Cl **200** *SC* **200.10.1** *P* **39** *L* **35** # 1

Swanson, Steven Corning Incorporated

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

Specifying a minimum value for channel insertion loss provides little value.

SuggestedRemedy

Delete the last row in Table 200-13

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Some optical PMDs have a non-zero value for the Channel insertion loss (min), so this row makes it clear that for all of the PMDs covered by this table, the minimum is zero.
This row is present (with a value of 0) in Table 86-13, Table 88-14, Table 89-13, Table 95-12, Table 112-7, Table 121-13, Table 122-17, Table 123-6, and Table 124-11, so Table 138-14 follows well establised practice.
[Editor's note: Clause changed from "200.10.1" to "200" and Subclause changed from "Table 200-13" to "200.10.1"]

Cl **138** *SC* **138.10.1** *P* **276** *L* **11** # 2

Swanson, Steven Corning Incorporated

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

Specifying a minimum value for channel insertion loss provides little value.

SuggestedRemedy

Delete the last row in Table 138-14.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Some optical PMDs have a non-zero value for the Channel insertion loss (min), so this row makes it clear that for all of the PMDs covered by this table, the minimum is zero.
This row is present (with a value of 0) in Table 86-13, Table 88-14, Table 89-13, Table 95-12, Table 112-7, Table 121-13, Table 122-17, Table 123-6, and Table 124-11, so Table 138-14 follows well establised practice.
[Editor's note: Clause changed from "138.10.1" to 138 and Subclause changed from "Table 138-14" to "138.10.1"]

Cl **200** *SC* **200.7.3** *P* **32** *L* **46** # 3

Swanson, Steven Corning Incorporated

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

953nm specifications in Table 200-9 are not applicable.

SuggestedRemedy

Replace row 2 in Table 200-9:

Specify nominal operating wavelength for at 910nm.

Utilize illustrative EMB values of 1230 for OM3, 1890 for OM4 and 2940 for OM5 at 910nm.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
910 nm is a reasonable representative wavelength for the second wavelength range.
However the specific minimum EMBs proposed do not well coincide with those in IEC 60793-2-10 ed.7 CDV wherein at 910 nm OM3 = 1260, OM4 = 1980, OM5 = 3100 MHz*km rounded to nearest 10 MHz*km.

Replace the contents of row 2 in Table 200-9 with the following: Effective modal bandwidth at 910 nm (min)^a | 1260 | 1980 | 3100 | MHz × km Note: the | character represents a column division and x represents the multiply character (Ctrl-q 0).

In row 1 of Table 200-9, replace the Unit entry with MHz × km

[Editor's note: Clause changed from "200.7.3" to "200" and Subclause changed from "Table 200-9" to "200.7.3"]

Cl **200** *SC* **200.10.1** *P* **39** *L* **39** # 4

Swanson, Steven Corning Incorporated

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

There is no need to test channel insertion loss for both wavelength ranges.

SuggestedRemedy

Add footnote "c" to Table 200-13 attached to Channel Insertion Loss (max):

A compliant 850nm channel insertion loss demonstrates compliance for the 910 channel.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Add the following sentence to the end of footnote b:
Compliant channel insertion loss at 850 nm also demonstrates compliance at 910 nm.

[Editor's note: Clause changed from "200.10.1" to "200" and Subclause changed from "Table 200-13" to "200.10.1"]

Cl **200** *SC* **200.10.2.1** *P* **40** *L* **10** # 5

Swanson, Steven Corning Incorporated

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

953nm specifications in Table 200-14 are not applicable.

SuggestedRemedy

Replace row 4 in Table 200-14:

Specify nominal operating wavelength for at 910nm.

Utilize illustrative EMB values of 1230 for OM3, 1890 for OM4 and 2940 for OM5 at 910nm.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
While it is acceptable to put non-normative information such as minimum EMB at 910 nm into the illustrative link power budget of Table 200-9, such information does not belong in normative Table 200-14. The current specifications are key normative items that define and delineate each fiber cable type including the minimum EMB at 953 nm.

