

# IEEE P802.3ct D3.2 100 Gb/s over DWDM systems 2nd Sponsor recirculation ballot comments

Cl 1 SC 1.4.237a P23 L32 # R2-1

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type E Comment Status D

The term being defined is duplicated at the start of the definition, most likely due to a copy/paste error: "DWDM black link: DWDM black link:"

SuggestedRemedy

Delete the second instance of "DWDM black link"

Proposed Response Response Status O

Cl 1 SC 1.4.237b P23 L35 # R2-2

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type E Comment Status D

The term being defined is duplicated at the start of the definition, most likely due to a copy/paste error: "DWDM channel: DWDM channel:"

SuggestedRemedy

Delete the second instance of "DWDM channel:"

Proposed Response Response Status O

Cl 1 SC 1.4.237c P23 L38 # R2-3

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type E Comment Status D

The term being defined is duplicated at the start of the definition, most likely due to a copy/paste error: "DWDM PHY: DWDM PHY:"

SuggestedRemedy

Delete the second instance of "DWDM PHY:"

Proposed Response Response Status O

Cl 154 SC 154.6 P112 L33 # R2-4

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type E Comment Status D

The following sentence, while technically correct, reads somewhat awkwardly and required multiple readings to correctly understand the intent: "The DWDM black link in Figure 154-3 is an example of a DWDM black link, where the grey shaded box is used to illustrate that the details of the DWDM black link are not specified." It might benefit from some re-wording to work better in the context of the sentence that preceded it.

SuggestedRemedy

Change:

"The DWDM black link in Figure 154-3 is an example of a DWDM black link, where the grey shaded box is used to illustrate that the details of the DWDM black link are not specified."

To:

"The grey shaded box in Figure 154-3 is used to illustrate some of the details of the DWDM black link that are not specified."

Or something similar.

Proposed Response Response Status O

# IEEE P802.3ct D3.2 100 Gb/s over DWDM systems 2nd Sponsor recirculation ballot comments

CI 154A SC 154A.4 P135 L40 # R2-5

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type E Comment Status D

The first sentence of the second paragraph in 154A.4 reads:

"The achievable distances across the multi-channel fiber between the optical multiplexer and demultiplexer will be determined by the total loss from TP2 to TP3, less the total loss of optical multiplexer and demultiplexer, the loss of potentially present patch panel connectors, and the optical path power penalty due to impairments."

Technically, the total loss from TP2 to TP3 includes all of the items on that list; therefore, they are not additions, but inclusions. My assumption is that the author was actually referring to fiber loss, but as written it would seem to include all sources of loss. Additionally, the calculation is not for the distance between the optical mux and demux, which would not include those loss figures; rather, it is the distance between TP2 and TP3.

## SuggestedRemedy

Proposed modifying the sentence in question to read:

"The achievable distances across the multi-channel fiber between TP2 and TP3 will be determined by the total loss from TP2 to TP3, which includes the total loss due to signal loss over fiber, the total loss of the optical multiplexer and demultiplexer, the loss of potentially present patch panel connectors, and the apparent loss due to impairments (the optical path power penalty)."

Or something similar.

Proposed Response Response Status O

CI 154A SC 154A.4 P135 L43 # R2-6

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type E Comment Status D

The second sentence of the second paragraph of 154A.4 reads as follows:

"The maximum allowable loss over the DWDM black link can therefore be calculated from the difference between the minimum average receive power (at TP3) and the minimum transmitter average channel output power (at TP2), which is 19 dB."

Technically, this is not the maximum permissible loss in the absolute sense, since devices can exceed the power output and sensitivity requirements in this specification; rather, it is the maximum permissible loss for a minimally compliant device.

## SuggestedRemedy

Propose replacing the sentence in question with the following text:

"The maximum allowable loss over the DWDM black link can therefore be calculated from the difference between the minimum average receive power (at TP3) and the minimum transmitter average channel output power (at TP2), which for a device meeting the minimum requirements is 19 dB."

Or something similar.

