Cl **FM** *SC* **FM** *P* **1** *L* **30** # 43

Marris, Arthur — Cadence Design Systems

Comment Type **E** *Comment Status* **X**

IEEE Std 802.3cm-2020 and 802.3cq-2002 have now been approved

SuggestedRemedy

Change 802.3cm-20XX to 802.3cm-2020 and 802.3cq-20XX to 802.3cq-2020 throughout the draft

Proposed Response *Response Status* **O**

Cl **FM** *SC* **FM** *P* **12** *L* **1** # 44

Marris, Arthur — Cadence Design Systems

Comment Type **E** *Comment Status* **X**

IEEE Std 802.3cg-2019 has been approved

SuggestedRemedy

Change 802.3cg-20XX to 802.3cg-2019 throughout the draft

Proposed Response *Response Status* **O**

Cl **FM** *SC* **FM** *P* **12** *L* **1** # 2

Wienckowski, Natalie — General Motors

Comment Type **E** *Comment Status* **X**

802.3cg was approved in 2019

SuggestedRemedy

Change 20xx to 2019

Proposed Response *Response Status* **O**

Cl **FM** *SC* **FM** *P* **12** *L* **13** # 99

Dudek, Mike — Marvell.

Comment Type **E** *Comment Status* **X**

802.3cm project is complete

SuggestedRemedy

Change 20xx to the appropriate date.

Proposed Response *Response Status* **O**

Cl **00** *SC* **0** *P* **12** *L* **1** # 49

Maguire, Valerie — The Siemon Company

Comment Type **E** *Comment Status* **X**

802.3cg has published.

SuggestedRemedy

Replace, "802.3cg-20xx" with, "802.3cg-2019"

Proposed Response *Response Status* **O**

Cl **00** *SC* **0** *P* **12** *L* **1** # 10

Lewis, Jon — Dell EMC

Comment Type **E** *Comment Status* **X**

IEEE Std 802.3cg-20xx should be 2019.

SuggestedRemedy

Change 20xx to 2019

Proposed Response *Response Status* **O**

Cl **00** *SC* **0** *P* **44** *L* **18** # 100

Dudek, Mike — Marvell.

Comment Type **E** *Comment Status* **X**

Incorrect reference in table 140-8

SuggestedRemedy

Change the maximum discrete reflectance from "see 140.10.3" to "see 140.10.2.2

Proposed Response *Response Status* **O**

Cl **1** *SC* **1** *P* **17** *L* **16** # 1

Wienckowski, Natalie General Motors

Comment Type **E** *Comment Status* **X**

The "important Notice" is no longer required according to IEEE.

SuggestedRemedy

Delete lines 16 through 26: IMPORTANT NOTICE: IEEE Standards documents are not intended to ensure safety, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and
regulations.
This IEEE document is made available for use subject to important notices and legal disclaimers. These
notices and disclaimers appear in all publications containing this document and may be found under the
heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Documents.”
They can also be obtained on request from IEEE or viewed at
http://standards.ieee.org/IPR/disclaimers.html

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.7.4** *P* **20** *L* **51** # 3

Wienckowski, Natalie General Motors

Comment Type **E** *Comment Status* **X**

Because you are showing a new row in the same table you are changing a row in, the text in the new row should be underlined to clearly show that this is new.

SuggestedRemedy

Underline all text in the last row of the table, including the cross-reference.

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.7.5** *P* **21** *L* **15** # 4

Wienckowski, Natalie General Motors

Comment Type **E** *Comment Status* **X**

Because you are showing a new row in the same table you are changing a row in, the text in the new row should be underlined to clearly show that this is new.

SuggestedRemedy

Underline all text in the last row of the table, including the cross-reference.

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.8** *P* **21** *L* **34** # 5

Wienckowski, Natalie General Motors

Comment Type **E** *Comment Status* **X**

Because you are showing a new row in the same table you are changing a row in, the text in the new row should be underlined to clearly show that this is new.

SuggestedRemedy

Underline all text in the last row of the table, including the cross-reference.

Proposed Response *Response Status* **O**

Cl **80** *SC* **80.1.14** *P* **25** *L* **14** # 42

Trowbridge, Steve Nokia

Comment Type **ER** *Comment Status* **X**

Two paragraphs in 80.1.4 from P802.3ba and P802.3bj (beginning on line 4, page 84, section 6 of IEEE Std 802.3-2018) are confusing when read in the context of new PMDs added by P802.3cd and P802.3cu

SuggestedRemedy

Bring into the draft and change the title of Table 80-4 to Nomenclature and clause correlation (100GBASE-R optical). In this way, the two table titles match the classification of the text in the base standard from clause 8.1.4.

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.1.4** *P* **33** *L* **10** # 7

Wienckowski, Natalie — General Motors

Comment Type **E** *Comment Status* **X**

Straddle the two Clause 151 labels to be in a single cell as is done for 117. (This should be done for 122 as well.)

SuggestedRemedy

Make the change defined in the comment.

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.1.4** *P* **33** *L* **28** # 26

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

The "O" and "M" for new rows must be underline.

SuggestedRemedy

Underline all text in new rows for 400GBASE-FR4 and 400GBASE-LR4-6.

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.1.4** *P* **33** *L* **28** # 6

Wienckowski, Natalie — General Motors

Comment Type **E** *Comment Status* **X**

All M's and O's in the 400GBASE-FR4 and 400GBASE-LR4-6 rows should be underlined as these are added text.

SuggestedRemedy

Add underlined as defined in the comment.

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.1.4** *P* **33** *L* **28** # 45

Marris, Arthur — Cadence Design Systems

Comment Type **E** *Comment Status* **X**

There needs to be more underlining in Table 116-4

SuggestedRemedy

Underline the table entries for the new PMDs in Table 116-4

Proposed Response *Response Status* **O**

Cl **140** *SC* **140** *P* **36** *L* **7** # 27

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

This is not an editing instruction, but this information is normally part of an editing instruction.

SuggestedRemedy

Delete "Clause 140 was added to IEEE Std 802.3-2018 by IEEE Std 803.3cd-2018". Change instruction at top of page to: "Change the title of Clause 140 (as inserted by IEEE Std 802.3cd-2018) as follows".

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.1** *P* **36** *L* **15** # 28

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

The word "three" here is not necessary. For future amendments, let's avoid unecessary words that might have to be revised in the future.

SuggestedRemedy

Delete "three".

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.1** *P* **37** *L* **1** # 117

Zimmerman, George — CME Cons./ADI, Cisco, Commscope, Marvell, SenTe

Comment Type **E** *Comment Status* **X**

If it is only the title and header of Table 140-1, say that and don't show all the rows. (usual is "unchanged rows not shown")

SuggestedRemedy

Change editing instruction to "Change Title and second column header of Table 140-1 as shown (unchanged rows not shown)"
Delete unchanged rows beginning at first body row.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6** *P* **41** *L* **18** # 54

Maniloff, Eric — Ciena

Comment Type **T** *Comment Status* **X**

The Average launch power max for 100GBASE-FR1 is calculated for an extinction ratio = ~14 dB. This is inconsistent with 100GBSE-LR1 as well as with 400GBASE-FR4 and 400GBASE-LR4-6, which all use an infinite extinction ratio in this calculation.

SuggestedRemedy

Use an infinite extinction ratio to calculate the Average launch power max for 100GBASE-FR1. Replace the value of -2.9 dBm in Table 140-6 with -3.2 dBm

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **26** # 66

Dawe, Piers — Mellanox

Comment Type **E** *Comment Status* **X**

In Table 140-6, transmit characteristics, the four rows for OMA - TDECQ could be combined into three. Doing so will help readers who are designing or testing a transmitter compliant to two columns at the same time. Similarly for the "allocation for penalties" rows in Table 140-8, illustrative link power budgets.