[Editor's note: Clause changed from "200.10.2.1" to "200" and Subclause changed from "Table 200-14" to "200.10.2.1"]

Cl **FM** *SC* **FM** *P* **9** *L* **3** # 6

Anslow, Pete Ciena

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

"IEEE Std 802.3cm-2018" should be "IEEE Std 802.3cm-20xx"

SuggestedRemedy

Change "2018" to "20xx"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **1** *SC* **1.4** *P* **13** *L* **16** # 7

Anslow, Pete Ciena

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

Definitions for:
1.4.110a: 400GBASE-SR4.2
1.4.110b: 400GBASE-SR8
are missing

SuggestedRemedy

Replace the current three lines under 1.4 with:
Insert the following new definitions after 1.4.110 “400GBASE-SR16” as follows:
1.4.110a: 400GBASE-SR4.2: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding over eight bidirectional lanes of multimode fiber, with reach up to at least 150 m. (See IEEE Std 802.3, Clause 200.)
1.4.110b: 400GBASE-SR8: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding over eight lanes of multimode fiber, with reach up to at least 100 m. (See IEEE Std 802.3, Clause 138.)

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Replace the current three lines under 1.4 with:
Insert the following new definitions after 1.4.110 “400GBASE-SR16” as follows:
1.4.110a: 400GBASE-SR4.2: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding over eight bidirectional lanes on multimode fiber, with reach up to at least 150 m. (See IEEE Std 802.3, Clause 200.)
1.4.110b: 400GBASE-SR8: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding over eight lanes of multimode fiber, with reach up to at least 100 m. (See IEEE Std 802.3, Clause 138.)

Cl **45** *SC* **45** *P* **15** *L* **1** # 8

Anslow, Pete Ciena

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

The changes to Clause 45 are missing

SuggestedRemedy

Populate this clause with the required changes.
I would be happy to assist with this if that would be helpful.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Populate Clause 45 with the necessary changes.

Cl **78** *SC* **78.1.4** *P* **17** *L* **7** # 9
Anslow, Pete Ciena
Comment Type **E** *Comment Status* **D** *Bucket*
"(as amended by P802.3cd-201x)" should be "(as amended by IEEE Std 802.3cd-201x)"
SuggestedRemedy
change "P802.3cd-201x" to "IEEE Std 802.3cd-201x)"
Proposed Response *Response Status* **W**
PROPOSED ACCEPT.

Cl **78** *SC* **78.1.4** *P* **17** *L* **7** # 10
Anslow, Pete Ciena
Comment Type **E** *Comment Status* **D** *Bucket*
Footnote b is missing
SuggestedRemedy
Show footnote b as:
bThe deep sleep mode of EEE is not supported for this PHY.
Proposed Response *Response Status* **W**
PROPOSED ACCEPT.

Cl **116** *SC* **116.1.2** *P* **18** *L* **12** # 11
Anslow, Pete Ciena
Comment Type **E** *Comment Status* **D** *Bucket*
It is very easy to overlook the strikethrough "s" in "uses"
SuggestedRemedy
Replace "<u>all</u> use<s>s</s>" with:
"<u>all use</u> <s> uses</s>"
where <u> and </u> are the start and end of underline font and
<s> and </s> are the start and end of strikethrough font
Proposed Response *Response Status* **W**
PROPOSED ACCEPT.

Cl **116** *SC* **116.3** *P* **20** *L* **1** # 12
Anslow, Pete Ciena
Comment Type **E** *Comment Status* **D** *Bucket*
"Delay constraints" is 116.4
SuggestedRemedy
Re-number the heading for Delay constraints from 116.3 to 116.4
Proposed Response *Response Status* **W**
PROPOSED ACCEPT.

Cl **116** *SC* **116.5** *P* **21** *L* **16** # 13
Anslow, Pete Ciena
Comment Type **E** *Comment Status* **D** *Bucket*
All of the references to 138.3.2 and 200.3.2 in Table 116-7 and 116-8 should be cross-references.
SuggestedRemedy
Change all of the references to 138.3.2 (8 in total) and 200.3.2 (8 in total) in Table 116-7 and 116-8 to be cross-references.
Proposed Response *Response Status* **W**
PROPOSED ACCEPT.

Cl **138** *SC* **138.9.4** *P* **33** *L* **19** # 14
Anslow, Pete Ciena
Comment Type **E** *Comment Status* **D** *Bucket*
too much white space after the text of 138.9.4
SuggestedRemedy
Delete the extra paragraph mark
Proposed Response *Response Status* **W**
PROPOSED ACCEPT.

Cl **138** *SC* **138.10.3.1** *P* **34** *L* **31** # 15

Anslow, Pete Ciena

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

"Add" is not a valid editing instruction.

SuggestedRemedy

Change "Add new …" to "Insert new …"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **138** *SC* **138.10.3.1** *P* **34** *L* **33** # 16

Anslow, Pete Ciena

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

The inserted text up to Figure 138-7a uses italic bold font.

