** # 111

Mellitz, Richard — Intel Corporation

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

Table 83D-5 is not reflective of the latest COM parameters.
Realistic package considerations in the best 15 dB channelsuggest a DFE

SuggestedRemedy

Update table 83D-5 to include entries in Annex 93A, Table 93A-1
set the following parameters:
Zp to 12 and 30
gDC min = -16, max = 0 , step=1
SNRTX= 29 dB
Sigma_rj= RJ 0.01 UI
ADD = 0.05 UI

fill-in valuse for C(1) and C(-1) from consensus meetings
Eta0 0 5.2 × 10-8 V2/GHz
Change label DER0 to BER

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #31

Cl **83D** *SC* **83D.4** *P* **153** *L* **37** # 112

Mellitz, Richard — Intel Corporation

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

Realistic package considerations in the best 15 dB channel suggest a DFE is required.
Presentation to illustrate.

SuggestedRemedy

change:
Nb = 5
Bmax= 0.5

Else change the loss objectives.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional material required demonstrating 15dB channel requires DFE. Material to date suggest package choice is a dominating factor on the use of DFE
Also see comment 34

Cl **83D** *SC* **83D.1** *P* **141** *L* **18** # 113

Ghiasi, Ali — Broadcom

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

Missing section on CAUI-4 chip to chip application operation

SuggestedRemedy

CAUI-4 transmitter on each end of link is adjusted based on channel knowledge to an approximate setting with the adaptive or adjustable receiver performing most of the equalization. Operation and control of the non-adpative receiver is outside the scope of this standard.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Add:
The CAUI-4 transmitter on each end of link is adjusted based on channel knowledge to an approximate setting with the adaptive or adjustable receiver performing the remainder of the equalization. Operation and control of a non-adpative receiver is outside the scope of this standard.

[Editor's note: Subclause changed from 1 to 83D.1]

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **29** # 114

Ghiasi, Ali — Broadcom

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

Missing variation positive and negative pre and pst cursor peaks

SuggestedRemedy

(v1+v4)/v1, (v2+v5)/v2, and (v3+v6)/v3 <5% per definition of CL72 and see ghiasi_01_0913

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #123
[Editor's note: Subclause changed from 3.1.6 to 83D.3.1.6]

Cl **00** *SC* **0** *P* *L* # 115

Dove, Dan — AppliedMicro

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

TBDs are remaining in the document

SuggestedRemedy

Remove all TBDs and replace with valid numbers.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
All TBDs are expected to be removed by other comments specific to each TBD (or TBC).
See other comment responses for details.

Cl **95** *SC* **95.8.9** *P* **110** *L* **38** # 116

Dove, Dan — AppliedMicro

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

The statement "The transmitter and receiver are not synchronous" is insufficient IMO.

SuggestedRemedy

Specify the minimum frequency offset between transmitter and receiver.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Asynchronous operation means the transmitter and receiver do not have a fixed phase relationship. It seems self evident that the period of time over which this is required to be true is the measurement time associated with measuring a BER<5e-5. In practice the frequency difference required is smaller than the +/- 100ppm deviation of the signal rate.

Cl **83D** *SC* **83D.4** *P* **152** *L* **48** # 117

Kochuparambil, Beth — Cisco Systems

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

Current Channel specifications seem inconsistent with link simulations of technical feasibility that have been shown. COM seems on the pessimistic side with discussions on the horizon of further constraining the channel.

COM was originally designed for a backplane and high-loss application. Is 'modified' COM constraining channels beyond technical feasibility of CTLE-only and CTLE+"short" DFE in turn affecting broad market potential (leaving more margin on the table which is what COM was supposed to counteract)? COM also makes for a relatively simple, reasonably-margined application such as medium-reach chip-to-chip far more abstract and challenging to implement on the channel side.

SuggestedRemedy

Remove of COM as channel specification with editorial license external both within sub-clause and appropriate references.

Insert IL, RL, ILfitted, ILD, ILDrms, and ICN as channel specification with editorial license and liasoned CEI-25G-MR as limits and reference.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional detail required on IL, RL etc specification.

Cl **83D** *SC* **83D.3** *P* **143** *L* **10** # 118

Kochuparambil, Beth — Cisco Systems

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

Consistancy with similar applications, such as OIF's CEI-25G-MR, seems desirable for both chip and channel implementers. Differentiation and Unique Identity is seen as some level of burst error protection is needed for Ethernet application.

