Cl **FM** *SC* **FM** *P* **1** *L* **24** # 51

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

Since 802.3cg is in standards association ballot, this amendment will likely be on 802.3-2018 as modified by 802.3cg-201x as well...

SuggestedRemedy

Add 802.3cg-201x to the list of amendments after 802.3bt-2018. Also add 802.3cg summary to the frontmatter at page 10.

Proposed Response *Response Status* **O**

Cl **FM** *SC* **FM** *P* **16** *L* **44** # 13

Dawe, Piers — Mellanox

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

"other IEEE 802.3 amendment projects running in parallel (e.g., IEEE P802.3cd) that modified the same text and tables" but 802.3cd isn't running in parallel now, it's published (although not finished - see other comments).

SuggestedRemedy

Change 3cd to 3cn, or change to:
other IEEE 802.3 amendments (e.g., IEEE Std 802.3cd) and projects running in parallel (e.g., IEEE P802.3cn) that modify the same text and tables.

Proposed Response *Response Status* **O**

Cl **00** *SC* **0** *P* **2** *L* **1** # 31

Kabra, Lokesh — Synopsys

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

Does not mention new clause added in 802.3cm as done in Abstract of other specifications like 802.3cd

SuggestedRemedy

Change "Std 802.3-2018 adds Physical" to "Std 802.3-2018 and adds Clause 150. This amendment adds Physical"

Proposed Response *Response Status* **O**

Cl **00** *SC* **0** *P* **10** *L* **51** # 32

Kabra, Lokesh — Synopsys

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

Does not mention new clause added in 802.3cm as done in Abstract of 802.3cd mentioned above in line 44 of page 10

SuggestedRemedy

Change "Std 802.3-2018 and adds Physical" to "Std 802.3-2018 and adds Clause 150. This amendment adds Physical"

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.3** *P* **17** *L* **4** # 21

Hajduczenia, Marek — Charter Communications

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

No normative references

SuggestedRemedy

Remove 1.3

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.3** *P* **17** *L* **4** # 1

Anslow, Pete — Ciena

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

As no normative references are being added, remove 1.3

SuggestedRemedy

Remove 1.3 from the draft

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.4** *P* **17** *L* **18** # 47

Marris, Arthur — Cadence Design Systems

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

The reach of 150 m does not match the project objective of 100 m specified here: http://www.ieee802.org/3/cm/Adopted_Objectives_NGMMF_01_08mar18.pdf

SuggestedRemedy

No change to the text is required. I would be curious to know why a longer reach was chosen.

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.4.110a** *P* **17** *L* **16** # 45

Marris, Arthur — Cadence Design Systems

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

400GBASE-SR4.2 is a really rubbish nomenclature. Choose something better or at least explain why it is called 4.2 in the definition.

SuggestedRemedy

Add extra sentences at the end of 400GBASE-SR4.2
"400GBASE-SR4.2 uses the same medium as 200GBASE-SR4. The 4.2 nomenclature is used to indicate that transmission is actually over eight fibres but in a bi-directional manner."

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.5** *P* **17** *L* **25** # 22

Hajduczenia, Marek — Charter Communications

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

No new abbreviations

SuggestedRemedy

Remove 1.5 unless there is anything that needs to be added

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.5** *P* **17** *L* **26** # 43

Marris, Arthur — Cadence Design Systems

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

Delete subcluase 1.5 as it makes no changes to the base standard.

SuggestedRemedy

Delete subcluase 1.5

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.5** *P* **17** *L* **26** # 2

Anslow, Pete — Ciena

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

As no new abbreviations are being added, remove 1.5

SuggestedRemedy

Remove 1.5 from the draft

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.5** *P* **17** *L* **29** # 33

Kabra, Lokesh — Synopsys

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

I did not find the term "ABBR" anywhere in this draft or 802.3cd

SuggestedRemedy

Delete the line

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.5** *P* **17** *L* **29** # 50

Trowbridge, Steve — Nokia

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

Left over instructions for how to use the template remain in the draft.