SuggestedRemedy

Re-apply paragraph tag "T,Text" to this text.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **FM** *SC* **FM** *P* **64** *L* **1** # 17

Anslow, Pete Ciena

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

The table of contents should appear between the front matter and Clause 1 in the draft.

SuggestedRemedy

Move the TOC to be between the front matter and Clause 1 in the FrameMaker book.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #38

Cl **FM** *SC* **FM** *P* **64** *L* **54** # 18

Anslow, Pete Ciena

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

The copyright year in the TOC should be 2018 not 201x

SuggestedRemedy

Change the copyright_year variable in the TOC to 2018

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **138** *SC* **138.10.3.1** *P* **276** *L* **33** # 19

Kolesar, Paul CommScope

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

The three content paragraphs are shown in italic font. They should instead by in non-italic font.

SuggestedRemedy

Change front to non-italic for the three content paragraphs.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
See response to comment #16

Cl **138** *SC* **138.10.3.1** *P* **277** *L* **8** # 20

Kolesar, Paul CommScope

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

Vertical alignment of the Tx and Rx lables in figure 138-7a for Option A and Option B could be improved.

SuggestedRemedy

Move the Tx and Rx lables slightly in the vertical direction so they appear consistent in vertical placement within each row.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **138** *SC* **138.10.3.4** *P* **277** *L* **42** # 21

Kolesar, Paul CommScope

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

Name of interface 7-2-3 should be italicized for clarity and to match the style of others.

SuggestedRemedy

Italicize "MPO adapter interface - opposed keyway configuration".

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **200** *SC* **200.8.5.1** *P* **35** *L* **12** # 22

Kolesar, Paul CommScope

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

Line thickness inconsistency.

SuggestedRemedy

Reduce thickness of arrow to the right of second "1 UI delay" box to match others.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
All of the lower arrows have the same line thickness. However, the arrow in question is not quite horizontal, which may account for an apparent line thickness difference.
See response to comment # 24

Cl **200** *SC* **200.8.5.1** *P* **35** *L* **6** # 23

Kolesar, Paul CommScope

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

Line fuzziness.The middle arrow appears fuzzy, likely due to not being perfectly horizontal.

SuggestedRemedy

Improve clarity of arrow.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change the upper middle horizontal arrow to have zero height.

Cl **200** *SC* **200.8.5.1** *P* **35** *L* **12** # 24

Kolesar, Paul CommScope

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

Line fuzziness.The fourth arrow appears fuzzy, likely due to not being perfectly horizontal.

SuggestedRemedy

Improve clarity of arrow.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change the third and fourth lower horizontal arrows to be zero height.

Cl **200** *SC* **200** *P* **23** *L* **1** # 25

Kolesar, Paul CommScope

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

The clause number is likely not correct, as 200 is a placeholder.

SuggestedRemedy

Replace 200 with actual clause number, along with attendant ripple effect throughout clause.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Re-number Clause 200 to Clause 150 throughout the draft.

Cl **200** *SC* **200** *P* **23** *L* **1** # 26

Kolesar, Paul CommScope

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

Clause 200 starts on page 23, which is likely incorrect and may cause conflicts with the page number of existng clauses.

SuggestedRemedy

Start page numbering commensurate with corrected clause number that was addressed in another comment.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change page numbering throughout the draft to be consisten with the PDF page numbering.

Cl **200** *SC* **200.10.2.1** *P* **40** *L* **14** # 27

Kolesar, Paul CommScope

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

The units of dispersion are missing parentheses around the denominator. Note: this same error was caught in draft IEC fiber specification 60793-2-10 ed.7. The units are also missing the dot multiplication symbol.

SuggestedRemedy

Add parentheses and dot to read ps/(nm2·km).

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change the units entry for the bottom row of Table 200-14 from "ps/nm^2 km" to "ps/(nm^2 x km)" where x represents the multiply character (Ctrl-q 0).

Also, in the two Effective modal bandwidth rows, change "MHz.km" to "MHz x km"

Cl **138** *SC* **138.10.2.1** *P* **279** *L* **20** # 28

Kolesar, Paul CommScope

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

Note: the coordinates of this comment are taken from 8023cd_D3p5.pdf. The units of dispersion are missing parentheses around the denominator. The units are also missing the dot multiplication symbol.

SuggestedRemedy

Add parentheses and dot to read ps/(nm2·km).

Proposed Response *Response Status* **Z**

REJECT.

This comment was WITHDRAWN by the commenter.

Cl **00** *SC* **0** *P* **265** *L* **54** # 29

Kolesar, Paul CommScope

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

Check page numbers against 802.3 and particularly 802.3cd when published.