Also applicable to 83D.2 and perhaps other references.

SuggestedRemedy

Suggest implementation of proposal with liasoned document as reference/guide (CEI-25G-MR) and editorial licence.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Currently the draft warns users:
"Maximum BER assumes errors are not correlated to ensure a sufficiently high mean time to false packet acceptance (MTTFPA) assuming 64B/66B coding. Actual implementation of the receiver is beyond the scope of this standard".

Cl **83D** *SC* **83D.1** *P* **142** *L* **3** # 119

Kochuparambil, Beth — Cisco Systems

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

Presentation will show further support for broad market need of targeting a 20dB channel for chip-to-chip application. 15dB will not meet broad market potential or economic feasibility as it greatly limits the applications.

SuggestedRemedy

Change chip-to-chip insertion loss budget at 12.89GHz to a 20dB channel.
Change includes text, figure 83D-2, figure 83D-3, and equation 83D-1.
Editorial license granted to change Equation 83D-1 to 1.083 + 2.436*sqrt(28.1*f/25.78125) + 0.698*(28.1*f/25.78125) for 50MHz<=f<=12.90223GHz and -17.851 + 2.694*(28.1*f/25.78125) for 12.90223GHz<f<=25.78125GHz and all related references.

NOTE: Equation gives 20.02dB at 12.89GHz.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Insufficient information to support a 20dB link reach at this time.
Also see comment 121, 120

Cl **83D** *SC* **83D.1** *P* **142** *L* **3** # 120

Li, Mike — Altera

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

[tilde]15 channel loss does to serve large market potential for CAUI-4 c2c
CommentEnd: 4

SuggestedRemedy

Change the channel loss to [tilde]15-20 dB

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Insufficient information to support a 20dB link reach at this time.
Also see comment 119, 121
[Editor's note: Clause changed from "Annex 83E" to 83D, Line changed from "3-4" to 3 and tilde characters changed to [tilde]]

Cl **83D** *SC* **83D.1** *P* **142** *L* **21** # 121

Li, Mike — Altera

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

[tilde] IL Equation and Figure need to be consistent with 15dB and 20 dB channels
CommentEnd: 54

SuggestedRemedy

Replace Eq. (83D-1) and Fig. 83D-3 with the ones from the presentation to be made at the meeting

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Insufficient information to support a 20dB link reach at this time.
Also see comment 119, 120
[Editor's note: Clause changed from "Annex 83E" to 83D, Line changed from "21-54" to 21 and tilde character changed to [tilde]]

Cl **83D** *SC* **83D.3.1** *P* **143** *L* **48** # 122

Li, Mike — Altera

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

pre-cursor and post-cursor values in Table 83D-1are TBDs
CommentEnd: 50

SuggestedRemedy

Replace TBDs in Table 83D-1 with ones from the presentation to be made at the meeting

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #77

[Editor's note: Clause changed from "Annex 83E" to 83D and Line changed from "48-49" to 48]

Cl **83D** *SC* **83D.3.1.6** *P* **147** *L* **25** # 123

Li, Mike Altera

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

c(-1) and c(1) are TBDs
CommentEnd: 29

SuggestedRemedy

replace c(-1) TBD with -20%, and c(1) TBD with -25%

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
see latchman_01_082713_CAUI editorial license
Also see comment 81, 48, 24, 114

[Editor's note: Clause changed from "Annex 83E" to 83D and Line changed from "25-28" to 25]

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **1** # 124

Li, Mike Altera

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

Table 83D-3 has many TBDs and some parameters no longer apply with the new spec method
CommentEnd: 20

SuggestedRemedy

Replace Table 83D-3 with one from the presentation to be made at the meeting

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See latchman_02_082713_CAUI with editorial license
Also see comments 84, 50

[Editor's note: Clause changed from "Annex 83E" to 83D and Line changed from "1-20" to 1]

Cl **83D** *SC* **83D.3.2.2.1** *P* **150** *L* **21** # 125

Li, Mike Altera

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

Reference CTLE non longer needed with the new spec method
CommentEnd: 20

SuggestedRemedy

Remove L21-54 on P150, and L1-46 on P151

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional information requred on new spec method

[Editor's note: Clause changed from "Annex 83E" to 83D, Page changed from "150 (L21-54), 151 (L1-46)" to 150 and Line set to 21]