SuggestedRemedy

Either remove the example and instructions "ABBR expanded version [abbreviations use paragraph tag AcrList,ac]", or remove entirely clauses 1.3 and 1.5 from the draft which do not identify anything to be added or changed

Proposed Response *Response Status* **O**

Cl **1** *SC* **1.5** *P* **17** *L* **29** # 41

Lusted, Kent — Intel

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

The abbreviation "ABBR" is not used anywhere else in the document. I suspect that it is leftover from the FrameMaker template.

SuggestedRemedy

Either define and use the abbreviation "ABBR" or remove the entry from the document.

Proposed Response *Response Status* **O**

Cl **1** *SC* **4** *P* **17** *L* **16** # 37

Kochuparambil, Beth — Cisco Systems, Inc.

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

I don't see precedence for a x.110a and x.110b subclause

SuggestedRemedy

Use different subclause numbering. ie: 1.4.111 and 1.4.112 (shifting the remaining subclause numbering)

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.6** *P* **19** *L* **24** # 34

Kabra, Lokesh — Synopsys

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

reserved value of 1011110 can be used for SR4.2 to avoid eating up unnecessary reserved value that may be required for 100G serial modes

SuggestedRemedy

Change "1011110 = reserved" to "1011110 = 400GABSE-SR4.2 PMA/PMMD"
Unstrike line 19 "11xxxxx = reserved"
Delete next 6 rows "111xxxx = reserved" to "1100000 = 400GBASE-SR4.2 PMA/PMD"

Proposed Response *Response Status* **O**

Cl **45** *SC* **45.2.1.21.1a** *P* **21** *L* **25** # 23

Hajduczenia, Marek — Charter Communications

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

Make sure line break is not allowed on "/" character to avoid breaking PMA/PMD across lines

SuggestedRemedy

Multiple locations in the draft

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.1.3** *P* **23** *L* **27** # 15

Dawe, Piers — Mellanox

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

This PHY doesn't have bidirectional lanes. Following discussion on D1.0 comment 7, we chose a different description in:
1.4.110a 400GBASE-SR4.2: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding over eight lanes on multimode fiber in a bidirectional WDM format, with reach up to at least 150 m. (See IEEE Std 802.3, Clause 150.)
This text should be consistent.

SuggestedRemedy

Change
400 Gb/s PHY using 400GBASE-R encoding over eight bidirectional lanes of multimode fiber, with reach up to at least 150 m (see Clause 150)
to
400 Gb/s PHY using 400GBASE-R encoding over eight lanes on multimode fiber in a bidirectional WDM format, with reach up to at least 150 m (see Clause 150)

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.2.5** *P* **24** *L* **44** # 16

Dawe, Piers — Mellanox

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

This isn't the base text in force, 802.3cd has altered it.
This isn't the second sentence, it's the second paragraph.

SuggestedRemedy

Either:
Change the second sentence of the second paragraph of 116.2.5 as follows:
The 400GBASE-R PMDs and their corresponding media are specified in Clause 122 through Clause 124
, and in Clause 138 and Clause 150.
Or:
Change the second paragraph of 116.2.5 (as amended by IEEE Std 802.3cd-2018) as follows:
The 200GBASE-R PMDs and their corresponding media are specified in Clause 121, and Clause 122, and Clause 136 through Clause 138. The 400GBASE-R PMDs and their corresponding media are specified in Clause 122 through Clause 124
, and in Clause 138 and Clause 150.

Proposed Response *Response Status* **O**

Cl **116** *SC* **116.2.5** *P* **24** *L* **45** # 24

Hajduczenia, Marek — Charter Communications

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

Added text (underline) contains now too many "and"s

SuggestedRemedy

Change "Clause 124, and in Clause 138 and Clause 150." to "Clause 124, Clause 138, and Clause 150."

Proposed Response *Response Status* **O**

Cl **130** *SC* **130.10.3.1** *P* **40** *L* **20** # 20

Ghiasi, Ali — Ghiasi Quantum

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

Two MDI are defined for 400GBASE-SR8, option two-row connector is not compatible with installed cable plant but option B single row connector is compatible with installed cable plant and this should be noted.

SuggestedRemedy

Add following text, Two-row twelve fiber interface is not compatible with installed cable plant but single-row sixteen-fiber interface is compatible with installed cable plant.