SuggestedRemedy

for extinction ratio ≥ 5 dB -2.2 -1.6 -0.4
for 4.5 dB ≤ extinction ratio < 5 dB -1.9 -1.6 -0.4
for extinction ratio < 4.5 dB -1.9 -1.5 -0.3

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **32** # 69

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **X**

The limit for TDECQ - 10log10(Ceq) (also known as K) is missing from two columns here, but it is still needed to protect the receiver from the bad signals that are not caught by the TDECQ limit or the overshoot limit. All other optical PAM4 transmitter specs have such a limit, which was introduced a long time ago, in July 2018 (P802.3cd/D3.4), and its continued presence is needed to protect equalizers, receivers and receiver designs that were/are designed relying on it.

To summarize the situation, we need different limits to exclude different kinds of bad signal: K protects receiver back end, TDECQ protects receiver front end and optical budget, overshoot spec against over-emphasised signals not caught by the other specs, and so on. We need them all, but K and TDECQ come off the same measurement, so not an extra cost.

SuggestedRemedy

Restore the limit for TDECQ - 10log10(Ceq) for 100GBASE-FR1 100GBASE-LR1, as before (3.4 dB, same as the TDECQ limit).

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **32** # 87

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

TDECQ-10log10(Ceq)(Max) was removed for 100GBASE-FR1 and 100GBASE-LR1 in Table 140-6.

SuggestedRemedy

Reinstate TDECQ-10log10(Ceq)(Max) for 100GBASE-FR1 and 100GBASE-LR1 using the values from 802.3cu D1.1. A supporting presentation will be provided for the TF meeting in Atlanta.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **34** # 68

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **X**

When limiting TECQ is needed, K(TP2) = TDECQ - 10log10(Ceq) must be limited too.

SuggestedRemedy

Under the row for TECQ in Table 140-6, insert a row for TECQ - 10log10(Ceq) (max), with the same limits as for TECQ. Also in Table 151-7.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **34** # 60

Dawe, Piers — Mellanox

Comment Type **T** *Comment Status* **X**

IEEE Standards Style Manual, 12. Homogeneity:
"The same term should be used throughout each standard or series of standards to designate a given concept. The use of an alternative term (synonym) for a concept already defined should be avoided."
We have established that TECQ and SECQ are the same thing. While "TECQ" (transmitter) is a nice name for a signal measured at TP2, "SECQ" (stressed or signal) works for a signal measured at TP3 also, so it seems that's the one we must choose.

SuggestedRemedy

Change "TECQ" to "SECQ" throughout the document. In Table 140-6, "TECQ (max)" could be changed to "SECQ at TP2 (max)", although 140.5.1 and 140.7 make clear that it's at TP2.
In tables 140-10 and 151-11, change "Stressed receiver conformance test signal calibration" to "SECQ".

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **42** # 72

Ingham, Jonathan — Broadcom

Comment Type **TR** *Comment Status* **X**

The material reviewed by the Task Force in order to justify the introduction of a Tx over/under-shoot limit is merely anecdotal and ultimately unconvincing.
In particular, I refer to cole_3cu_01b_0120, where Tx waveforms at 26.6 GBd (clearly of questionable relevance to this Task Force) are shown to lead to Rx LOL for 13.5% and 19% overshoot. The introduction of a new specification and the associated limit value of 12% on the basis of these isolated examples is the wrong conclusion. The observed LOL can be attributed to the performance of the particular Rx used for the measurements. Some implementers may have an Rx that performs poorly with 5% overshoot in the input waveform, whilst others may have an Rx that performs well with 30% overshoot. To set the limit based on the examples provided in cole_3cu_01b_0120 is inappropriate. In addition, it is not clear how overshoot is defined in this study, again rendering it difficult to justify the setting of a limit based on the results.
Constraining the Tx performance by introducing an additional specification potentially reduces yield and increases cost. Since there is no evidence that a new constraint is required for the PMD specifications under development by this Task Force, the over/under-shoot specification should be removed. 50 GBd PAM4 SMF PMDs have already undergone rigorous qualification and interoperability studies by end users, without the need being identified for any Tx over/under-shoot constraint other than the existing constraint on the largest magnitude tap coefficient in the reference equalizer.
Finally, with the continuing transition to optical interfaces that are reliant on Rx equalization, the interpretation of constraints on features of the TP2 waveform, especially if measured without the reference equalizer, is increasingly uncertain. This applies not only to traditional mask constraints but also to the constraint introduced in this draft. This is why the existing constraint on the largest magnitude tap coefficient in the reference equalizer is a superior method to control over/under-shoot.

SuggestedRemedy

In Table 140-6, delete the line with description "Transmitter over/under-shoot (max)". In Table 140-10, delete the line with parameter "Transmitter over/under-shoot". Delete subclause 140.7.11.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **42** # 88

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

Transmitter over/under-shoot (max) specifications for 100GBASE-FR1 and 100GBASE-LR1 are too stringent.

SuggestedRemedy

Change Transmitter over/under-shoot (max) specifications for 100GBASE-FR1 and 100GBASE-LR1 from 12% to 30%

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.1** *P* **41** *L* **42** # 89

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

Transmitter over/under-shoot (max) specifications for 100GBASE-FR1 and 100GBASE-LR1 currently indicated as normative.

SuggestedRemedy

Transmitter over/under-shoot (max) specifications are known to be used by one customer, for a different PAM4 PMD. Change the specifications to informative with an appropriate footnote for both 100BASE-FR1 and 100GBASE-LR1.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.2** *P* *L* # 52

Bhatt, Vipul — II-VI Incorporated

Comment Type **T** *Comment Status* **X**

As outlined in http://www.ieee802.org/3/cd/public/July18/king_3cd_02a_0718.pdf, discussed in Dawe and Echeverri-Chac?n cited on http://www.ieee802.org/3/cu/public/Jan20/cole_3cu_01b_0120.pdf#page=10, and expanded in http://www.ieee802.org/3/cu/public/Jan20/cole_3cu_01b_0120.pdf, “TDECQ-10.log(Ceq)” is an indirect and inaccurate indicator of transmitter impairments. Therefore, it fails to accurately indicate how hard the EQ has to work, or its likely resilience to receiver impairments. Similarly “SECQ – 10log10(Ceq)” has the same shortcomings and is not an appropriate condition for defining limits for Stressed Receiver Sensitivity and should be removed. This will align the Recever specifications with Transmitter specifications.

SuggestedRemedy

Delete entry for “SECQ – 10log10(Ceq)f (max)” for 100GBASE-FR and 100GBASE-LR in Table 140-7.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.2** *P* **42** *L* **11** # 11

Lewis, Jon — Dell EMC

Comment Type **E** *Comment Status* **X**

"defined in Table 140–7 per the definitions in 140.7." This just reads oddly given that the Table number and the subsequent clause are the same (140-7 and 140.7). It took me a moment to realize that the definitions weren't in the Table but in the clause 140.7.

SuggestedRemedy

Change "defined in Table 140–7 per the definitions in 140.7." to "defined in Table 140–7 per the definitions in clause 140.7."

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.2** *P* **43** *L* **12** # 35

Trowbridge, Steve — Nokia

Comment Type **ER** *Comment Status* **X**

Since this is a single-lane interface, there is only one wavelength

SuggestedRemedy

Change "Wavelengths (range) to "Wavelength (range)"

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.2** *P* **43** *L* **21** # 83

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

In Table 140-7 the values for Receiver sensitivity (max) for 100GBASE-FR1 and 100GBASE-LR1 only apply for values of SECQ up to 1.4 dB, but receivers need to work with SECQ up to 3.4 dB. The footnote pointing to the relevant equations is convoluted. It would be clearer to revert back to having the equation references in the table and simplifying the footnote.

SuggestedRemedy

In Table 140-7 Receiver sensitivity (OMAouter) (max), replace the values of -4.5 and -6.1 with Equation (140-2)and Equation (140-3) respectively.