Cl **83D** *SC* **83D.3.2.2.2** *P* **151** *L* **49** # 126

Li, Mike Altera

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

Those sections need to be re-written with the new spec method

SuggestedRemedy

Replace those texts with ones from presentation to be made at the meeting

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional information required on new spec method
[Editor's note: Clause changed from "Annex 83E" to 83D, Page changed from "151 (L49-54), 152 (L1-11)" to 151 and Line set to 49]

Cl **83D** *SC* **83D.4** *P* **152** *L* **50** # 127

Li, Mike Altera

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

This section on channel characteristics needs to be re-written with the new spec method

SuggestedRemedy

Replace those texts with ones from the presentation to be made at the meeting

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional information required on new spec method

[Editor's note: Clause changed from "Annex 83E" to 83D, Page changed from "152 (L50-54), 153 (L1-46)" to 152 and Line set to 50]

Cl **95** *SC* **95.8.1** *P* **105** *L* **22** # 128

Dawe, Piers Mellanox

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

Up until now, the naming (numbering) of test patterns was consistent across 10/40/100G. Now we have two Pattern 5, the pattern defined in 82.2.10 (no FEC) and the RS-FEC encoded version of it.

SuggestedRemedy

Pick a new name for the RS-FEC encoded version, e.g. 5f for FEC encoded or 5r for RS-FEC encoded.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The description of pattern 5 as an 'RS-FEC encoded scrambled idle' and the reference with note a given in Table 95-9 is unambiguous.

Editors note: this comment is very similar to comment 195, which was resolved with the current draft (see response comment 174 against D1.0):

"In Table 95-9 change "Scrambled idle" to "RS-FEC encoded scrambled idle"
Add a footnote to the Defined in value "82.2.10":
"The pattern defined in 82.2.10 as encoded by Clause 91 RS-FEC for 100GBASE-SR4"
Also, in 95.8.1.1 change "scrambled idle" to "RS-FEC encoded scrambled idle".

End of editors note

Cl **95** *SC* **95.7.1** *P* **102** *L* **48** # 129

Dawe, Piers Mellanox

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

40GBASE-SR4 has a peak power limit of +4 dBm, which protects the receiver from overload by high power transmitters with high overshoot and a particular extinction ratio. This spec should have such a limit for the same reason, although it can be relaxed a little. This spec has no test cost because the peak power can be found from the eye mask measurement. The only cost to the transmitter is avoiding highest power transmitters with high overshoot and a particular extinction ratio.

SuggestedRemedy

Insert: Peak power, each lane (max) 4.2 dBm (as in Table 86-6). Also add it to Table 95-7 (receiver table).
Define peak power as the level at which an eye mask measurement would give the usual hit ratio (5e-5).

Proposed Response *Response Status* **W**

PROPOSED REJECT.
This comment was discussed in the MMF ad hoc prior 29th Aug 2013. The group agreed that the need for, and the limit set by, a peak power spec should be studied further, and it was noted that the peak power could be obtained at the same time as Tx eye mask measurements (with power calibration), and that a spec value should not impinge on the transmitter average power and OMA specs (ie it limits overshoot at highest Tx output powers only).

Cl **95** *SC* **95.7.1** *P* **102** *L* **48** # 130

Dawe, Piers Mellanox

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

We have set the Tx spec with 3 dBm max OMA, -3 dBm min OMA at max TDP. An implementer who builds within these min and max limits must keep the difference in launch OMA between any two lanes to 6 dB or less. We should use this as a no-added-cost spec, so we can make receiver testing a little more reasonable - also it's convenient if the aggressor lanes are not at the max for normal product, so normal product, slightly attenuated, can be used to generate them.

SuggestedRemedy

Insert
Difference in launch OMA between any two lanes (max) 6 dBm
In Table 95-7, change "OMA of each aggressor lane" from 3 to 2.3. (2.3 is -5.6 victim OMA + 6 difference at Tx + 1.9 difference in loss.)
Or, just make the second change without adding the "Difference in launch OMA" row.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The difference in launch OMA between any two lanes can be greater than 6 dB where transmitters have different TDP values. Hence aggressor channels should be at the max OMA specified to ensure interoperability.

Cl **95** *SC* **95.7.1** *P* **103** *L* **5** # 131

Dawe, Piers Mellanox

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

Put the rows in a more logical order and/or the same as Clause 86.