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.5.1** *P* **34** *L* **5** # 5

Brandt, David — Rockwell Automation

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

400GBASE-SR8 is not underlined as an insertion.

SuggestedRemedy

Underline 400GBASE-SR8.

Proposed Response *Response Status* **O**

Cl **138** *SC* **1** *P* *L* **13** # 49

Peter, Stassar — Huawei

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

"Four" is new text and should be underlined

SuggestedRemedy

Replace "four" by an underlined "four"

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.1** *P* **28** *L* **10** # 3

Anslow, Pete — Ciena

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

There are now no changes being made to the second paragraph of 138.1, so it does not need to be present in the draft.

SuggestedRemedy

Change the editing instruction to:
"Change the first paragraph of 138.1, and change Table 138–3, as follows:"
Remove the second paragraph of 138.1 from the draft

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.1** *P* **28** *L* **12** # 26

Hajduczenia, Marek — Charter Communications

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

Lists of PHYs in multiple locations - please avoid enumerating all the PHYs over and over again

SuggestedRemedy

Change repeated enumerations "50GBASE-SR, 100GBASE-SR2, 200GBASE-SR4, and 400GBASE-SR8" indicatign all PMDs to "Clause 138 PMDs" - it is simpler to maintain in the future - multiple locations in the draft

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.1** *P* **28** *L* **13** # 44

Marris, Arthur — Cadence Design Systems

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

No need to add the word "four". It reads better if you simply delete the word "three".

SuggestedRemedy

Delete the word "four" (which should have been underlined) on line 13.

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.1** *P* **28** *L* **23** # 35

Kabra, Lokesh — Synopsys

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

Adding 400GBASE-SR8 column to Table 138-3 does not look good since all the rows except "117-RS" are exclsuive and duplicated for 200G & 400G. It may be neater to retain Table 138-3 as-is for 200G and add another table for 400GBASE-SR8. It will look logical as we already have Table 138-1 & Table 138-2 for 50G & 100G respectively

SuggestedRemedy

Change "Table 138-2, or Table 138-3" in line 19 to "Table 138-2, Table 138-3 or Table 138-4a"
Retain Table 138-3 as is for 200G and add another Table 138-4a for 400G;

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.1** *P* **29** *L* **11** # 25

Hajduczenia, Marek — Charter Communications

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

"must" in the text of the footnote, we typically void this word per style guide

SuggestedRemedy

Change "must behave" to "is expected to behave"

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.1** *P* **29** *L* **21** # 4

Anslow, Pete — Ciena

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

"200 and 400 Gigabit Ethernet is introduced" should be "200 and 400 Gigabit Ethernet are introduced"

SuggestedRemedy

show the "is" in strikethrough font and add "are" in underline font.

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.3.1** *P* **32** *L* **23** # 36

Kabra, Lokesh — Synopsys

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

Reference to 116.3 is incorrect for Delay Constraints. In 802.3cd, it is 116.4

SuggestedRemedy

Change "116.3 to 116.4"

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.4** *P* **33** *L* **22** # 52

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

While the transmit disables are parameterized n-1 to 0, the register/bit numbers are just 1.9.8 to 1.9.1, which leaves the reader to guess whether n-1 is fixed at 1.9.8, or 0 at 1.9.1 (note, these are clear in clause 45, but the whole purpose of these redundant tables is to keep the reader from having to go back to clause 45)

SuggestedRemedy

Change "1.9.8" to "1.9.n"

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.4** *P* **33** *L* **43** # 53

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

While the transmit disables are parameterized n-1 to 0, the register/bit numbers are just 1.10.8 to 1.10.1, which leaves the reader to guess whether n-1 is fixed at 1.10.8, or 0 at 1.10.1 (note, these are clear in clause 45, but the whole purpose of these redundant tables is to keep the reader from having to go back to clause 45)

SuggestedRemedy

Change "1.10.8" to "1.10.n"

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.5.1** *P* **34** *L* **13** # 27

Hajduczenia, Marek — Charter Communications

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

Figure 138-2 should use <0:n> as number of lanes being used, and then descriptive text can be changed as follows: "four lanes, two lanes, and one lane per direction, respectively" to "four lanes (n=8), two lanes (n=4), and one lane (n=2) per direction, respectively" - in thsi way, you do not need to replace the figure every time a new PMD is added.