Change footnote c to: Receiver sensitivity (OMAouter) (max) for 100GBASE-DR is informative and for 100GBASE-FR1 and 100GBASE-LR1 is normative. It is defined for a transmitter with a value of SECQ up to 3.4 dB.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.2** *P* **43** *L* **28** # 56

Stassar, Peter Huawei

Comment Type **TR** *Comment Status* **X**

At the January 2020 meeting in Geneva the cu Task Force agreed to delete the entries for "TDECQ - 10log10(Ceq) (max)" in Table 140-6 for 100GBASE-FR & LR.
As outlined in http://www.ieee802.org/3/cd/public/July18/king_3cd_02a_0718.pdf, as summarized in http://www.ieee802.org/3/cu/public/Jan20/cole_3cu_01b_0120.pdf, "TDECQ-10.log(Ceq)" is not a good indicator of how hard the EQ has to work, nor of it's likely resilience to receiver impairments.
Therefore "SECQ - 10log10(Ceq)" is not an appropriate condition for defining limits for Stressed Receiver Sensitivity and should be removed, maintaining consistency with the removal of "TDECQ-10.log(Ceq)" as a metric for transmitter quality.

SuggestedRemedy

Delete the entries for "SECQ - 10log10(Ceq)f (max)" for 100GBASE-FR and 100GBASE-LR in Table 140-7.

Additionally copy subclause 140.7.5 in from IEEE Std 802.3cd™-2018, and modify the first sentence "The TDECQ and TDECQ – 10log10(Ceq) shall be within the limits given in Table 140–6..." to "TDECQ shall be within the limits given in Table 140–6...".
This needs to be edited in a way that the original sentence is maintained for 100GBASE-DR.

Also copy subclause 140.7.10 in from IEEE Std 802.3cd™-2018, and modify the before last bullet to:
"The required values of the “Stressed receiver sensitivity (OMAouter) (max)” and “Stressed eye closure for PAM4 (SECQ)” are as given in Table 140–7."
This needs to be edited in a way that the original sentence is maintained for 100GBASE-DR.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.6.3** *P* **44** *L* **16** # 55

Maniloff, Eric Ciena

Comment Type **E** *Comment Status* **X**

Channel Insertion loss for 100GBASE-DR is referencing the incorrect sub-clause. The loss for this is in 140.9. Note that 802.3ct had the correct sub-clause referenced for the channel loss for 100GBASE-DR.

SuggestedRemedy

Change reference for 100GBASE-DR channel insertion loss to 140.9

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.1** *P* **45** *L* **2** # 75

Lewis, David Lumentum

Comment Type **T** *Comment Status* **X**

Need to add TECQ and Receiver sensitivity to Table 140-10.

SuggestedRemedy

Add a row: Transmitter eye closure for PAM4 (TECQ), pattern 6, subclause 140.7.12.

Add a row: Receiver sensitivity (OMAouter) (max), pattern 3 or 5, subclause 140.7.9.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.5** *P* **45** *L* **25** # 74

Lewis, David Lumentum

Comment Type **T** *Comment Status* **X**

This subclause in 802.3cd needs to be copied into the draft and modified to include 100GBASE-FR1 and 100GBASE-LR1.

SuggestedRemedy

Copy over subclause 140.7.5 from 802.3cd into the draft. Modify the first sentence from "The reference equalizer for 100GBASE-DR is a 5 tap..." to "The reference equalizer is a 5 tap...".

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.5.1** *P* **45** *L* **25** # 101

Dudek, Mike Marvell.

Comment Type **T** *Comment Status* **X**

The reference equalizer for 100GBASE-FR1 and 100GBASE-LR1 needs to be defined.

SuggestedRemedy

Bring 140.7.5.1 into the draft and change "100GBASE-DR" to "100GBASE-DR, 100GBASE-FR1 and 100GBASE-LR1"

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.9** *P* **45** *L* **37** # 84

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

Since receiver sensitivity is normative for 100GBASE-FR1 and 100GBASE-LR1, the word "should" needs to be replaced by "shall".

SuggestedRemedy

Replace "Receiver sensitivity should meet Equation (140-2)" with "Receiver sensitivity shall meet Equation (140-2)" on line 37.
Replace "Receiver sensitivity should meet Equation (140-3)" with "Receiver sensitivity shall meet Equation (140-3)" on line 42.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.9** *P* **45** *L* **47** # 85

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

The description of RS is not complete.

SuggestedRemedy

Replace "is the receiver sensitivity" with "is the receiver sensitivity (OMAouter) (max)", on line 47.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.9** *P* **45** *L* **50** # 102

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

This section is ambiguous as to whether sensitivity is normative or not for FR1 and LR1. It is pretty clear that it is normative on line 50, but "should" is used not "shall" on lines 37 and 42.

SuggestedRemedy

Change "should meet" to "shall meet" on lines 37 and 42.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.9** *P* **45** *L* **50** # 86

Lewis, David — Lumentum

Comment Type **ER** *Comment Status* **X**

There is underlining required in the paragraph at line 50 for changes from the original text in 802.3cd.

SuggestedRemedy

Underline "the 100GBASE-DR " and add a strikeout "s" after receiver. Underline all of the second sentence.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.9.** *P* **45** *L* **51** # 29

Brown, Matt — Huawei Technologies Canada

Comment Type **TR** *Comment Status* **X**

This paragraph says that for FR1/LR1 that RS and SRS are normative. Yet the statements above use the word "should" which is associated with an informative specification. The paragraph at line 51, provides no value and should be deleted. Like everywhere else in 802.3, the difference between normative and informative is clear from the wording, "shall" vs "should" or "may". From the standards style manual: "The word should indicates that among several possibilities, one is recommended as particularly suitable without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (should equals is recommended that)."

SuggestedRemedy

Delete the paragraph on page 45 line 51.
If a normative specfication is intended, then change the statements above to normative ("shall") statements.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **30** # 65

Dawe, Piers — Mellanox

Comment Type **T** *Comment Status* **X**

Don't put the subclause for Transmitter over/under-shoot after the receiver-related subclauses when all other transmitter-related subclauses in 140.7 are before.

SuggestedRemedy

Because it's so closely related to T(D)ECQ measurement, put it after Transmitter eye closure for PAM4 (TECQ) and before Extinction ratio.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **33** # 70

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **X**

We need to agree a measurement method for overshoot, and agree a limit. We should have an idea of what the threat is to design a useful defence, but here is a measurement proposal that at least should give consistent results.
First, notice that limiting overshoot at TP2 is pointless if chromatic dispersion can make it higher at TP3.
Also notice that a measurement on a square wave measures the worst of pre-emphasis and post-emphasis, but a real signal's overshoot can be determined by the sum of these. This is a bad choice of pattern anyway because PMAs may fail to lock on it and forward the signal correctly to the PMD.
Also notice that traditional peak measurements are distorted by scope noise, particularly for optical scopes at such high bandwidths.