SuggestedRemedy

Either move the row:
Average launch power of OFF transmitter
to be with the other average launch power items (Table 83E-1, CAUI-4 host transmitter, did similar with Differential peak-to-peak output voltage),
or move it to the end, as Table 86-6, because all the other specs apply with transmitter on, so this is the odd one out and should not be among them.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The ordering in Table 95-6 was based on the format of clauses 87 and 88 (as was noted in the response to the similar comment 190 against D1.0).

Cl **83E** *SC* **83E.3.3.3** *P* **171** *L* **42** # 132

Dawe, Piers Mellanox

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

C2M CAUI-4 has the same SJ mask for host and module. C2C CAUI-4 has the same again. This means we can have four identical CDRs concatenated, which is not good for jitter accumulation. I believe the conventional approach would be to set the Tx side jitter BW lower than the Rx side. TR because we may not have the full answer in York.

SuggestedRemedy

Consider if having all four jitter specs the same is safe; if not, change some a little to avoid problems with jitter accumulation.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional detail on proposal required. If jitter accumulation becomes an issue, one should fail output jitter requirements.

Cl **95** *SC* **95.8.1** *P* **105** *L* **23** # 133

Dawe, Piers Mellanox

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

A PHY whose inputs are not valid signals will output the Remote Fault signal (in this case, RS-FEC encoded) by default. This includes the case when its inputs are PRBS31, a common and easily generated input (crosstalk) pattern for testing a PHY output. RS is scrambled with the same long scrambler as Pattern 5 so will be equally valid for testing.

SuggestedRemedy

Add Pattern 6f, RS-FEC encoded scrambled Remote Fault. Allow its use wherever Pattern 5 is allowed. Coordinate with 802.3bj as necessary.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
This would be a departure from clause 52, 86, 87, 88.

A contribution showing justification and support is invited.

Cl **95** *SC* **95.8.8** *P* **107** *L* **44** # 134

Dawe, Piers Mellanox

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

Vertical eye closure penalty is defined in 52.9.9.2 using "the 99.95th percentile of the lower histogram to the 0.05th percentile of the upper histogram". This choice of percentile is appropriate for non-FEC PMDs so would be expected to not be appropriate for FEC-protected PMDs.

SuggestedRemedy

Either add an exception: e.g. the 99.5th percentile of the lower histogram to the 0.5th percentile of the upper histogram. Or ensure that the VECP limit chosen is takes the different BER into account and gives consistent results across the expected range of SRS testers' SNRs.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The choice of percentile is appropriate for a FEC supported PMD with target BER of 5e-5, and will help to avoid inadvertant over-stressing of the receiver during SRS testing.

Cl **83E** *SC* **83E.4.2** *P* **175** *L* **39** # 135

Dawe, Piers Mellanox

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

Some hosts and modules e.g. data centre switches, 100GBASE-SR4, QSFP, will always have FEC protection. For them, EW15 and EH15 cause a pointless extra cost in power consumption, crosstalk, design time and, particularly, test cost. EW6 and EH6 are ideal for them.

SuggestedRemedy

Divide 4 into 4a (new, put first because it's much simpler) and 4b (as at present).
4a) For a CAUI-4 host or module where the signals are protected by RS-FEC, the eye width is given by EW6.
At the beginning of 4b, insert:
For a CAUI-4 host or module where the signals are not always protected by RS-FEC, the eye width is found as follows.
Similarly for item 6 and eye height.
In 83E.4.2.1 Vertical eye closure,
Vertical eye closure is calculated using Equation (83E-9)
VEC = 20 log10(AV/EH)
where
...
For a CAUI-4 host or module where the signals are protected by RS-FEC, EH is EH6 from step 5 of 83E.4.2. For a CAUI-4 host or module where the signals are not always protected by RS-FEC, EH is EH15 as given in Equation (83E-8).
(Editorials: equation Equation, missing full stop, give base of log.)

Proposed Response *Response Status* **W**

PROPOSED REJECT.
See response to comment #137

Cl **83E** *SC* **83E.3.4.2** *P* **172** *L* **50** # 136

Dawe, Piers Mellanox

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

Use the same terminology as OIF VSR.

SuggestedRemedy

Change "Module stressed receiver test" to "Module stressed input test". Similarly, change "Host stressed receiver test" to "Host stressed input test".