SuggestedRemedy

Per comment

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.5.4** *P* **35** *L* **22** # 54

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

Typo - 100GBSE-SR2 should be 100GBASE-SR2 (service to humanity - it's wrong in the base standard - maintenance has been submitted)

SuggestedRemedy

Change "100GBSE-SR2" to "100GBASE-SR2"

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.7.1** *P* **36** *L* **53** # 11

Dawe, Piers — Mellanox

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

The transition time spec is not consistent for transmit and SRS specs. See slides 6 and 7 of dawe_3cm_01a_0119.

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 an extra 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 (observed in 13.28125 GHz) after a slow channel - but still used 34 ps for the slowest signal in SRS. This is inconsistent. The survey results for MMF (dawe_3cd_01b_0518 slide 8 green and slide 11 brown) 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.
Also, it is more convenient to use the same bandwidth for transition time as for TDECQ. If someone prefers to use a different bandwidth, he can read the results across, similar to the second alternative in the remedy.
Someone using emphasis to make a slow transmitter look faster will find that it makes the transition time shorter too. If his transmitter is slow enough to worry about the transition time spec, he won't have a problem with tightening the cursor tap strength limit.

SuggestedRemedy

Either: in 138.8.7, Transmitter transition time, for 400GBASE-SR8, change 13.28125 GHz to 11.2 GHz and 26.5625 GHz to 22.4 GHz (twice) (same as 138.8.5, TDECQ).
Or:
In Table 138-8, Transmit characteristics, add a second Transmitter transition time row for 400GBASE-SR8, max 32 ps (not 34), and:
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 of 34 ps for 400GBASE-SR8 to Table 138-9, Receive characteristics, in the section for Conditions of stressed receiver sensitivity test.

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.8.5** *P* **38** *L* **38** # 6

Dawe, Piers — Mellanox

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

The 0.1 dB allocation for both modal noise and mode partition noise is too little. See dawe_3cm_adhoc_01_101118, castro_3cm_01_1118, pepeljugoski_1_1104 and castro_3cm_01_0119: we need 0.1 to 0.2 dB for MN (castro_3cm_01_0119 says 0.23 to 0.45 dB) as well as 0.1 dB for MPN. The total penalties should be kept below 4.6 dB, which is unreasonably high already. This should be done with a formula, as for 100GBASE-SR4, so as not to penalise good transmitters.
In the remedy, M = 0.0065*Pave may be on the low side: 100GBASE-SR4 has M2 = 0.0175*Pave.

SuggestedRemedy

Add an exception in 138.8.5 as follows:
For 400GBASE-SR8, 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
In 138.8.10 Stressed receiver sensitivity, 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* **O**

Cl **138** *SC* **138.8.5.1** *P* **38** *L* **45** # 9

Dawe, Piers Mellanox

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

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, can be difficult to receive (outside the TDECQ spec limit) because the 5-tap FFE can't correct the fourth post-cursor and the (now -ve) first precursor at the same time.
The fast channel can have less mode partition noise but more modal noise, but the problem remains.
In practice, it seems that TDECQ uses at least one precursor for real MMF transmitters.
Possible remedies include:
Ensure there is at least one precursor (tap 2 or 3 is the largest), or
Modify TDECQ if tap 1 is the largest by adding an interferer representing the uncorrected precursor that this weird transmitter would have on a short link, or
Defining MMF TDECQ with fast and slow channels, in the same spirit as SMF with high and low dispersion, noting that if tap 2 or 3 is the largest it can be assumed that TDECQ(fast) < TDECQ(slow), so no need to determine it. It should be possible to make a reasonable estimate of TDECQ(fast) from the dataset of a TDECQ(slow) measurement, but it's not likely that one would need to do that, as noted above.