SuggestedRemedy

Apply the spec to the same cases as TECQ and TDECQ: TP2, TP3 with most positive chromatic dispersion, and TP3 with most positive chromatic dispersion.
Use the same pattern and observation bandwidth as for T(D)ECQ so that determining the overshoot is another free by-product of measuring for T(D)ECQ, with a much simpler, non-iterative, calculation: in tables 140-10 and 151-11, remove the row for "Transmitter over/under-shoot", and here and in, delete "test pattern specified for transmitter over/under-shoot in Table 140-10".
Find the scope noise.
Create a vertical histogram from the measured waveform (not the equalized one).
Convolve the histogram with the noise that could be added to it at maximum T(D)ECQ, RSS-reduced by the scope noise.
Find the two points where the CDFs come to a number such as 5e-5.
Either find the distance from the "three" level to the upper point, and from the lower point to the "zero" (these are the overshoot and undershoot before normalisation), or find the distance from the average level to the upper point, and from the lower point to the average (these are the peak excursions).
Normalise by either OMA or standard deviation of the waveform. The former is more familiar, the latter avoids the pattern dependency of the OMA definition.
Limit upper and lower separately because excursions on just one side could overload a receiver.
Adjust the limits according to information I haven't seen at time of writing, or insert an editor's note for tables 140-6 and 151-7: "The limit for transmitter over/under-shoot needs confirmation before Standards Association ballot".
Delete most of 151.8.12 but refer to 140.7.11.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **35** # 90

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

Transmitter over/under-shoot measurement method lacking many definitions

SuggestedRemedy

Replace the editors note with the following text:

Transmitter over/under-shoot is measured by applying a noise function to an overshoot level (the convolution of the oscilloscope noise and an ideal gaussian distribution) and scaling the sigma of the noise until the cumulative distribution function (CDF) of the overshoot level meets the CDF of the signal at the SER of the PMD type, and is measured at two windows nominally centered at 0.45 UI and 0.55 UI (with a window width of 0.04 UI). The over/under-shoot test passes if the CDF reaches the prescribed SER below the over/under-shoot level in both of the measurement windows. The combined response of the O/E converter and oscilloscope has a 3 dB bandwidth of approximately 26.5625 GHz with a fourth-order Bessel-Thompson response to at least 1.3 x 53.125 GHz. At frequencies above 1.3 x 53.125 GHz the response should not exceed -20 dB. Compensation may be made for any deviation from an ideal fourth-order Bessel-Thompson response.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **36** # 16

Carlson, Steven — HSD/Bosch/Ethernovia

Comment Type **TR** *Comment Status* **X**

There should not be a note that technical text is needed in a WG draft. This text should have been present in D2.0.

SuggestedRemedy

Remove: Editor's Note: We need some text to describe the test method.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **36** # 36

Trowbridge, Steve — Nokia

Comment Type **TR** *Comment Status* **X**

The editor's note is effectively a TBD that should have been considered lack of technical completeness for moving to WG ballot

SuggestedRemedy

Provide the test method for Tx over/under-shoot

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **36** # 47

Slavick, Jeff — Broadcom

Comment Type **TR** *Comment Status* **X**

Editors note states a test method is missing to for checking that a device complies to the over/under shoot requirements.

SuggestedRemedy

Add a teset method

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.11** *P* **46** *L* **36** # 8

Wienckowski, Natalie — General Motors

Comment Type **TR** *Comment Status* **X**

There should not be a note that text is needed in a WG draft.

SuggestedRemedy

Remove the note: Editor's Note: We need some text to describe the test method.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.7.12** *P* **46** *L* **38** # 76

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

Description of TECQ test is missing.

SuggestedRemedy

Add a new subclause 140.7.12 Transmitter eye closure for PAM4 (TECQ)

The TECQ of each lane shall be within the limits given in Table 140-6 for 100GBASE-FR1 and 100GBASE-LR1 if measured using the test pattern for TECQ in Table 140-10. TECQ shall be measured using the methods specified for TDECQ in 140.7.5, except that the test fiber is not used.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.9** *P* **48** *L* **10** # 30

Brown, Matt — Huawei Technologies Canada

Comment Type **T** *Comment Status* **X**

Wasn't the reach for LR1 reduced to 6 km?

SuggestedRemedy

Change "10 000" to "6 000".

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10** *P* **50** *L* **35** # 67

Dawe, Piers — Mellanox

Comment Type **T** *Comment Status* **X**

Here, there is guidance for interoperation between 100GBASE-LR1 and 100GBASE-DR, and between 100GBASE-LR1 and 100GBASE-FR1, but not between 100GBASE-FR1 and 100GBASE-DR. Separately, there are statements in 140.6, but 140.6 is not referenced from here, nor are 140.10a and 140.10b referenced from there.

SuggestedRemedy

In 140.6, add one cross-reference and update two existing ones:
The 100GBASE-FR1 PMD interoperates with the 100GBASE-DR PMD provided that the channel requirements for 100GBASE-DR are met (see 140.10).
The 100GBASE-LR1 PMD interoperates with the 100GBASE-DR PMD provided that the channel requirements defined in 140.10a.2 are met.
The 100GBASE-LR1 PMD interoperates with the 100GBASE-FR1 PMD provided that the channel requirements defined in 140.10a.3 are met.

Change 140.10a and 140.10b as follows:
140.10a Requirements for interoperation between 100GBASE-DR, 100GBASE-FR1, and 100GBASE-LR1
The 100GBASE-DR, 100GBASE-FR1, and 100GBASE-LR1 PMDs can interoperate with each other as described here.
140.10a.1 Requirements for interoperation between 100GBASE-FR1 and 100GBASE-DR
The 100GBASE-FR1 and 100GBASE-DR PMDs can interoperate with each other provided that the fiber optic cabling (channel) characteristics for 100GBASE-DR (see 140.10) are met.
140.10a.2 Requirements for interoperation between 100GBASE-LR1 and 100GBASE-DR
...for 100GBASE-DR (see140.10) are met, with...
140.10a.3 Requirements for interoperation between 100GBASE-LR1 and 100GBASE-FR1
...for 100GBASE-FR1 (see140.10) are met, with...

For consistency, in 151.12,
...400GBASE-FR4 (see 151.11) are met, with...

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10.2.2** *P* **49** *L* **45** # 46

Slavick, Jeff — Broadcom

Comment Type **E** *Comment Status* **X**

Editors direction for modiying the sub-clause is not proper font

SuggestedRemedy

Change to proper font for providing directions to the editorial team

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10a** *P* **51** *L* **10** # 104

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The 100GBASE-LR1 transmitter has a minimum OMA-TDECQ increase of 1.5 dB over DR (when extinction ratio is between 4.5 and 5dB). The max attenuation should be 1.5dB more than the max DR channel attenuation (2.6dB in table 140-12) as the channels are the same except for attenuation.

SuggestedRemedy

Change the maximum loss from 3.9dB to 4.1dB.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10a** *P* **51** *L* **11** # 103

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The 100GBASE-LR1 receiver has 2.2dB better stressed sensitivity than DR at the same SECQ. The max attenuation should be 2.2dB more than the max DR channel attenuation (2.6dB in table 140-12) as the channels are the same except for attenuation.

SuggestedRemedy

Change the maximum loss from 4.5dB to 4.8dB.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10b** *P* **51** *L* **14** # 37

Trowbridge, Steve — Nokia

Comment Type **T** *Comment Status* **X**

Is it the case that 100GBASE-FR1 can interoperate with 100GBASE-DR with no extra min/max loss specified?

SuggestedRemedy

If FR1/DR can interoperate up to DR reach without needing any extra min/max loss limits, perhaps worth adding a clause 140.10c with a single sentence to say this. Otherwise, add the appropriate min/max loss table.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10b** *P* **51** *L* **32** # 105

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The 100GBASE-LR1 receiver has 1.6dB better stressed sensitivity than FR1 at the same SECQ. The max attenuation should be 1.6dB more than the max FR channel attenuation (4dB) as the channels are the same except for attenuation.

SuggestedRemedy

Change the maximum loss from 5.1dB to 5.6dB.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.10b** *P* **51** *L* **33** # 106

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The 100GBASE-LR1 transmitter has an OMA-TDECQ increase of 1.2 over FR1. The max attenuation should be 1.2dB more than the max FR1 channel attenuation (4dB) as the channels are the same except for attenuation.

SuggestedRemedy

Change the maximum loss from 4.9 dB to 5.2dB.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.11.4.4** *P* **54** *L* **25** # 41

Trowbridge, Steve — Nokia

Comment Type **TR** *Comment Status* **X**

This table hasn't been incorporated into the P802.3cu draft, however once the missing measurement method in 140.7.11 for over/undershoot is provided, this clause/table should be brought into the draft and an OM10 PICs item should be added to point to 140.7.11.