In general, use host output , host input, module input and module output, as agreed years ago for nPPI. e.g. change
Table 83E-8-Module stressed receiver parameters
to
Table 83E-8-Module stressed input parameters

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change "Module stressed receiver test" to "Module stressed input test". Similarly, change "Host stressed receiver test" to "Host stressed input test".

In general, use host output , host input, module input and module output, as agreed years ago for nPPI. e.g. change
Table 83E-8-Module stressed receiver parameters
to
Table 83E-8-Module stressed input parameters
with editorial license

Cl **83E** *SC* **83E.3.3.1** *P* **169** *L* **32** # 137

Dawe, Piers Mellanox

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

A host is designed to support particular PMD types which use FEC or don't, in particular module formats. Some data centre switches are likely to support only 100GBASE-CR4 and 100GBASE-SR4 (and would have supported 500 m SMF) in QSFP - both of these use FEC which is in the host. For these, requiring BER<1e-15 when the host-to-host chain of three links (CAUI-optical-CAUI) can work at 5e-5 places a pointless burden of test cost on the 100GBASE-SR4 module.
Also it requires larger voltages than necessary, which adds to thermal and crosstalk issues. These things are unnecessary costs in design as well as production.

SuggestedRemedy

Create two classes of C2M CAUI-4. The one without FEC as is (BER max 1e-15), and the FEC-protected one with BER max 2.5e-6 (just 5% of the 5e-5 that delivers 1e-12 after FEC).
I believe the corrected BER for short packets for 2.5e-6 is 3.4e-23.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
A passive CR4 implementation will not use CAUI-4 chip-to-module. Having two chip to module specs will increase market fragmentation and potentially introduce user confusion
Also see latchman_02_0513_optx
Comment #219 against D1.0 proposed defining two options: one for non-RS-FEC use and the other for with-RS-FEC use. This was not supported by a straw poll of the Task Force.
Also see comments 104, 154, 144, 135

Cl **83E** *SC* **83E.3.1.3** *P* **163** *L* **23** # 138

Dawe, Piers Mellanox

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

Use consistent terminology as agreed for nPPI.

SuggestedRemedy

Change
Transmitter return loss
The differential output return loss, in dB, of the transmitter is...
Figure 83E-7-Transmitter differential return loss
to:
Host differential output return loss
The differential return loss, in dB, of the host output is...
or
The host differential output return loss, in dB, is...
Figure 83E-7-Host differential output return loss

Proposed Response *Response Status* **W**

PROPOSED REJECT.
83E.3.1.3 and equation 83E-2 is also used for module transmitter specs

Cl **83E** *SC* **83E.3.1** *P* **162** *L* **30** # 139

Dawe, Piers Mellanox

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

We measure signals in 33 GHz but any product receiver's bandwidth is much less than 33 GHz, so a lower observation bandwidth would make the tests correlate better to reality. A lower number should be chosen, and this should be coordinated with P802.3bj. Apart from for transition time measurements, this change seems feasible, and transition time specifications may be unnecessary anyway.

SuggestedRemedy

If feasible, choose a lower observation bandwidth such as 25 GHz, and reduce all the eye height entries to account for the lower observation bandwidth. Also review VEC and transition time limits in case they are affected.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional material required on the reduction of all eye height entries
[Editor's note: Clause changed from 93E to 83E]

Cl **95** *SC* **95.5.4** *P* **100** *L* **30** # 140

Dawe, Piers Mellanox

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

Defining signal detect by average power when signal compliance is largely based on OMA forbids any implementation from declaring certain out-of-spec signals after too much loss as FAIL, particularly if they have low extinction ratio. It turns out we don't need to do this. The definition below is even-handed to choice of implementation and consistent with other specs in this clause, so it's more correct and defensible than present draft or previous clauses.
Also proposed rewording of the signal detect criterion that continues to cause confusion. Note the -9 dBm below is Tx OMA of -7.1 dBm from Table 95-6, 100GBASE-SR4 transmit characteristics - max loss 1.9 dB from Table 95-8, 100GBASE-SR4 illustrative link power budget.

SuggestedRemedy

Change
[(Optical power at TP3 >= average receive power, each lane (min) in Table 95-7)
AND
(compliant 100GBASE-R signal input)]
to
Compliant 100GBASE-R signal input at TP3 with OMA >= -9 dBm and average optical power >= average receive power, each lane (min) in Table 95-7
(-9 would become -8.5 if another comment is accepted).