Proposed Response Response Status O

CI 154 SC 154.6 P112 L53 # R2-7

Huber, Thomas Nokia

Comment Type E Comment Status D

Two places in this paragraph (which extends onto page 113 below figure 154-3) are missing the hyphen in the PMD name.

## SuggestedRemedy

Change "100GBASE ZR" to "100GBASE-ZR"

Proposed Response Response Status O

# IEEE P802.3ct D3.2 100 Gb/s over DWDM systems 2nd Sponsor recirculation ballot comments

CI **154A** SC **154A.4** P**137** L**1** # **R2-8**  
 Issenhuth, Tom Issenhuth Consulting, LLC, Huawei Technologies Co.,  
 Comment Type **E** Comment Status **D**  
 The table number is missing from the table title  
 SuggestedRemedy  
 Add the Table number "Table 154A-5" to the table title  
 Proposed Response Response Status **O**

CI **153** SC **153.2.3.2.5** P**92** L**36** # **R2-9**  
 Dawe, Piers J G NVIDIA  
 Comment Type **TR** Comment Status **D**  
 The need for an example file containing an example SC-FEC codeword published at <http://standards.ieee.org/downloads/802.3/> has not gone away, and before this project can complete, it needs to be reviewed. If reviewers do not agree on its correctness and consistency with the draft, one or both of draft and file would need to be re-issued and reviewed again.  
 SuggestedRemedy  
 Reinstate the text "NOTE—A file containing an example SC-FEC codeword is available at <http://standards.ieee.org/downloads/802.3/>. Upload a draft file for review, e.g. in the P802.3ct web area, before or at the same time as the next draft.  
 Proposed Response Response Status **O**

CI **154** SC **154.9.9** P**119** L**23** # **R2-10**  
 Dawe, Piers J G NVIDIA  
 Comment Type **TR** Comment Status **D**  
 \*\*\* Comment submitted with the file jitterCornerIn100GBASE-ZR\_2.pdf attached \*\*\*  
 With respect to D3.0 comment 85 and D3.1 comments 69 and 79 about jitter bandwidth: the EVMrms calculation used to implement G.698.2 has the effect of a CRU of 15 MHz or fb/1863.5, which is too high for real DSP receivers and a lot higher than for 802.3 PAM4 optical signals. See presentation. This should be reduced to 2 to 3 MHz, but should not be arbitrarily low. It is convenient to keep Jpkpk\*fJitter the same as for other 100Gb/s/lane optical PMDs, giving 2.1 MHz. The proposed remedy has 2.2 MHz so as to simplify the EVM block processing. And see a related comment about jitter tolerance, so as to keep the balance of burden between transmitter and receiver correct.  
 SuggestedRemedy  
 Change:  
 The error vector magnitude, as defined in Recommendation ITU-T G.698.2 for DP-DQPSK signals, shall be within the limits given in Table 154–7.  
 to:  
 Error vector magnitude is as defined in Recommendation ITU-T G.698.2 for DP-DQPSK signals, with the exception that the samples are aligned to the signal with the effect of a clock recovery unit (CRU) with a corner frequency of 2.2 MHz and a slope of 20 dB/decade. NOTE--This may be achieved by correcting the phase of the symbols (not the optical phase) with a block size of 7000 UI rather than the default 1000 UI block size.  
 The error vector magnitude shall be within the limits given in Table 154–7.  
 Proposed Response Response Status **O**

## IEEE P802.3ct D3.2 100 Gb/s over DWDM systems 2nd Sponsor recirculation ballot comments

CI **154** SC **154.9.15** P**119** L**17** # **R2-11**

Dawe, Piers J G

NVIDIA

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

With respect to D3.0 comment 85 and D3.1 comments 69 and 79 about jitter bandwidth: the EVMrms way of specifying transmitter quality allows jitter on the phase of the symbols that can be significant and must be tolerated by the receiver. A way of assuring this is needed, and is usual: see "stressed sensitivity" or "jitter tolerance" definitions in many clauses and annexes. As this is the only normative receiver performance spec, jitter tolerance it should be included here as in so many optical receiver stressed sensitivity clauses, though it could be applied separately.