SuggestedRemedy

To ensure that the 400GBASE-SR8 transmitter is not gaming the spec like this:
Change the fourth sentence in 138.8.5.1 as follows: change "Tap 1, tap 2, or tap 3, has the largest magnitude tap coefficient..." to
"For 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4, tap 1, tap 2, or tap 3, has the largest magnitude tap coefficient... For 400GBASE-SR8, tap 2 or tap 3, has the largest magnitude tap coefficient..."
Note another comment relates to the same sentence.

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.8.5.1** *P* **38** *L* **45** # 8

Dawe, Piers Mellanox

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

All the PAM4 specs should allow the same range of over-emphasis so that a common equalizer IC can be used for all, without all 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 or resolution but don't benefit the transmitter implementer - however they did not implement it fully.
While SMF TDECQ is measured for both extremes of channel, MMF TDECQ is measured for the slow channel only. We could measure MMF TDECQ for the fast channel too. If not, we can read across to the other case we don't measure, recognising that a signal after the slow measurement channel looks 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). Anyone using emphasis to make a slow transmitter look faster will start well to the right (large tap strength) and will not be concerned by this limit.This proposal is consistent with the SMF specs and still allows a strongly over-emphasised transmitter.

SuggestedRemedy

Change the fourth sentence in 138.8.5.1 as follows: change "Tap 1, tap 2, or tap 3, has the largest magnitude tap coefficient, which is constrained to be at least 0.8." to
"...constrained to be at least 0.8 for 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4, and at least 0.85 for 400GBASE-SR8".
Note another comment relates to the same sentence.

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.10.1** *P* **39** *L* **45** # 17

Dawe, Piers Mellanox

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

Wording should be improved. In the remedy, the stricken "and" is not shown. The last option is the cleanest.

SuggestedRemedy

Change
Only applies to 100GBASE-SR2, 200GBASE-SR4, and 400GBASE-SR8. to
Applies only to 100GBASE-SR2, 200GBASE-SR4, and 400GBASE-SR8. or
100GBASE-SR2, 200GBASE-SR4, and 400GBASE-SR8 only or
Except 50GBASE-SR

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.11.3** *P* **44** *L* **1** # 28

Hajduczenia, Marek — Charter Communications

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

Rather than reproduce the whole table, it is enough to indicate in editprial instructions to insert a new row as shown below under SR4

SuggestedRemedy

Per comment

Proposed Response *Response Status* **O**

Cl **138** *SC* **138.11.4.1** *P* **44** *L* **50** # 18

Dawe, Piers — Mellanox

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

Tidying up, now the list has four items in it.

SuggestedRemedy

Change
Compatible with 50GBASE-R or 100GBASE-R or 200GBASE-R or 400GBASE-R PCS and PMA
to
Compatible with 50GBASE-R, 100GBASE-R, 200GBASE-R, or 400GBASE-R PCS and PMA

Proposed Response *Response Status* **O**

Cl **150** *SC* **8.9** *P* **59** *L* **27** # 48

Peter, Stassar — Huawei

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

The unit for Receiver sensitivity in Equation 150-1 should be dBm instead of dB. Similar in Subclause 138.8.9, even when it is not part of the changes to 138.

SuggestedRemedy

Replace "dB" by "dBm"

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.5.4** *P* **51** *L* **43** # 55

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

The word "must" should be avoided, because it looks like a hidden shall. The meaning would be unchanged by simply deleting "must". However, as this is worded, this might be an implementation note. "should" or "is strongly recommended' is appropriate.
"As an unavoidable consequence of the requirements for the setting of the SIGNAL_DETECT parameter,
implementations must provide adequate margin between the input optical power level at which the
SIGNAL_DETECT parameter is set to OK, and the inherent noise level of the PMD including the effects of
crosstalk, power supply noise, etc."

SuggestedRemedy

Change "must provide" to "provides" or, alternatively, Replace "must" with "should" in the referenced sentence.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.5.4** *P* **51** *L* **47** # 56

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

"Various implementations are permitted by this standard, including implementations that generate..." The standard is actually implementation-independent. You're trying to give an example, but in the process, suggest that somewhere the standard specifies a bunch of specific implementations and "permits" them.

SuggestedRemedy

Replace "Various implementations are permitted by this standard, including implementations that generate..." with "Implementations may generate..."