SuggestedRemedy

Align page numbers against 802.3 and its ammendments, particularly 802.3cd.

Proposed Response *Response Status* **Z**

REJECT.

This comment was WITHDRAWN by the commenter.

Cl **138** *SC* **138.1** *P* **23** *L* **28** # 30

Dudek, Mike Marvell

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

The PMD name is wrong in table 138-3a

SuggestedRemedy

Change 400GBASE-SR4.2 to 400GBASE-SR8.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **138** *SC* **138.10.3.1** *P* **35** *L* **1** # 31

Dudek, Mike Marvell

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

There is only one row.

SuggestedRemedy

Delete "in each row" two places.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **200** *SC* **200.5.4** *P* **28** *L* **40** # 32

Dudek, Mike Marvell

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

The reference to 200.6 in the footnote to Table 200-4 should be a hot link.

SuggestedRemedy

Fix it.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Make "200.6" in Footnote a to Table 200-4 a cross-reference.
[Editor's note: Subclause changed from "200." to "200.5.4", Page set to "28", Line set to "40"]

Cl **200** *SC* **200.6** *P* **47** *L* **18** # 33

Dudek, Mike Marvell

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

It doesn't read correctly that "this positioning". We haven't previously defined any positioning. Also 200.10.3.1 doesn't give the positioning of transmit and receive lanes. (All used fibers have both transmit and receive lanes).

SuggestedRemedy

Change "This positioning of transmit and receive lanes at the MDI" to "The positioning of the TxRX pair types at the MDI"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change:
"This positioning of transmit and receive lanes at the MDI ..." to:
"The positioning of the TxRx pair types at the MDI ..."

Cl **200** *SC* **200.7.1** *P* **48** *L* **10** # 34

Dudek, Mike Marvell

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

Is there an intentional difference between this spec and other multimode specs that this is just called "wavelength" rather than "center wavelength". If so where is the definition of "wavelength"

SuggestedRemedy

Change "wavelength (range)" to "Center wavelength (range)". Also in table 200-8.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **200** *SC* **200.9.2** *P* **54** *L* **53** # 35

Dudek, Mike Marvell

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

There is a footnote symbol but the footnote is on a different page.

SuggestedRemedy

Move the footnote to be on the same page as it's reference.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **200** *SC* **200.10.3.1** *P* **58** *L* **1** # 36

Dudek, Mike Marvell

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

It would be better to use consistent terminology. In section they are called TR and RT but here on page 58 line 1 they are called TR and RT optical lanes.

SuggestedRemedy

Change "optical lanes" to "TxRx pair types"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
In the first sentence of 200.10.3.1 change:
"The eight transmit and eight receive optical lanes of 400GBASE-SR4.2 …" to:
"The four type TR and four type RT TxRx pairs of 400GBASE-SR4.2 …"

Change the fourth sentence of 200.10.3.1 from:
"The TR optical lanes occupy the leftmost four positions." to:
"The TR TxRx pair types occupy the leftmost four positions."

Change the fifth sentence of 200.10.3.1 from:
"The RT optical lanes occupy the rightmost four positions." to:
"The RT TxRx pair types occupy the rightmost four positions."

Cl **200** *SC* **200.11.4.6** *P* **63** *L* **15** # 37

Dudek, Mike Marvell

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

OC5 and OC6 are both labelled MDI dimensions. OC5 should be MDI mating.

SuggestedRemedy

change it.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Change the "Feature" entry for OC5 to "MDI mating."

Cl **00** *SC* **0** *P* **64** *L* # 38

Dudek, Mike Marvell

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

Pages 64 and 65 have a table of contents that should not be here. It is also missing some clauses.

SuggestedRemedy

These should be moved to immediately after the front matter and completed.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Move the table of contents to be between the front matter and Clause 1 and update it to match the draft contents.