I believe that this amount of SJ on top of such a noisy signal as for a BER of 4.62e-3 doesn't change the sensitivity enough to warrant changing the headline numbers of 35 and 19.5 in Table 154-8.

The sinusoidal jitter could be described by a formula in the style of 121.8.9.4, Sinusoidal jitter for receiver conformance test, if that is preferred.

And see a related comment about jitter generation, so as to keep the balance of burden between transmitter and receiver correct. The numbers in the suggested remedy are based on a 2.2 MHz jitter corner frequency as proposed there.

#### SuggestedRemedy

Add text: the clock for the DQPSK symbol streams of the test transmitter is modulated with the sinusoidal jitter of each of the frequency, amplitude jitter pairs in Table 154-12, in turn. Table 154-12--Applied sinusoidal jitter

Parameter	Case A	Case B	Case C	Case D	Case E	Unit
Jitter frequency	0.22	0.72	2.2	6.4	21	MHz
Jitter amplitude (pk-pk)	0.49	0.15	0.05	0.05	0.05	UI

Proposed Response Response Status **O**

CI **154A** SC **154A.3** P**134** L**47** # **R2-12**

Dawe, Piers J G

NVIDIA

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

Completing D3.1 comment 81: "This (welcome) annex is not about applications."  
Also, see 1.4.309 link segment.

#### SuggestedRemedy

Change 154A.3 Examples of DWDM black link applications with OSNR at TP3 between 19.5 dB (12.5 GHz) and 35 dB (12.5 GHz), to:

154A.3 Example with OSNR at TP3 between 19.5 dB (12.5 GHz) and 35 dB (12.5 GHz)

Change "For any application over any DWDM black link distance" to "For any DWDM black link distance".

Change "Specifically in an example application of 40" to "Specifically in an example of 40"

Change "154A.4 Example of DWDM black link applications with OSNR at TP3 greater than or equal to 35 dB (12.5 GHz)"

to "154A.4 Example with OSNR at TP3 greater than or equal to 35 dB (12.5 GHz)"

Change "four examples of DWDM black link applications with OSNR at TP3" to "four examples with OSNR at TP3".

Change "conventional point-to-point Ethernet application where the PMDs" to "conventional point-to-point Ethernet link segment where the PMDs"

Change Table 154A-2--40 channel example DWDM black link application with OSNR (TP3) >= 35 dB (12.5 GHz)

to: Table 154A-2--40 channel example with OSNR (TP3) >= 35 dB (12.5 GHz)

and similarly for the next three tables.

Proposed Response Response Status **O**

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general

COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn

SORT ORDER: Comment ID

Comment ID **R2-12**

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# IEEE P802.3ct D3.2 100 Gb/s over DWDM systems 2nd Sponsor recirculation ballot comments

CI 1 SC 1.4.237b P23 L35 # R2-13

Dawe, Piers J G

NVIDIA

Comment Type TR Comment Status D

As D3.0 comment 87 and D3.1 comment 82 pointed out, the path between PMDs is not from TP2 to TP3 because TP2 is not at the PMD, so a transmitting DWDM PHY is not TP2 (even though a receiving DWDM PHY can be called TP3). The path between PMDs is from MDI to MDI, or PMD to PMD, or transmitter to receiver, or PHY to PHY. As almost every optical clause says, "NOTE--Transmitter compliance testing is performed at TP2 as defined in 121.5.1, not at the MDI." If G.698.2 means that Ss is at Tx and Rs is at Rx, the DWDM channel is from MDI to MDI and TP2 is not relevant here, as well as being incorrect by 802.3. If G.698.2 means that there is something between Ss and Tx and between Rs and Rx, then TP3 is not relevant here.

## SuggestedRemedy

Change "1.4.237b DWDM channel: DWDM channel: The transmission path from a transmitting DWDM PHY (TP2) to a receiving DWDM PHY (TP3). to "1.4.237b DWDM channel: DWDM channel: The transmission path from a transmitting DWDM PHY to a receiving DWDM PHY." or, following  
Correct misuse of TP2 throughout the draft.