SuggestedRemedy

Bring the table from P802.3cd clause 140.11.4.4 into the draft and add an OM10 PICS item to point to 140.7.11.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.11.4.6** *P* **54** *L* **28** # 91

Nicholl, Gary — Cisco Systems

Comment Type **T** *Comment Status* **X**

Missing PICS items for Overshoot, TECQ and Receiver Sensitivity tests

SuggestedRemedy

Insert Section 140.11.4.4 from 802.3cd before Section 140.11.4.6, and amend to include new PICS itens for Overshoot, TECQ and Receiver Sensitivity. Make this PICS items mandatory for 100GBASE-FR1 and 100GBASE-LR1 only.

Proposed Response *Response Status* **O**

Cl **140** *SC* **140.11.4.6** *P* **54** *L* **40** # 107

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The requirements for the maximum discrete reflectance in table 140-12 don't apply to LR1/FR1 which are given in Table 140-14

SuggestedRemedy

Change the PICs to match the requirements.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151** *P* **55** *L* **1** # 82

Lewis, David — Lumentum

Comment Type **TR** *Comment Status* **X**

Additional test data is now available and we should revisit the limitation of 400GBASE-LR4-6 to 6 km reach. A supporting presentation will be made.

SuggestedRemedy

Change 400GBASE-LR4-6 to 400GBASE-LR4 throughout.
Change 6 km to 10 km in Table 151-6, Table 151-9, footnote a of Table 151-12, Table 151-13, at 1.4.107a, 30.5.1.1.2, Table 116-2, Figure 151-1.
In Table 151-12 change the coefficient from 0.138 to 0.23 for minimum and maximum dispersion of 400GBASE-LR4.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151** *P* **55** *L* **1** # 118

Zimmerman, George — CME Cons./ADI, Cisco, Commscope, Marvell, SenTe

Comment Type **E** *Comment Status* **X**

Insert instruction for clause 151 is missing

SuggestedRemedy

Add new editing instruction before header to clause 151 - "Insert new clause 151 in numeric order as follows"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.1** *P* **55** *L* **30** # 31

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

Use proper terminology. See Annexes 120B, 120C, 120D, 120E.

SuggestedRemedy

Change as follows…
"Chip-to-chip 400GAUI-16" to "400GAUI-16 C2C"
"Chip-to-module 400GAUI-16" "400GAUI-16 C2M"
"Chip-to-chip 400GAUI-8" to "400GAUI-8 C2C"
"Chip-to-module 400GAUI-8" to "400GAUI-8 C2M"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.5.1** *P* **58** *L* **45** # 50

Maguire, Valerie — The Siemon Company

Comment Type **E** *Comment Status* **X**

Extra spaces between paragraphs.

SuggestedRemedy

Remove carriage returns on lines 45 and 46.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.5.4** *P* **59** *L* **53** # 18

Brown, Matt — Huawei Technologies Canada

Comment Type **TR** *Comment Status* **X**

The reference should be to 151.2 rather than 116.3. It is correct that 116.3 provides the default architecture, 151.2 points to 116.3 and provides additional information for mapping SIGNAL_DETECT.

SuggestedRemedy

Change the reference to "161.3" to "151.2".

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.5.4** *P* **60** *L* **12** # 108

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The condition for signal detect fail is Average Optical power <=-30dBm. The Average launch power of OFF transmitter is -16dBm in table 151-7. i.e. an OFF transmitter will not cause signal detect to negate.

SuggestedRemedy

Change -30dBm to -16dBm

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7** *P* **62** *L* **23** # 33

Lusted, Kent — Intel

Comment Type **TR** *Comment Status* **X**

The references to G.657.A1 and G657.A2 are assumed to be ITU-T G.657, 2009 from the base standard because no other version is referenced in this draft specification. However, a newer version of ITU-T G.657 published 2016 makes numerous changes to the SMF specifications that may be relevant to this draft.

SuggestedRemedy

Update the Normative Reference in Clause 1.3 from the base specfication (IEEE 802.3-2018) with the updated ITU-T G.657 document.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7** *P* **62** *L* **23** # 32

Lusted, Kent — Intel

Comment Type **TR** *Comment Status* **X**

The references to G.652.B and G652.D are assumed to be ITU-T G.652, 2009 from the base standard because no other version is referenced in this draft specification. However, a newer version of ITU-T G.652 published 2016 makes numerous changes to the SMF specifications that may be relevant to this draft.

SuggestedRemedy

Update the Normative Reference in Clause 1.3 from the base specfication (IEEE 802.3-2018) with the updated ITU-T G.652 document.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* *L* # 122

Zivny, Pavel — Tektronix

Comment Type **T** *Comment Status* **X**

Table 151.7 , entry "Transmitter over/under-shoot (max)" , value "12%" (both reaches).
In the presentation "zivny_3cu_01_0320" we show that the transmitter overshoot degrades the link performance more significantly in cases of absolute overshoot (rather than relative overhoot). We further show that the peaking impact starts at the level of about 4.5 dBm. (with margin, 4.3 dBm is desirable)

SuggestedRemedy

1. remove the 12% overshoot value (same table)
2. in its place insert this overshoot specification:
"Transmitter overshoot (max)" , value "4.3 dBm"
3. follow illustration in the presentation (see aobve) for the definition of "overshoot"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **14** # 109

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The Average launch power each lane (max) seems very low for FR4 compared to LR4-6. (2.1dB lower) whereas the OMA outer max is only 0.7dB higher. (and OMA outer - TDECQ) is only 0.5dB higher. For LR4-6 this max averageoutput with the max OMA the ER would be 3.5dB however which is the min ER. For FR4 at the max OMA the ER would have to be >5.1dB

SuggestedRemedy

Consider why there is such a difference in philosophy between allowing a high average power and requiring high overload and damage points versus requiring higher ER when the OMA is high. Adjust the specifications as appropriate.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **15** # 92

Nicholl, Gary — Cisco Systems

Comment Type **T** *Comment Status* **X**

Table 151-7. The relationship between AvgPwr(max) and OMAouter(max) for 400GBASE-LR4-6 is inconsistent with that used for 400GBASE-FR4, 100GBASE-DR, 100GBASE-FR1 and 100BASE-LR1.

In the case of 400GBASE-LF4-6 the average power max is 1.2 dBm higher than the OMA max, but for the other PMDs the average power max is 0.2dB lower than the PMA max.

SuggestedRemedy

Make the following changes in Table 151-7:

Change the Average launch power, each lane (max) for 400GBASE-LR4-6 from 5.6 dBm to 4.2 dBm.
Change the Total average launch power (max) for 400GBASE-LR4-6 from 11.6 dBm to 10.2 dBm.

Make the following changes in Table 151-8:

Change the Average receive power, each lane (max) for 400GBASE-LR4-6 from 5.6 dBm to 4.2dBm.
Change the Damage thresholda, each lane for 400GBASE-LR4-6 from 6.6 dBm to 5.2dBm.

Make the following changes to Table 151-16 in Section 151.12:

Change the 400GBASE-LR4-6 transmitter to 400GBASE-FR4 receiver Min loss from 2.1 dB to 0.7dB.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **28** # 93

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

TDECQ-10log10(Ceq)(Max) was removed from Table 151-7.

SuggestedRemedy

Reinstate TDECQ-10log10(Ceq)(Max) for 400GBASE-FR4 and 400GBASE-LR4-6 in Table 151-7, and using the values from 802.3cu D1.1

A supporting presentation will be provided for the TF meeting in Atlanta.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **29** # 59

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **X**

The limit for TDECQ - 10log10(Ceq) (also known as K) has been deleted from this table, but it is still needed to protect the receiver from the bad signals that are not caught by the TDECQ limit or the overshoot limit. All other optical PAM4 transmitter specs have such a limit, which was introduced a long time ago, in July 2018 (P802.3cd/D3.4), and its continued presence is needed to protect equalizers, receivers and receiver designs that were/are designed relying on it. Particularly 400GBASE-LR4-6 where the TDECQ limit is higher than for any existing SMF PMD.