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The signal_detect value definition is in the same format as many other clauses.

The definition does allow an implementation to declare out of spec signals as FAIL (a non-complaint signal meeting the average power level is left undefined by Table 95-7).

The proposed remedy would require average power and OMA monitors, which may increase cost and power burn of the receiver.

See also comment 61
and also the final response to comment 95 against D1.0.

Cl **95** *SC* **95.7.1** *P* **102** *L* **43** # 141

Dawe, Piers Mellanox

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

As compared with 40GBASE-SR4 we have reduced OMA min and P_ave min by as much as we have reduced OMA minus TDP (min) and increased TDP max, implying that in spite of the larger TDP max, we wish to accommodate transmitters with the same (good) low end TDP as 40GBASE-SR4 and very low optical power. Is this really a likely scenario? It will be easier for e.g. network maintenance and diagnostics if the optical power levels for 40GBASE-SR4 and 100GBASE-SR4 are similar.

SuggestedRemedy

Consider increasing:
Average launch power, each lane (min) from -9.1 TBC to -8.6 TBC dBm,
Optical Modulation Amplitude (OMA), each lane (min) from -7.1 TBC to -6.6 TBC dBm,
Average receive power, each lane (min) from -11 TBC to -10.5 TBC dBm.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The TDP value for 100GBASE-SR4 includes a larger proportion of the 'allocation for penalties' than did 40GBASE-SR4. Penalising good high speed transmitters with a higher than necessary power level requirement may add to their cost.

Cl **83E** *SC* **83E.3.1.2** *P* **162** *L* **18** # 142

Dawe, Piers Mellanox

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

The apparent peak-to-peak differential output voltage of the host depends on the pattern used, because the host channel and HCB have loss and the signal is under-emphasised where observed. A misleadingly low voltage would be recorded with PRBS9, with an error depending on the (unknown) host loss.

SuggestedRemedy

Define peak-to-peak differential output voltage with patterns 3 (PRBS31) or 5 or 5f (see other comments about options for pattern 5). For preference, do this throughout 83D and 83E, but definitely for host output and crosstalk calibration.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional information on how a misleadingly low voltage would be recorded with PRBS9. 802.3bj also uses PRBS9 for differential and common mode signal levels

Cl **83E** *SC* **83E.3.1** *P* **162** *L* **13** # 143

Dawe, Piers Mellanox

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

The single ended output voltage specification adds welcome clarity. But is -0.8 V appropriate? Either the host output is DC coupled, when its voltage could not go far below 0 V without unusual power supply arrangements. Or it's AC coupled, and the bias voltage can float. The current spec puts an unnecessary constraint on the module's design of AC coupling and/or ESD protection, for a host situation that won't happen.
Also, why does Table 83E-1 say DC common-mode voltage when OIF VSR Table 13-1 says simply "Common Mode Voltage"?

SuggestedRemedy

Change -0.8 to -0.4. Add note saying this doesn't apply if the host presents a high DC common-mode impedance.
Consider changing DC common-mode output voltage (min) from -0.3 to -0.1, and/or change DC common-mode output voltage to Common-mode output voltage, twice.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change -0.8 to -0.4
DC common mode output voltage terminology consistent with 802.3bj, value consistent with OIF VSR.

Cl **83E** *SC* **83E.3.4.1** *P* **172** *L* **46** # 144

Dawe, Piers Mellanox

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

The module supports a particular PMD type which uses FEC or it doesn't. For modules using FEC, where the FEC is in the host (100GBASE-SR4 in QSFP for data centres, which was/is the point of the whole project and will be the highest volume optical type), requiring BER<1e-15 when the host-to-host chain of three links (CAUI-optical-CAUI) can work at 5e-5 places a pointless burden of test cost on the 100GBASE-SR4 module.
Also it requires larger voltages than necessary, which adds to thermal and crosstalk issues. These things are unnecessary costs in design as well as production.

Now, what about a data centre product that supports only 100GBASE-CR4 and 100GBASE-SR4 (and maybe non-802.3 500 m SMF) in QSFP - both of these use FEC which is in the host, so for 100GBASE-SR4, the chain of links CAUI-optical-CAUI has to work at BER<5e-5.