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.5.5** *P* **52** *L* **1** # 57

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

Subclause 150.5.5 tells the user nothing about the lane-by-lane signal detect function, or how it is different from the global signal detect function specified in 150.5.4. The text "Various implementations of the Signal Detect function are permitted by this standard"and is not useful, since it suggests a list of implementations are permitted, when, in fact, the standard is implementation independent and does not "permit implementations" but rather specifies behavior, electrical, and sometimes physical characteristics which implementations must conform to. Also, there is no content in this subclause other than the description of how MDIO reports this when implemented. It sets no requirements on the function. Unfortunately, I can't say what the requirements are for lane-by-lane from this.

SuggestedRemedy

Delete "Various implementations of the Signal Detect function are permitted by this standard."
Add requirements, or a reference to requirements elsewhere, as relevant to lane-by-lane signal detect, or else, rename or combine 150.5.5 with the previous subclause

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.6** *P* **53** *L* **23** # 30

Ingham, Jonathan — Foxconn Interconnect Technology

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

Typographical error.

SuggestedRemedy

Replace "capble" with "capable".

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.7.1** *P* **54** *L* **18** # 29

Ingham, Jonathan — Foxconn Interconnect Technology

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

There is an opportunity to allow component re-use in PMDs defined outside of 802.3, particularly 100G BiDi, with a goal of lowered cost. Please refer to the supporting presentation.

SuggestedRemedy

In Table 150-7, change "Average launch power, each lane (min)" from -6.5 dBm to -6.2 dBm.
In Table 150-7, change "Outer Optical Modulation Amplitude (OMAouter), each lane (min)" from -4.5 dBm to -4.2 dBm.
In Table 150-7, change "OMAouter - TDECQ, each lane (min)" from -5.9 dBm to -5.6 dBm.
In Table 150-8, change "Average receive power, each lane (min)" from -8.5 dBm to -8.2 dBm.
In Table 150-9, change "Power budget (for max TDECQ)" from 6.6 dB to 6.9 dB.
In Table 150-9, add a row "Allocation to allow component re-use in PMDs defined outside 802.3" with a value of 0.3 dB for all cable types.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.7.1** *P* **54** *L* **30** # 10

Dawe, Piers — Mellanox

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

The transition time spec is not consistent for transmit and SRS specs, and too slow for this 400GBASE-SR4.2 channel which needs faster transmitters. See slides 6 and 7 of dawe_3cm_01a_0119.

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 an extra burden for the bidi spec.
802.3cd chose 34 ps as the slowest after a slow channel (SMF clauses). Here, we have 34 ps for the slowest MMF signal after a fast channel, equivalent to 38 ps (observed in 13.28125 GHz) after a slow channel - but 34 ps is used for the slowest signal in SRS. This is inconsistent. The survey results for MMF (dawe_3cd_01b_0518 slide 8 green and slide 11 brown) 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 this spec and still allow plenty of margin for measurement.
Also, it is more convenient to use the same bandwidth for transition time as for TDECQ. If someone prefers to use a different bandwidth, he can read the results across, similar to the second alternative in the remedy.
Someone using emphasis to make a slow transmitter look faster will find that it makes the transition time shorter too. If his transmitter is slow enough to worry about the transition time spec, he won't have a problem with tightening the cursor tap strength limit, and it will fail TDECQ anyway because it's too slow.

SuggestedRemedy

Either: in 150.8.7, Transmitter transition time, change 13.28125 GHz to 9 GHz and 26.5625 GHz to 18 GHz (twice) (same as 150.8.5, TDECQ).
Or:
Change 34 ps to 30 ps, and:
In 150.8.10 Stressed receiver sensitivity, change "the transition time is no greater than the value specified in Table 150-7" to "the transition time is no greater than 34 ps", or add a limit could of 34 ps to Table 150-8, Receive characteristics, in the section for Conditions of stressed receiver sensitivity test.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.7.3** *P* **56** *L* **7** # 39