To summarize the situation, we need different limits to exclude different kinds of bad signal: K protects receiver back end, TDECQ protects receiver front end and optical budget, overshoot spec against over-emphasised signals not caught by the other specs, and so on. We need them all, but K and TDECQ come off the same measurement, so not an extra cost.

SuggestedRemedy

Restore the limits for TDECQ - 10log10(Ceq) as before (3.4 dB for 400GBASE-FR4 and 3.5 dB for 400GBASE-LR4-6, same as the TDECQ limits).

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **31** # 62

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **X**

When limiting TECQ is needed, K(TP2) = TDECQ - 10log10(Ceq) must be limited too.

SuggestedRemedy

Under the row for TECQ in Table 140-6, insert a row for TECQ - 10log10(Ceq) (max), with the same limits as for TECQ. Also in Table 151-7.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **37** # 64

Dawe, Piers — Mellanox

Comment Type **T** *Comment Status* **X**

The transmitter transition time, max 17 ps at TP2, is probably so slow as to be barely effective for a low-dispersion PMD type: it's not far off the slowest that can be made for a 3.4 dB T(D)ECQ limits. If a transmitter is that slow, and significant chromatic dispersion, particularly in 400GBASE-LR4-6, makes the signal at the receiver even slower, it would be slower than any 400GBASE-DR4 or 100GBASE-DR signal could be, yet still pass the higher 3.5 dB TDECQ limit. Any PMD (polarisation mode dispersion) will make this worse. We don't expect that implementers will create equalizer ICs specially for each PMD type; they will be the same as for all 100G/lane, so we should not present them with a new and unnecessary challenge. I doubt that real transmitters are that slow.

If we wanted to contain the problem more precisely, we could introduce a maximum cursor tap limit (part of both TECQ at TP2 and TDECQ at TP3, and could be applied consistently across PMDs).

See http://ieee802.org/3/cn/public/tf_interim/19_0820/dawe_3cn_01_190820.pdf for an earlier report on this issue; halve all the times for 100G/s lanes.

SuggestedRemedy

Reduce the transition time limit, to 15 or 16 ps TBD, or introduce a maximum cursor tap limit. The limit (ps or cursor) should be checked with a commercial simulator.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **38** # 73

Ingham, Jonathan — Broadcom

Comment Type **TR** *Comment Status* **X**

The material reviewed by the Task Force in order to justify the introduction of a Tx over/under-shoot limit is merely anecdotal and ultimately unconvincing.
In particular, I refer to cole_3cu_01b_0120, where Tx waveforms at 26.6 GBd (clearly of questionable relevance to this Task Force) are shown to lead to Rx LOL for 13.5% and 19% overshoot. The introduction of a new specification and the associated limit value of 12% on the basis of these isolated examples is the wrong conclusion. The observed LOL can be attributed to the performance of the particular Rx used for the measurements. Some implementers may have an Rx that performs poorly with 5% overshoot in the input waveform, whilst others may have an Rx that performs well with 30% overshoot. To set the limit based on the examples provided in cole_3cu_01b_0120 is inappropriate. In addition, it is not clear how overshoot is defined in this study, again rendering it difficult to justify the setting of a limit based on the results.
Constraining the Tx performance by introducing an additional specification potentially reduces yield and increases cost. Since there is no evidence that a new constraint is required for the PMD specifications under development by this Task Force, the over/under-shoot specification should be removed. 50 GBd PAM4 SMF PMDs have already undergone rigorous qualification and interoperability studies by end users, without the need being identified for any Tx over/under-shoot constraint other than the existing constraint on the largest magnitude tap coefficient in the reference equalizer.
Finally, with the continuing transition to optical interfaces that are reliant on Rx equalization, the interpretation of constraints on features of the TP2 waveform, especially if measured without the reference equalizer, is increasingly uncertain. This applies not only to traditional mask constraints but also to the constraint introduced in this draft. This is why the existing constraint on the largest magnitude tap coefficient in the reference equalizer is a superior method to control over/under-shoot.

SuggestedRemedy

In Table 151-7, delete the line with description "Transmitter over/under-shoot (max)". In Table 151-11, delete the line with parameter "Transmitter over/under-shoot". Delete subclause 151.8.12.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **38** # 95

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

Transmitter over/under-shoot (max) specifications for 400GBASE-FR4 and 400GBASE-LR4-6 currently indicated as normative.

SuggestedRemedy

Transmitter over/under-shoot (max) specifications are known to be used by one customer, for a different PAM4 PMD.Change the specifications to informative with an appropriate footnote for both 400BASE-FR4 and 400GBASE-LR4-6.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **38** # 94

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

Transmitter over/under-shoot (max) specifications for 400GBASE-FR4 and 400GBASE-LR4-6 are too stringent

SuggestedRemedy

Change Transmitter over/under-shoot (max) specifications for 400GBASE-FR4 and 400GBASE-LR4-6 from 12% to 30%

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.1** *P* **63** *L* **47** # 19

Brown, Matt — Huawei Technologies Canada

Comment Type **TR** *Comment Status* **X**

For footnote "b", what is the significance of "even if"? Are there other cases where it should? I suspect that the intention is that the OMA_outer is supposed to be met over a range of ER and TDECQ.

SuggestedRemedy

Explain more completely what the intent for meeting OMA_outer is.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.2** *P* *L* # 53

Bhatt, Vipul — II-VI Incorporated

Comment Type **T** *Comment Status* **X**

As outlined in http://www.ieee802.org/3/cd/public/July18/king_3cd_02a_0718.pdf, discussed in Dawe and Echeverri-Chac?n cited on http://www.ieee802.org/3/cu/public/Jan20/cole_3cu_01b_0120.pdf#page=10, and expanded in http://www.ieee802.org/3/cu/public/Jan20/cole_3cu_01b_0120.pdf, “TDECQ-10.log(Ceq)” is an indirect and inaccurate indicator of transmitter impairments. Therefore, it fails to accurately indicate how hard the EQ has to work, or its likely resilience to receiver impairments. Similarly “SECQ – 10log10(Ceq)” has the same shortcomings and is not an appropriate condition for defining limits for Stressed Receiver Sensitivity and should be removed. This will align the Recever specifications with Transmitter specifications.

SuggestedRemedy

Delete row for “SECQ – 10log10(Ceq)f, lane under test (max)” for 400GBASE-FR4 and 100GBASE-LR4-6 in Table 151-8.

Delete “SECQ – 10log10(Ceq) (max), lane under test” in the last bullet item in 151.8.11.2.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.2** *P* **64** *L* **3** # 20

Brown, Matt — Huawei Technologies Canada

Comment Type **T** *Comment Status* **X**

The specifications are not defined in Table 151-8, they are listed there; the specifications are defined within subclause 151.8.

SuggestedRemedy

Delete "defined" twice.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.2** *P* **64** *L* **29** # 77

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

In Table 151-8 the values for Receiver sensitivity (max) only apply for values of SECQ up to 1.4 dB, but receivers need to work with SECQ up to 3.4 dB. The footnote pointing to the relevant equations is convoluted. It would be clearer to revert back to having the equation references in the table and simplifying the footnote.

SuggestedRemedy

In Table 151-8 Receiver sensitivity (OMAouter) (max), replace the values of -4.6 and -4.7 with Equation (151-1)and Equation (151-2) respectively.

Change footnote c to: Receiver sensitivity (OMAouter) (max) is defined for a transmitter with a value of SECQ up to 3.4 dB.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.2** *P* **64** *L* **35** # 57

Stassar, Peter — Huawei

Comment Type **TR** *Comment Status* **X**

At the January 2020 meeting in Geneva the cu Task Force agreed to delete the entries for "TDECQ - 10log10(Ceq) (max)" in Table 151-7 for 400GBASE-FR4 & LR4-6.
As outlined in http://www.ieee802.org/3/cd/public/July18/king_3cd_02a_0718.pdf, as summarized in http://www.ieee802.org/3/cu/public/Jan20/cole_3cu_01b_0120.pdf, "TDECQ-10.log(Ceq)" is not a good indicator of how hard the EQ has to work, nor of it's likely resilience to receiver impairments.
Therefore "SECQ - 10log10(Ceq)" is not an appropriate condition for defining limits for Stressed Receiver Sensitivity and should be removed, maintaining consistency with the removal of "TDECQ-10.log(Ceq)" as a metric for transmitter quality.

