

IEEE P802.3cm D2.0 400 Gb/s over Multimode Fiber Initial Working Group ballot comments

CI 138 SC 138.1 P 28 L 12 # 26

Hajduczenia, Marek Charter Communications

Comment Type ER Comment Status R Bucket

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

Response Response Status U

REJECT.  
The enumeration of the PMDs avoids ambiguity.

CI 138 SC 138.8.5 P 38 L 38 # 6

Dawe, Piers Mellanox

Comment Type TR Comment Status R

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,  $M = 0.0065 \cdot P_{ave}$  may be on the low side: 100GBASE-SR4 has  $M_2 = 0.0175 \cdot P_{ave}$ .

SuggestedRemedy

Add an exception in 138.8.5 as follows:  
For 400GBASE-SR8, Equation (138-1) is used in place of Equation (121-11).  
 $R = \sqrt{\sigma_G^2 + \sigma_S^2 - M^2}$  (138-1)  
where  $M = 0.0065 P_{ave}$   
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.)

Response Response Status U

REJECT.  
This comment is similar to comments #39 against D1.0, #4 against D1.1 and #1 against D1.2, which were rejected.  
It is highly desirable to keep the per lane specifications for 400GBASE-SR8 identical to the other PMDs in Clause 138 and changing the TDECQ definition for 50GBASE-SR, 100GBASE-SR2, and 200GBASE-SR4 is out of scope for this project.

CI 138 SC 138.8.5.1 P 38 L 45 # 9

Dawe, Piers Mellanox

Comment Type TR Comment Status R

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.

Response Response Status U

REJECT.  
This comment is similar to comments #42 against D1.0, #7 against D1.1 and #4 against D1.2, which were rejected.  
It is highly desirable to keep the per lane specifications for 400GBASE-SR8 identical to the other PMDs and 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.  
Limiting to at most three post-cursors in the reference equalizer means that the transmitted signal, when propagated through the TDECQ reference response, cannot have a significant amount of fourth post-cursor response at the receiver without suffering higher TDECQ penalty.  
Insufficient evidence has been provided to justify a change.

IEEE P802.3cm D2.0 400 Gb/s over Multimode Fiber Initial Working Group ballot comments

CI 150 SC 150.8.5 P 58 L 18 # 12

Dawe, Piers Mellanox

Comment Type TR Comment Status A

The 0.1 dB allocation for both modal noise and mode partition noise is too little. See daw\_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.  $M = 0.0065 * P_{ave}$  may be on the low side: 100GBASE-SR4 has  $M2 = 0.0175 * P_{ave}$ .

**SuggestedRemedy**

Insert:

Equation (150-1) is used in place of Equation (121-11).

$R = \sqrt{\sigma_G^2 + \sigma_S^2 - M^2}$  (150-1)

where  $M = 0.0065 P_{ave}$

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.

Response Response Status U

ACCEPT IN PRINCIPLE.

See response to comment #29. The consensus was that 4.9 dB allocation for total penalties is acceptable for 400GBASE-SR4.2.

CI 150 SC 150.8.5.1 P 58 L 28 # 14

Dawe, Piers Mellanox

Comment Type TR Comment Status R

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".

Response Response Status U

REJECT.

This comment is similar to comments #48 against D1.0, #14 against D1.1 and #9 against D1.2, which were rejected.

Limiting to at most three post-cursors in the reference equalizer means that the transmitted signal, when propagated through the TDECQ reference response, cannot have a significant amount of fourth post-cursor response at the receiver without suffering higher TDECQ penalty.

Insufficient evidence has been provided to justify a change.

Straw poll

Should a conditional TDECQ test with SECQ bandwidth be added to the draft?

Y: 4

N: 6