Lingle, Robert — OFS

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

An allocation for modal noise (MN) plus mode partition noise (MPN) penalties of 0.1 dB was assumed when preparing Clause 138, based on an analysis reiterated recently in king_3cm_01_0319.pdf, extrapolating data from pepeljugoski_01_0108.pdf to the case of PAM-4 signaling with KP4 FEC, obtaining an estimate of 0.08 dB for MN penalty. Relevant data on p13 for k=0.1 in the latter contribution was obscured by overlay of other data. The unobscured data from Pepeljugoski's earlier work, which has been shared with the Task Force, raises the estimate of MN penalty to 0.19 dB. The experimental work in sun_3cm_01a_0319.pdf argued for a MN penalty not greater than 0.25 dB. Taken together, these findings argue for raising the allocated penalty for MPN and MN from 0.1 to 0.3 dB.

SuggestedRemedy

Change two entries in Table 150-9 as follows. 1) Change Power budget from 6.6 to 6.8 dB. 2) Change the Allocation for Penalties from 4.6 to 4.8 dB. Make appropriate adjustments in Tables 150-7 and/or 150-8 to accommodate the increased allocation for penalties.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.7.3** *P* **56** *L* **14** # 38

Kolesar, Paul CommScope

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

Proper allocations for modal noise penalty have been the subject of several past comments and contributions. In king_3cm_01_0319 (King) a reference was made to simulation work done by Petar Pepeljugoski that provides insights to the magnitude of modal noise penalty (MNP) as a function of mode selective loss (MSL) and mode partition noise k factor (MPNk). However, the referenced graphical data for MPNk = 0.1 (i.e. the relevant value for VCSELs) was obscured by data at higher MPNk values. Fortunately, Petar subsequently provided the complete unobscured data for MPNk = 0.1 and gave permission to use it.

I fitted two trendline functions to the upper boundary of dense data to project towards 1.5 dB MSL. The exponential fit projected 0.08 dB and the 2nd order polynomial fit projected to 0.05 dB MNP at 1.5 dB MSL (i.e. the maximum connection loss allocation stated in the draft standard). Of these two, the 2hd order polynomial appears the more resonable, as the exponenetial curve accelerates too quickly. See related contribution from Kolesar.

Converting the 0.05 dB value to account for PAM4 signaling, FEC and link bandwidth as shown in King, results in a modal noise penalty allocation of 0.19 dB for 400GBASE-SR4.2. The current allocation for both modal noise and mode partition noise is 0.1 dB, and therefore deemed inadequate.

SuggestedRemedy

Increase the power budget by 0.2 dB from 6.6 dB to 6.8 dB by adjustments to Tx and/or Rx specifications. The allocation for penalties on page 56 line 18 should be commensurately increased by 0.2 dB from 4.6 to 4.8 dB. Note that these changes are proposed to an informative table, but are the result of changes, to be determined, in normative tables 150-7 and/or 150-8.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.5** *P* **58** *L* **18** # 12

Dawe, Piers Mellanox

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

The 0.1 dB allocation for both modal noise and mode partition noise is too little. See dawe_3cm_adhoc_01_101118, castro_3cm_01_1118, pepeljugoski_1_1104 and castro_3cm_01_0119: we need 0.1 to 0.2 dB for MN (castro_3cm_01_0119 says 0.23 to 0.45 dB) as well as 0.2 to 0.4 dB for MPN. The total penalties should be kept below 4.6 dB, which is unreasonably high already. This should be done with a formula, as for 100GBASE-SR4, so as not to penalise good transmitters.
This remedy keeps the 150 m reach for OM5, although the 100 m transmitters have to be slightly better than needed for 100 m on OM4. M = 0.0065*Pave may be on the low side: 100GBASE-SR4 has M2 = 0.0175*Pave.