SuggestedRemedy

Delete row for "SECQ - 10log10(Ceq)f, lane under test (max)" for 400GBASE-FR4 and 100GBASE-LR4-6 in Table 151-8.

Additionally delete "SECQ - 10log10(Ceq) (max), lane under test" in the last bullet item in 151.8.11.2.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.2** *P* **64** *L* **35** # 119

Chang, Frank — Source

Comment Type **T** *Comment Status* **X**

For FR4 and LR4-6, the usefulness of 10Log(Ceq) is questionable, "SECQ-10Log(Ceq)" is not capable to prevent excess peaking and ensure interop, we will present some test results for this.

SuggestedRemedy

Take "SECQ-10Log(Ceq)" out of specs for FR4 and LR4-6 in Table 151-8

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.7.2** *P* **64** *L* **42** # 21

Brown, Matt — Huawei Technologies Canada

Comment Type **TR** *Comment Status* **X**

The intent of footnote b is unclear. The referencing row is average receive power minimum, each lane, whereas the footnote talks about Receiver Sensitivity (OMA_outer). Perhaps the footnote should be moved down a row. Even then its not clear. Does it then mean that the values in the row above must be met for SECQ less than 1.4 dB, but then the values the reference equations (which also defined RS) are used?

SuggestedRemedy

Move the location of the footnote reference if it makes sense. Reword footnote to provide a bit more clarity for the whole specification of RS.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.1** *P* **66** *L* **17** # 81

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

Need entries in Table 151-11 for TECQ and Receiver sensitivity.

SuggestedRemedy

Add a row: Transmitter eye closure for PAM4 (TECQ), pattern 6, subclause 151.8.6.

Add a row: Receiver sensitivity (OMAouter) (max), pattern 3 or 5, subclause 151.8.10.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.2** *P* **66** *L* **42** # 110

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

Table 151-5 does not specify SMSR

SuggestedRemedy

Change the table reference to 151-7

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5** *P* **67** *L* **29** # 120

Chang, Frank — Source

Comment Type **E** *Comment Status* **X**

"TDECQ –10log(Ceq)" should not be there anymore

SuggestedRemedy

Delete "TDECQ –10log(Ceq)"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5** *P* **67** *L* **29** # 38

Trowbridge, Steve — Nokia

Comment Type **TR** *Comment Status* **X**

TDECQ-10log10(Ceq) is not a parameter for any PMD defined in this clause.

SuggestedRemedy

Delete ", TDECQ-10log10(Ceq)," from the first sentence of 151.8.5

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5.1** *P* **67** *L* **50** # 22

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

The acronym RIN has not been defined in the Clause.

SuggestedRemedy

Change "RIN" to "relative intensity noise (RIN)".

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5** *P* **67** *L* **29** # 71

Stassar, Peter — Huawei

Comment Type **TR** *Comment Status* **X**

Since the agreement at the January 2020 meeting in Geneva to remove the row for "TDECQ – 10log10(Ceq) (max)" in Table 151-7, the inclusion of "TDECQ – 10log10(Ceq)" in the text of subclause 151.8.5 should be removed as well.

SuggestedRemedy

Delete "TDECQ – 10log10(Ceq)," in the first sentence of 151.8.5.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5.1** *P* **69** *L* **7** # 23

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

The acronym DGD has not been defined in the Clause.

SuggestedRemedy

Change "DGD" to "differential group delay (DGD)".

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5.4** *P* **69** *L* **18** # 58

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **X**

The 12% overshoot limit means that the largest magnitude tap coefficient minimum of 0.8 specified in 121.8.5.4 is too low. No signal with less than about 0.9 can pass this overshoot spec. Note that 140.7.5.1 is in IEEE Std 802.3cd. If we change this to 0.85, the overshoot limit (if applied at TP3) would bite first. It would be better to tighten this to 0.9 (higher for a better signal).
If in future the overshoot limit is propagated to other PAM4 PMDs in maintenance, the two limits in the proposed sentence could be consolidated again.

SuggestedRemedy

In 151.8.5.4 and 140.7.5.1 (in 802.3cd), change:
Tap 1, tap 2, or tap 3 has the largest magnitude tap coefficient, which is constrained to be at least 0.8. to:
Tap 1, tap 2, or tap 3 has the largest magnitude tap coefficient. For 100GBASE-DR, this is constrained to be at least 0.8, and for 100GBASE-FR1 and 100GBASE-LR1, it is constrained to be at least 0.85.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5.4** *P* **69** *L* **28** # 24

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

In figure 151-4, Insconsistent font type and size.

SuggestedRemedy

Change all to Arial 8pt.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.5.4** *P* **72** *L* **28** # 25

Brown, Matt — Huawei Technologies Canada

Comment Type **E** *Comment Status* **X**

In figure 151-7, insconsistent font type and size.

SuggestedRemedy

Change all to Arial 8pt.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.6** *P* **69** *L* **39** # 63

Dawe, Piers — Mellanox

Comment Type **T** *Comment Status* **X**

There is probably too much material in 151.8 that duplicates 140.7 and possibly 124.8 or 121.8, wasting a careful reader's time. Transmitter transition time is a prime example.

SuggestedRemedy

Try to consolidate the definitions as appropriate.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.6** *P* **69** *L* **39** # 61

Dawe, Piers — Mellanox

Comment Type **T** *Comment Status* **X**

There is a subclause 151.8.6 Transmitter eye closure for PAM4 (TECQ) but no equivalent for Clause 140.

SuggestedRemedy

Move this subclause to 140.7.5a (after TDECQ). Refer to it from 151.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.6** *P* **69** *L* **41** # 80

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

For uniformity with the other subclauses in 151.8, we should reference the limits and the test pattern for the test.

SuggestedRemedy

Add a sentence at the beginning of the paragraph: "The TECQ of each lane shall be within the limits given in Table 151-7 for 400GBASE-FR4 and 400GBASE-LR4-6 if measured using a test pattern specified for TECQ in Table 151-11.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.10** *P* **70** *L* **32** # 96

Nicholl, Gary — Cisco Systems

Comment Type **T** *Comment Status* **X**

This paragraph says that both RS and SRS are normative. Yet the statements use the word "should" which is associated with an informative specification.

Like everywhere else in 802.3, the difference between normative and informative is clear from the wording, "shall" vs "should" or "may". From the standards style manual: "The word should indicates that among several possibilities, one is recommended as particularly suitable without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (should equals is recommended that)."

SuggestedRemedy

If a normative specfication is intended, then change the statements above to normative ("shall") statements.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.10** *P* **70** *L* **35** # 78

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

Since receiver sensitivity is normative, the word "should" needs to be replaced by "shall".

SuggestedRemedy

Replace "Receiver sensitivity should meet Equation (1151-1)" with "Receiver sensitivity shall meet Equation (151-1)" on line 35.
Replace "Receiver sensitivity should meet Equation (151-2)" with "Receiver sensitivity shall meet Equation (151-2)" on line 38.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.10** *P* **70** *L* **35** # 111

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

This section is somewhat ambiguous as to whether sensitivity is normative or not for FR1 and LR1. It is pretty clear that it is normative on page 71 line 28 but "should" is used not "shall" on lines 35 and 38.

SuggestedRemedy

Change "should meet" to "shall meet" on lines 35 and 38.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.10** *P* **70** *L* **47** # 79

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **X**

The description of RS is not complete.