Cl **138** *SC* **138.8.5** *P* **274** *L* **27** # 39

Dawe, Piers Mellanox

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

The effect of modal noise and mode partition noise, on top of the already overly high 4.5 dB TDECQ, has been under-estimated. The 0.1 dB allocation in the budget might be adequate for MPN alone; if so we need to account for modal noise. The relation between measured TDECQ and penalties in service should be improved. See dawe_3cm_adhoc_01_101118

SuggestedRemedy

Insert:
Equation (138-1) is used in place of Equation (121-11).
R=sqrt(sigmaG^2 + sigmaS^2 - M^2) (138-1)
where M = 0.0065Pave
[Note to reader: Pave is already defined in 121.8.5.3]
In 138.8.10 Stressed receiver sensitivity, either refer to the new Eq. 138-1 (as above) and say that:
the values of M in Equation (138-1) is set to zero
or, leave this section referring to Eq. 121-11 but to avoid confusion, add:
NOTE--The parameter M of Equation (138-1) is not used.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Changing the TDECQ definition for 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4 is out of scope for this project and it is highly desireable to keep the per lane specifications for 400GBASE-SR8 as close as possible to the other PMDs.
In addition, previous analysis has shown that the penalty for modal noise is significantly less than 0.1 dB for NRZ. Insufficient evidence has been provided to show that the penalty is large enough to warrant a change to the link budget. See the following for previous analysis: http://www.ieee802.org/3/aq/public/nov04/pepeljugoski_1_1104.pdf. Experimental data showing that the penatly is large enough to warrant a change would be helpful to support any proposed change.

Cl **200** *SC* **200.8.5.1** *P* **35** *L* **6** # 40

Dawe, Piers Mellanox

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

All the PAM4 specs should allow the same range of over- or under-emphasis so that a common equalizer IC can be used for all without the SMF equalizers carrying a burden because of the MMF spec, or all the 850 nm MMF receivers carrying a burden because of the bidi spec. 802.3cd chose a largest magnitude tap coefficient of at least 0.8 as a way of protecting the receiver from excessively peaky signals that abuse the receiver's dynamic range, resolution or sensitivity but don't benefit the transmitter implementer. While SMF TDECQ is measured for both extremes of channel, MMF TDECQ is measured for the slow channel only. We can read across to the other case we don't measure, but recognise that a signal after a slow channel will look less emphasised than what the receiver has to tolerate after a fast channel. The reference equalizer's largest magnitude tap coefficient (0.8 for a fast channel) should be set consistently (as from the same transmitter) for the slow channel. The survey results for MMF (green points, slide 8, dawe_3cd_01b_0518) are all to the right of +0.5 dB (or tap strength about 1.1); with the slower filter for 400GBASE-SR4.2 they will be further to the right. So we could tighten up more than this proposal, but this is consistent with the SMF specs and still allows a strongly over-emphasised transmitter.

SuggestedRemedy

In "the largest magnitude tap coefficient, which is constrained to be at least 0.8", change 0.8 to 0.93.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
VCSEL measurements to date have shown slightly higher TDECQ penalties than SMF transmitters due to low bandwidth, and the use of peaking can help to improve yield and reduce cost especially at process, temperature, and voltage corners. Increasing the minimum coefficient of the largest magnitude tap would reduce the flexibility for the transmitter design.

Cl **138** *SC* **138.8.5.1** *P* **274** *L* **39** # 41

Dawe, Piers Mellanox

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

All the PAM4 specs should allow the same range of over- or under-emphasis so that a common equalizer IC can be used for all without the SMF equalizers carrying a burden because of the MMF spec. 802.3cd chose a largest magnitude tap coefficient of at least 0.8 as a way of protecting the receiver from excessively peaky signals that abuse the receiver's dynamic range, resolution or sensitivity but don't benefit the transmitter implementer. While SMF TDECQ is measured for both extremes of channel, MMF TDECQ is measured for the slow channel only. We can read across to the other case we don't measure, but recognise that a signal after a slow channel will look less emphasised than what the receiver has to tolerate after a fast channel. The reference equalizer's largest magnitude tap coefficient (0.8 for a fast channel) should be set consistently (as from the same transmitter) for the slow channel. The survey results for MMF (green points, slide 8, dawe_3cd_01b_0518) are all to the right of +0.5 dB (or tap strength about 1.1). So we could tighten up more than this proposal, but this is consistent with the SMF specs and still allows a strongly over-emphasised transmitter.

SuggestedRemedy

In "the largest magnitude tap coefficient, which is constrained to be at least 0.8", change 0.8 to 0.85.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Changing the constraint on the largest magnitude tap coefficient for 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4 is out of scope for this project and it is highly desireable to keep the per lane specifications for 400GBASE-SR8 as close as possible to the other PMDs.
In addition, VCSEL measurements to date have shown slightly higher TDECQ penalties than SMF transmitters due to low bandwidth, and the use of peaking can help to improve yield and reduce cost especially at process, temperature, and voltage corners. Increasing the minimum coefficient of the largest magnitude tap would reduce the flexibility for the transmitter design.