SuggestedRemedy

Insert:
Equation (150-1) is used in place of Equation (121-11).
R=sqrt(sigmaG^2 + sigmaS^2 - M^2) (150-1)
where M = 0.0065Pave
In 150.8.10 Stressed receiver sensitivity, refer to the new Eq. 150-1 (as above) and say that:
the value of M in Equation (150-1) is set to zero.
(or, leave this section referring to Eq. 121-11 but to avoid confusion, add:
NOTE--The parameter M of Equation (150-1) 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 150-9, the power budget doesn't change, the allocation for penalties for 70 m and 100 m decrease from 4.6 to 4.5 dB and the additional insertion losses for 70 m and 100 m increase by 0.1 dB to 0.4, 0.3 dB.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.5.1** *P* **58** *L* **28** # 14

Dawe, Piers — Mellanox

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

Equalizing a signal after a 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, can be difficult to receive (outside the TDECQ spec limit) because the 5-tap FFE can't correct the fourth post-cursor and the (now -ve) first precursor at the same time.
The fast channel can have less mode partition noise but more modal noise, but the problem remains.
In practice, it seems that TDECQ uses at least one precursor for real MMF transmitters.
Possible remedies include:
Ensure there is at least one precursor (tap 2 or 3 is the largest), or
Modify TDECQ if tap 1 is the largest by adding an interferer representing the uncorrected precursor that this weird transmitter would have on a short link, or
Defining MMF TDECQ with fast and slow channels, in the same spirit as SMF with high and low dispersion, noting that if tap 2 or 3 is the largest it can be assumed that TDECQ(fast) < TDECQ(slow), so no need to determine it. It should be possible to make a reasonable estimate of TDECQ(fast) from the dataset of a TDECQ(slow) measurement, but it's not likely that one would need to do that, as noted above.

SuggestedRemedy

To ensure that the transmitter is good enough for the intended range of channel bandwidths, change "Tap 1, tap 2, or tap 3, has" to "Tap 2 or tap 3 has".

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.5.1** *P* **58** *L* **29** # 7

Dawe, Piers — Mellanox

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

All the PAM4 specs should allow the same range of over-emphasis so that a common equalizer IC can be used for all, without all their equalizers 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 or resolution 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 could measure MMF TDECQ for the fast channel too. If not, we can read across, recognising that a signal after the slow measurement channel looks 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 (bigger again). Anyone using emphasis to make a slow transmitter look faster will start well to the right (large tap strength) and will not be concerned by this limit.This proposal 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 0.9.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.8** *P* **59** *L* **13** # 40

Lusted, Kent — Intel

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

The title of this subsection is RIN12OMA. However, the first sentence of the first paragraph references RIN. Is the name of the method RIN or RIN12OMA?

SuggestedRemedy

Consider changing the title of subsection 150.8.8 to be "Relative intensity noise (RIN)"

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.8** *P* **59** *L* **16** # 42

Lusted, Kent — Intel

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

The first list item "a" of exceptions to the methodology in 52.9.6 states that "the optical return loss is 12 dB". In IEEE 802.3-2018 Section 4 (page 638), the procedure in 52.9.6.2 references "optical return loss specified in Table 52–7 for 10GBASE-S, Table 52–12 for 10GBASE-L, and Table 52–16 for 10GBASE-E" which have an optical return loss limit of 12 dB.

This is confusing because the table values are already 12dB yet it is listed as an exception

SuggestedRemedy

Consider removing exception item "a" from the list

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.10** *P* **60** *L* **50** # 46

Marris, Arthur — Cadence Design Systems

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

Minus sign using incorrect font.

SuggestedRemedy

Remove the blue colour from the minus sign in:
SECQ - 10log10(Ceq)

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.8.10.1** *P* **61** *L* **21** # 58

Zimmerman, George — CME Consulting/ADI, APL Gp, Aquantia, BMW, Cisc

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

"10 LB" Looks like a unit, folding units into the variable. It would be much clearer if it said "10 x LB MHz" where x is the multiplication symbol and there are nonbreaking spaces between 10, x, LB, and MHz.

SuggestedRemedy

Replace "10 LB" by"10 x LB MHz" where x is the multiplication symbol and there are nonbreaking spaces between 10, x, LB, and MHz.

Proposed Response *Response Status* **O**

Cl **150** *SC* **150.10** *P* **62** *L* **42** # 19

Dudek, Mike — Marvell

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

It is not obvious what a transceiver type is at this point in the document.

SuggestedRemedy

Change "opposite type" to "opposite pair type" Consider adding a sentence in paranthesis "(Bidirectional transceiver pair types are defined in 150.6)"

Proposed Response *Response Status* **O**