SuggestedRemedy

Replace "is the receiver sensitivity" with "is the receiver sensitivity (OMAouter) (max)", on line 47.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.11** *P* **71** *L* **38** # 112

Dudek, Mike — Marvell.

Comment Type **E** *Comment Status* **X**

There are only two different patterns allowed

SuggestedRemedy

Change "any" to "either"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.11.2** *P* **73** *L* **12** # 113

Dudek, Mike — Marvell.

Comment Type **E** *Comment Status* **X**

RINxx.x is not defined in this clause (or the glossary)

SuggestedRemedy

Define what it is here.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.11.2** *P* **77** *L* **17** # 121

Chang, Frank — Source

Comment Type **E** *Comment Status* **X**

“SECQ – 10log10(Ceq) (max), lane under test" seems not needed any more.

SuggestedRemedy

Delete “SECQ – 10log10(Ceq) (max), lane under test"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.12** *P* **73** *L* **44** # 97

Nicholl, Gary — Cisco Systems

Comment Type **TR** *Comment Status* **X**

Transmitter over/under-shoot measurement method lacking many definitions

SuggestedRemedy

Replace the editors note with the following text:

Transmitter over/under-shoot is measured by applying a noise function to an overshoot level (the convolution of the oscilloscope noise and an ideal gaussian distribution) and scaling the sigma of the noise until the cumulative distribution function (CDF) of the overshoot level meets the CDF of the signal at the SER of the PMD type, and is measured at two windows nominally centered at 0.45 UI and 0.55 UI (with a window width of 0.04 UI). The over/under-shoot test passes if the CDF reaches the prescribed SER below the over/under-shoot level in both of the measurement windows. The combined response of the O/E converter and oscilloscope has a 3 dB bandwidth of approximately 26.5625 GHz with a fourth-order Bessel-Thompson response to at least 1.3 x 53.125 GHz. At frequencies above 1.3 x 53.125 GHz the response should not exceed -20 dB. Compensation may be made for any deviation from an ideal fourth-order Bessel-Thompson response.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.12** *P* **73** *L* **44** # 34

Effenberger, Frank — Futurewei Technologies

Comment Type **TR** *Comment Status* **X**

The test method for overshoot is missing

SuggestedRemedy

Replace the editor's note with the material found in the associated supplementary file

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.12** *P* **73** *L* **44** # 39

Trowbridge, Steve — Nokia

Comment Type **TR** *Comment Status* **X**

The editor's note is effectively a TBD that should have been considered lack of technical completeness for moving to WG ballot

SuggestedRemedy

Provide the test method for Tx over/under-shoot

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.12** *P* **73** *L* **45** # 9

Wienckowski, Natalie — General Motors

Comment Type **TR** *Comment Status* **X**

There should not be a note that text is needed in a WG draft.

SuggestedRemedy

Remove the note: Editor's Note: We need some text to describe the test method.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.12** *P* **73** *L* **45** # 48

Slavick, Jeff — Broadcom

Comment Type **TR** *Comment Status* **X**

Editors note states a test method is missing to for checking that a device complies to the over/under shoot requirements.

SuggestedRemedy

Add a teset method

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.8.12** *P* **73** *L* **45** # 17

Carlson, Steven — HSD/Bosch/Ethernovia

Comment Type **TR** *Comment Status* **X**

There should not be a note that technical text is needed in a WG draft. This text should have been present in D2.0.

SuggestedRemedy

Remove: Editor's Note: We need some text to describe the test method.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.9.1** *P* **73** *L* **52** # 12

Lewis, Jon — Dell EMC

Comment Type **T** *Comment Status* **X**

P802.3cr has centralized the general safety references in Annex J. P802.3cr is in a recirculation WG ballot and is likely to complete prior to P802.3cu. TF Chairs should discuss the order of the amendments as that would determine if this change should happen in P802.3cu or P802.3cr.

SuggestedRemedy

Change "All equipment subject to this clause shall conform to IEC 60950-1." to "All equipment subject to this clause shall conform to the general safety requirements as specified in J.2". Add Editor's Note to be removed prior to SA ballot to align text with changes to P802.3cr.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.9.1** *P* **73** *L* **52** # 14

Carlson, Steven — HSD/Bosch/Ethernovia

Comment Type **TR** *Comment Status* **X**

P802.3cr is harmonizing general safety references across all of IEEE 802.3 in Annex J. P802.3cr is in the 1st WG ballot recirculation and is likely to complete the ballot cycle prior to P802.3cu. Coordination between TFs and the P802.3cr project should be maintained to keep this material in sync.

SuggestedRemedy

Change "All equipment subject to this clause shall conform to IEC 60950-1." to "All equipment subject to this clause shall conform to the general safety requirements as specified in J.2". Add Editor's Note to be removed prior to SA ballot to align text with changes to P802.3cr.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.11.1** *P* **76** *L* **7** # 51

Maguire, Valerie — The Siemon Company

Comment Type **E** *Comment Status* **X**

Extra spaces between paragraphs.

SuggestedRemedy

Remove carriage returns on lines 7 and 8.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.11.2.1** *P* **76** *L* **13** # 114

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

It seems strange to allow only 2dB connection loss for LR4-6 while FR4 has 3dB when LR4-6 has unallocated margin which is included for extra connectors (not to be extra margin for something we haven't thought of which true unallocated margin is for.) Based on the spec as written cable plant with more than 5dB loss is out of spec, although Table 151-13 does seem to allocate this unallocated margin.

SuggestedRemedy

For LR4-6 Change the connection loss from 2dB to 3.3dB. In table 151-9 change Channel Insertion loss to 6.3dB and unallocated margin to 0dB. Delete the 2nd sentence in this paragraph.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.12** *P* **73** *L* **50** # 116

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The 400GBASE-LR4-6 transmitter has an OMA-TDECQ increase of 0.5dB over FR4. The max attenuation should be 0.5dB more than the max FR1 channel attenuation (4dB) as the channels are the same except for attenuation.

SuggestedRemedy

Change the maximum loss from 4 dB to 4.5dB.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.12** *P* **73** *L* **52** # 115

Dudek, Mike — Marvell.

Comment Type **T** *Comment Status* **X**

The 400GBASE-LR4-6 receiver has 2.1dB better stressed sensitivity than FR4 at the same SECQ. The max attenuation should be 2.1dB more than the max FR channel attenuation (4dB) as the channels are the same except for attenuation.

SuggestedRemedy

Change the maximum loss from 4dB to 6.1dB.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.13.4.5** *P* **82** *L* **24** # 98

Nicholl, Gary — Cisco Systems

Comment Type **T** *Comment Status* **X**

Missing PICS items for Overshoot, TECQ and Receiver Sensitivity tests

SuggestedRemedy

Add new PICS items for Overshoot, TECQ and Receiver Sensitivity tests

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.13.4.5** *P* **82** *L* **44** # 40

Trowbridge, Steve — Nokia

Comment Type **TR** *Comment Status* **X**

If the over/undershoot measurement mechanism mentioned in a related comment on clause 151.8.12 had been specified, you woud need a PICS to point to it.

SuggestedRemedy

Add an OM10 PICS item to this table pointing to the over/undershoot measurement method to be added to 151.8.12.

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.13.4.6** *P* **83** *L* **6** # 13

Lewis, Jon — Dell EMC

Comment Type **T** *Comment Status* **X**

If Annex J is inserted in 151.9.1 then the PICs needs to be updated also.

SuggestedRemedy

Change "Conforms to IEC 60950-1" to "Conforms to J.2"

Proposed Response *Response Status* **O**

Cl **151** *SC* **151.13.4.6** *P* **83** *L* **6** # 15

Carlson, Steven — HSD/Bosch/Ethernovia

Comment Type **TR** *Comment Status* **X**

If Annex J is inserted in 151.9.1 then the PICs require updating.

SuggestedRemedy

Change "Conforms to IEC 60950-1" to "Conforms to J.2"

Proposed Response *Response Status* **O**