SuggestedRemedy

Create two classes of C2M CAUI-4. The one without FEC as is (BER max 1e-15), and the FEC-protected one with BER max 2.5e-6 (just 5% of the 5e-5 that delivers 1e-12 after FEC).
I believe the corrected BER for short packets for 2.5e-6 is 3.4e-23.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
See response to comment #137

Cl **95** *SC* **95.7.2** *P* **103** *L* **33** # 145

Dawe, Piers Mellanox

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

Use the best-practice terminology used in 802.3ba since pepeljugoski_01_0308.pdf: avoid "receive power" because it's ambiguous: some think it's the power that's received, others the power that could be received. It would be confusing to MMF product implementers and users if Clause 95 uses different words to Clause 86.

SuggestedRemedy

Change
Average receive power
to
Average power at receiver input
throughout Clause 95.
(Average power at TP3 would mean the same but be shorter.)
Similarly, change
Receive power, each lane (OMA) (max
to
Power in OMA at receiver input, each lane (OMA) (max)
or as 86.7.3:
Optical Modulation Amplitude (OMA), each lane (max)
noting the closing bracket.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
"Average receive power" is used in clauses 52, 53, 87, 88.
"Receive power (OMA)" is used in clauses 87, 88.

Add closing bracket to (max in
"Receive power, each lane (OMA) (max"

Cl **95** *SC* **95.7.1** *P* **102** *L* **51** # 146

Dawe, Piers Mellanox

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

We need more study to home in on a suitable TDP limit. TDP of 5 is near to a "cliff", and with FEC, it may be a little more than necessary.

SuggestedRemedy

Simulate the maximum TDP cases (product link and SRS test) and establish what TDP limit will give stably usable performance. Check for consistency between max TDP and the VECP in SRS test.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
petrilla_01_0813 presented work confirming the TDP value and method used to derive it, and was reviewed and agreed in the MMF ad hoc.

A presentation describing the results of further simulation work would be welcomed.

Cl **95** *SC* **95.7.1** *P* **103** *L* **13** # 147

Dawe, Piers Mellanox

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

As I understand it, this eye mask has been derived from a Gaussian model, which gives lower jitter than filter response types seen in practice.

SuggestedRemedy

Check this mask against other likely filter responses, tweak mask coordinates.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
No specific remedy provided.

Cl **95** *SC* **95.7.2** *P* **103** *L* **52** # 148

Dawe, Piers Mellanox

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

Even if we expect the stressed eye to look diamond shaped, we want to prioritise the level stress around X=0.39 and X=0.61.

SuggestedRemedy

Consider using a similar but 10-sided eye.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
No specific remedy suggested.

Cl **95** *SC* **95.1** *P* **95** *L* **13** # 149

Dawe, Piers Mellanox

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

Compare these three texts:
86.1 Overview
When forming a complete Physical Layer, a PMD shall be connected to the appropriate PMA as shown in Table 86-1, to the medium through the MDI, and ***optionally to the management functions that are accessible*** through the management interface defined in Clause 45, or equivalent.
87.1 Overview
When forming a complete Physical Layer, a PMD shall be connected to the appropriate PMA as shown in Table 87-1, to the medium through the MDI and ***to the management functions that are optionally accessible*** through the management interface defined in Clause 45, or equivalent.
95.1 Overview
When forming a complete Physical Layer, a PMD shall be connected to the appropriate PMA as shown in Table 95-1, to the medium through the MDI and ***to the management functions that are optionally accessible*** through the management interface defined in Clause 45, or equivalent.

It was agreed in P802.3ba that 86.1 and 87.1 should differ because 40GBASE-LR4 has a mandatory management function (87.5.8 PMD lane-by-lane transmit disable function shall be provided for testing purpose, although it does not have to be implemented in MDIO), while 40GBASE-SR4 and 100GBASE-SR10 do not. 40GBASE-LR4 needs this function for convenient testing of each WDM lane. 100GBASE-SR4, like 40GBASE-SR4 and 100GBASE-SR10, do not.

SuggestedRemedy

Change the sentence in 95.1 to align with 86.1.

Review any other such discrepancies.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The management functions may be accessible, so it seems more consistent to follow clause 52 :
change
"and to the management functions that are optionally accessible through the management interface defined in Clause 45, or equivalent."
to
". and optionally with the management functions that may be accessible through the management interface defined in Clause 45."