Cl **138** *SC* **138.8.5.1** *P* **274** *L* **39** # 42

Dawe, Piers Mellanox

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

Equalizing a signal after an 11.2 GHz BT4 filter with a 5-tap FFE needs at least one precursor unless the signal is carefully pre-distorted. If it is, and a fourth post-cursor is needed, the same transmitter seen after a fast channel, e.g. a short fibre, will be difficult to receive because the 5-tap FFE can't correct the fourth post-cursor and the (now -ve) first precursor at the same time. As we don't have tap weight limits except for the cursor, this could be as bad as trying to receive a neutral signal after an 11.2 GHz filter with no precursor.
Note there is a separate comment that explains why allowing a second precursor is undesirable. Accepting both comments ("Tap 2 has") has an additional benefit of simplifying and speeding up TDECQ measurement.

SuggestedRemedy

To ensure that the transmitter is good enough without having to rely on a particular channel bandwidth and a fourth post-cursor, change "Tap 1, tap 2, or tap 3, has" to "Tap 2 or tap 3 has".

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Changing the constraint on which tap can have the largest magnitude for 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4 is out of scope for this project and it is highly desireable to keep the per lane specifications for 400GBASE-SR8 as close as possible to the other PMDs.
In addition, limiting to at most three post-cursors in the reference EQ means that the transmitted signal, when propagated through a worst case channel, cannot have a significant amount of post-cursor response at the receiver without suffering higher TDECQ penalty. The chromatic and modal dispersion effects of the optical channel, in combination with laser performance, may result in a reference EQ solution with four postcursor taps being the optimal response for the channel.

Cl **200** *SC* **200.7.1** *P* **31** *L* **29** # 43

Dawe, Piers Mellanox

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

The transition time spec is intended to protect the receiver from unreasonably slow signals, and it should be possible to use a common equalizer IC across all 50G/lane PAM4 optical PMDs without having to carry a burden for just one or a few PMD types. 802.3cd chose 34 ps as the slowest after a slow channel (SMF clauses) but also used 34 ps for the slowest MMF signal after a fast channel, equivalent to 36 ps after a slow channel - but still used 34 ps for the slowest signal in SRS. This is inconsistent. The channel for 400GBASE-SR4.2 can be even slower, so the error is larger. The survey results for show that actual transition times are significantly faster than these numbers, and transmitters for 150 m have to be better than those for 100 m, so there is room to correct the spec and still allow plenty of margin for measurement.

SuggestedRemedy

Change 34 ps to 30 ps.
In 200.8.10 Stressed receiver sensitivity, change "the transition time is no greater than the value specified in Table 200-7" to "the transition time is no greater than 34 ps", or add a limit could of 34 ps to Table 200-8, Receive characteristics, in the section for Conditions of stressed receiver sensitivity test.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
VCSEL measurements shown in
http://www.ieee802.org/3/cd/public/May18/king_3cd_03_0518.pdf and
http://www.ieee802.org/3/cd/public/July18/king_3cd_02a_0718.pdf had transition times as high as 33ps, with no receiver problems seen.
The definitive measurement of the stress of the SRS test source is it’s SECQ, individual components of the stress cannot all be at their maximum values and still meet the SECQ values.

Cl **138** *SC* **138.7.1** *P* **272** *L* **53** # 44

Dawe, Piers Mellanox

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

The transition time spec is intended to protect the receiver from unreasonably slow signals, and it should be possible to use a common equalizer IC across all 50G/lane PAM4 optical PMDs without having to carry a burden for just one or a few PMD types. 802.3cd chose 34 ps as the slowest after a slow channel (SMF clauses) but also used 34 ps for the slowest MMF signal after a fast channel, equivalent to 36 ps after a slow channel - but still used 34 ps for the slowest signal in SRS. This is inconsistent. The survey results show that actual transition times are significantly faster than these numbers, so there is room to correct the spec and still allow plenty of margin for measurement.

SuggestedRemedy

Change 34 ps to 32 ps.
In 138.8.10 Stressed receiver sensitivity, change "the transition time is no greater than the value specified in Table 138-8" to "the transition time is no greater than 34 ps", or add a limit could of 34 ps to Table 138-9, Receive characteristics, in the section for Conditions of stressed receiver sensitivity test.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Changing the transition time for 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4 is out of scope for this project and it is highly desireable to keep the per lane specifications for 400GBASE-SR8 as close as possible to the other PMDs.

Cl **200** *SC* **200.8.5** *P* **34** *L* **46** # 45

Dawe, Piers Mellanox

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

The effect of modal noise and mode partition noise, on top of the already overly high 4.5 dB TDECQ, has been under-estimated. The 0.1 dB allocation in the budget apears inadequate for MPN alone, and we need to account for modal noise also. The relation between measured TDECQ and penalties in service should be improved. See dawe_3cm_adhoc_01_101118
This remedy keeps the 150 m reach for OM5, but the 100 m links are paying a penalty, now 0.2 dB, for support of 150 m.

SuggestedRemedy

Insert:
Equation (138-1) is used in place of Equation (121-11).
R=sqrt(sigmaG^2 + sigmaS^2 - M^2) (138-1)
where M = 0.0065Pave
[Note to reader: Pave is already defined in 121.8.5.3]
In 138.8.10 Stressed receiver sensitivity, either refer to the new Eq. 138-1 (as above) and say that:
the values of M in Equation (138-1) is set to zero
or, leave this section referring to Eq. 121-11 but to avoid confusion, add:
NOTE--The parameter M of Equation (138-1) is not used.
Reduce the limits for TDECQ and TDECQ-10log10(Ceq), from 4.5 dB to 4.3 dB (0.2 dB lower than the SECQ values, allowing for 0.3 dB MPN penalty with associated Pcross, including the 0.1 dB already in the draft budget).
In the budget table 200-9, the power budget and allocation for penalties don't change, but the additional insertion losses for 70 m and 100 m increase by 0.1 dB each.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Previous analysis has shown that the penalty for modal noise is significantly less than 0.1 dB for NRZ. Insufficient evidence has been provided to show that the penalty is large enough to warrant a change to the link budget. See the following for previous analysis: http://www.ieee802.org/3/aq/public/nov04/pepeljugoski_1_1104.pdf. Experimental data showing that the penatly is large enough to warrant a change would be helpful to support any proposed change.

Cl **138** *SC* **138.1** *P* **265** *L* **20** # 46

Dawe, Piers Mellanox

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

"a complete Physical Layer ... as shown in Table 138–1, Table 138–2, Table 138–3, or Table 138–3a": too many tables showing almost the same information makes it hard for the reader to see what is common and what is different.

SuggestedRemedy

Combine to one table with columns for clause number, sublayer, and each PHY type.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Clause 138 in P802.3cd D3.5 has Table 138–1, Table 138–2, and Table 138–3. The addition of Table–138-3a follows the existing style of Clause 138.

Cl **200** *SC* **200.8.5.1** *P* **35** *L* **2** # 47

Dawe, Piers Mellanox

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

The receiver is assessed with a stressed eye generator that "should have wide and smooth frequency response, and linear phase response". So it won't need unusually strong precursors. A real transmitter, being more "causal" than neutral unless pre-distorted, will need weaker precursors than the SRS signal. Yet a transmitter is allowed to use pre-distortion to need stronger precursors, maybe of the opposite sign, than the SRS signal, and we should ensure that the transmitter combined with the range of channels can't be significantly worse than the SRS signal. For some low power equalizer architectures, precursors are much more expensive than post-cursors (sun_3cd_042518_adhoc), yet we expect MMF to be low power.
A straightforward transmitter probably won't need a second precursor. A clever transmitter can be set up to avoid a second precursor.
Note there is a separate comment that explains why at least one precursor is needed. Accepting both comments ("Tap 2 has") has an additional benefit of simplifying and speeding up TDECQ measurement.

SuggestedRemedy

Change "Tap 1, tap 2, or tap 3, has" to "Tap 1 or tap 2 has" (requiring the transmitter be set up to work without relying on a second precursor "special case" weight).
Do the same in 138.8.5.1 if warranted.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Allowing just one pre-cursor in the reference EQ means the transmitted signal, when propagated through a worst case channel, cannot have a significant amount of pre-cursor response at the receiver without suffering higher TDECQ penalty. An electrical channel typically can guarantee that, however the chromatic and modal dispersion effects of the optical channel in combination with laser performance may require the extra tap.

Cl **200** *SC* **200.8.5.1** *P* **35** *L* **2** # 48

Dawe, Piers Mellanox

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

Equalizing a signal after an 9 GHz BT4 filter with a 5-tap FFE needs at least one precursor unless the signal is carefully pre-distorted. If it is, and a fourth post-cursor is needed, the same transmitter seen after a fast channel, e.g. a short fibre, will be difficult to receive because the 5-tap FFE can't correct the fourth post-cursor and the (now -ve) first precursor at the same time. As we don't have tap weight limits except for the cursor, this could be as bad as trying to receive a neutral signal after an 9 GHz filter with no precursor.
Note there is a separate comment that explains why allowing a second precursor is undesirable. Accepting both comments ("Tap 2 has") has an additional benefit of simplifying and speeding up TDECQ measurement.