Cl **83D** *SC* **83D.3.1.5** *P* **146** *L* **50** # 150

Dawe, Piers Mellanox

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

This says "The eye mask shown in Figure 83D-7 is defined at a BER of 10-15, using the methodology described in TBD."
1. Masks don't have BER, they are just shapes. Passing a mask is usually defined by hit ratio, not BER.
2. For a near end mask, for a signal intended to go through a lossy noisy channel and deliver BER of 1e-15, 1e-15 is not the correct criterion anyway.
3. A 10-sided mask would give more consistent and relevant results and/or reduced test time.

SuggestedRemedy

Choose an appropriate hit ratio.
Choose an appropriate 10-sided mask.
Revise the wording so that you don't say the mask has a hit ratio.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Points in the eye mask can correspond to a BER. Since the link is to operate at 1E-15, 1E-15 is an appropriate criterion. Additional material required to consider suggested remedy

Cl **83D** *SC* **83D.2** *P* **143** *L* **5** # 151

Dawe, Piers Mellanox

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

The TP0a/TP5a test fixture in Clause 93 is defined with max and min loss but no unique reference loss. This forces the user to use two sets of boards, e.g. low loss and reflection for measuring reflection and transition time, high loss for measuring eye mask. Or risk his customer using the other type of board and failing his stuff. Or doing some complicated correction procedure. It's a pain. Even in design and simulation, it's a pain.

SuggestedRemedy

Working with P802.3bj, define a single test fixture reference loss and reflection (e.g. zero reflection, like all the other compliance board reference responses that I know) so that we don't have to do so many measurements and simulations twice.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Absolute compliance point loss can be difficult to meet based on implementation restrictions. Providing a range helps ensure implementation flexibility while minimizing variability (as the commenter highlights).

Cl **95** *SC* **95.7.3** *P* **104** *L* **40** # 152

Dawe, Piers — Mellanox

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

The relation between TDP and allocation for penalties (for max TDP) may not be correct.
But we don't need to solve this - electrical PMDs don't show such information.

SuggestedRemedy

Delete the row: Power budget (for max TDP)
Either delete:
Allocation for penalties (for max TDP)
or change it to:
Allocation for penalties that are not included in TDP
Its value is:
Launch power in OMA minus TDP (min) -8 TBC
+ TDP (max) +5 TBC
- Insertion losses -1.9
- Stressed receiver sensitivity (OMA) (max) +5.6
= 0.7 TBC dB

Proposed Response *Response Status* **W**

PROPOSED REJECT. [Editor's note: Clause changed from 10 to 95]
The suggested remedy would deviate from the formats of clause 86, 87, 88, 52.
For comparison, it is noted that clause 95 has just 1.3 dB of the 'allocation for penalties' not included in TDP vs 2.9 dB in clause 86.

Cl **83E** *SC* **83E.3.1** *P* **162** *L* **19** # 153

Dawe, Piers — Mellanox

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

We define the stressed eye in 33 GHz while OIF use 40 GHz. 40 GHz gives a less relevant measurement (the product receiver's bandwidth is less than 33 GHz so of the two, 33 GHz is more representative of the usable eye) but OIF wish to use the same observation bandwidth across all CEI-25/28, while we wish to use a consistent and more appropriate observation bandwidth across 802.3bj and 802.3bm. We also wish to keep the same effect of the spec as OIF VSR: a marginal signal under one spec should be marginal under the other.

SuggestedRemedy

Reduce all the eye height entries by a few percent to account for the lower observation bandwidth. Also review the VEC limits (any change would be very small, as high-VEC signals are already low bandwidth) and transition time limits.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Additional material required on "a few percent"
[Editor's note: Clause changed from 93E to 83E]

Cl **83E** *SC* **83E.3.3.1** *P* **169** *L* **32** # 154

Wertheim, Oded — Mellanox Technologies

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

The BER requirement for the CAUI-4 chip-to-module host receiver (10^-15 BER) introduces a requirement that does not seem to consider the FEC protection used in 100GBASE-SR4 links.
As a result, a host receiver, designed for links protected by FEC will still be required to match the 10^-15 BER requirement in order to be CAUI-4 chip-to-module compliant. This will introduce additional design and testing efforts and costs.

SuggestedRemedy

Modify the BER requirement to address FEC protected and FEC unprotected links. For a link with FEC protection, the host receiver should achieve the BER requirement after the FEC correction.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
See response to comment #137