SuggestedRemedy

To ensure that the transmitter is good enough without having to rely on a particular channel bandwidth and a fourth post-cursor, change "Tap 1, tap 2, or tap 3, has" to "Tap 2 or tap 3 has".

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Limiting to at most three post-cursors in the reference EQ means that the transmitted signal, when propagated through a worst case channel, cannot have a significant amount of post-cursor response at the receiver without suffering higher TDECQ penalty. The chromatic and modal dispersion effects of the optical channel, in combination with laser performance, may result in a reference EQ solution with four postcursor taps being the optimal response for the channel.

Cl **200** *SC* **200.8.5** *P* **34** *L* **44** # 49

Dawe, Piers Mellanox

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

While "approximately 13.28125 GHz" seems tight enough, "approximately 9 GHz" seems very loose. Later the draft says "Compensation may be made for any deviation from an ideal fourth-order Bessel-Thomson response", but it's not clear if one is invited to compensate for inaccurate bandwidth as well as inaccurate filter shape.

SuggestedRemedy

Delete "approximately" or change "an ideal fourth-order Bessel-Thomson response" to "the ideal fourth-order Bessel-Thomson response".
Same for 138.8.5.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
This is an identical form of words as used in the various clauses of P802.3cd D3.5 after several iterations due to comments. Changing the wording as per the suggested remedy would not be an improvement to the draft.

Cl **200** *SC* **200.7.3** *P* **32** *L* **44** # 50

Abbott, John Corning Incorporated

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

Not sure this comment was entered...please delete if duplicate
Page 32 line 44(table)
In Table 200-9 (Illustrative Power Budget) the power budget needs to be done at both 850nm and 910nm (or 918 nm) because the budget depends on wavelength. There needs to a row with the 910nm (or 918nm) EMB using IEC guidance. There probably needs to be another row giving the wavelength where the power budget is being calculated [which wavelength is the constraint] (so that we just use one table rather than have Table 200-9a(850nm) and Table 200-9b(918nm).

SuggestedRemedy

1. include row with the "power penalty wavelength" (probably 918nm)
2. Include row with IEC EMB estimates at "power penalty wavelength"
3

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Multiple wavelengths are used in several single-mode clauses, such as Clause 122, yet only one wavelength is used to illustrate the power budget. The 850 nm wavelength chosen here corresponds to that which will be used to measure the attenuation of the channel.

Cl **200** *SC* **200.7.3** *P* **32** *L* **44** # 51

Abbott, John Corning Incorporated

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

May be duplicate
In Table 200-9 (Illustrative Power Budget) when the power budget is being calculated for OM3 or OM4, the most accurate chromatic dispersion formula to use is the OM5 one which was developed during OM5 development using a round-robin of OM3 and OM4 fibers from fiber manufacturers. This results in a lower chromatic dispersion penalty for OM3 and OM4, and this is the more accurate way to calculate the illustrative power budget.

SuggestedRemedy

1. redo with OM5 chromatic dispersion estimate, report.
2. This might also apply to SR8 at 850nm.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The decision to change the chromatic dispersion specifications for OM3 and OM4 is the purview of the fiber specification committees of TIA TR-42 and IEC 86A.

Cl **200** *SC* **200.8.4** *P* **34** *L* **44** # 52

Abbott, John Corning Incorporated

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

This may be duplicate comment
Page 34 line 44 - 3dB bandwidth of approximately 9GHz should be recalculated following Jonathan Ingham procedure in ingham_3cm_02_0918.pdf for OM3 and OM4, using the OM5 chromatic dispersion formulation, which is the more accurate formula. If the resulting bandwidth is 9.1 or higher for OM3 and OM4, use 9.1GHz, if 9.2GHz or higher for OM3 and OM4, use 9.2GHz, etc. This will reduce the required FEC.

SuggestedRemedy

1. redo calculation of this key BW with the OM5 chromatic dispersion formula used for OM3 and OM4. This will be a more accurate estimate of the BW
2. used the BW for 100m OM4 - this should be a little higher than 9GHz (i.e. 9.1GHz)

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The filter choice is selected as the lowest among the three fiber bandwidth grades at their stated reaches in order to provide a single test condition that covers all three. A different filter bandwidth will not affect the choice of FEC as that choice is made to harmonize with existing FEC chioce made in P802.3bs and P802.3cd.