Proposed Response Response Status O

CI 154 SC 154.6 P114 L32 # R2-14

Dawe, Piers J G

NVIDIA

Comment Type ER Comment Status D

As 154.4 says, MDIO is optional. Editorial suggestions at the end of the sentence

## SuggestedRemedy

Change:  
The Tx\_optical\_channel\_index, the Rx\_optical\_channel\_index, and the Tx\_Rx\_diff\_opt\_chan\_ability variables are mapped to the relevant MDIO variables and PMA/PMD register names in 154.4.  
to:  
Optionally, the Tx\_optical\_channel\_index, the Rx\_optical\_channel\_index, and the Tx\_Rx\_diff\_opt\_chan\_ability variables are mapped to MDIO variables and PMA/PMD register names according to 154.4.

Proposed Response Response Status O

CI 30 SC 30.5.1.1.28 P29 L13 # R2-15

Dawe, Piers J G

NVIDIA

Comment Type T Comment Status D

"a PHY that supports RS-FEC at the MDI" doesn't make sense. The PHY uses the FEC not supports it, and the FEC sublayer is separated from the MDI by PMD and PMA

## SuggestedRemedy

Change to e.g. one of these:  
a PHY that uses FEC on the medium  
a PHY that uses FEC on link segment  
a PHY that uses FEC through the PMD  
a PHY that transmits FEC-protected signals from the PMD

Proposed Response Response Status O

CI 153 SC 153.2.3.2.4 P89 L29 # R2-16

Dawe, Piers J G

NVIDIA

Comment Type E Comment Status D

Font for column numbers is much smaller than for row numbers, which are at the preferred font size (9 point).

## SuggestedRemedy

Please make them larger.

Proposed Response Response Status O

CI 154 SC 154.6 P113 L26 # R2-17

Dawe, Piers J G

NVIDIA

Comment Type T Comment Status D

Near and far ends are not defined, and anyway the other direction should be correct too.

## SuggestedRemedy

Change "The 100GBASE-ZR near end Tx, the associated DWDM channel, and the 100GBASE-ZR far end Rx are all selected to have the same channel center frequency." to "In each direction of transmission, the 100GBASE-ZR Tx, the associated DWDM channel, and the 100GBASE-ZR Rx are all selected to have the same channel center frequency."

Proposed Response Response Status O

# IEEE P802.3ct D3.2 100 Gb/s over DWDM systems 2nd Sponsor recirculation ballot comments

Cl 154 SC 154.9.19 P120 L42 # R2-18

Dawe, Piers J G

NVIDIA

Comment Type TR Comment Status D

It is not clear what the reference receiver in Annex A of Recommendation ITU-T G.698.2 is. Annex A says "The reference receiver includes the following steps as defined in the EVM calculation in clause 7.2.12, except the first item: compensate for chromatic dispersion and differential group delay". This might mean that the first item "compensate for chromatic dispersion and differential group delay" is included in EVM but not in Annex A, or vice versa. If these are additional steps that are not defined in 7.2.12, where are they defined?

SuggestedRemedy

Define more clearly what the differences between 7.2.12 and Annex A are.

Proposed Response Response Status O

Cl 154 SC 154.9.7 P119 L13 # R2-19

Dawe, Piers J G

NVIDIA

Comment Type T Comment Status D

As this is defined by reference, its name should be identical to that in the reference.

SuggestedRemedy

Change "power difference between X and Y polarizations", to "power difference between polarizations", as in G.698.2 which provides the definition. Also in Tables 7 and 11.

Proposed Response Response Status O

Cl 154 SC 154.9.8 P119 L18 # R2-20

Dawe, Piers J G

NVIDIA

Comment Type T Comment Status D

As this is defined by reference, its name should be identical to that in the reference.

SuggestedRemedy

Change "skew between X and Y polarizations", to "Skew between the two polarizations", as in G.698.2 which provides the definition. Also in Tables 7 and 11.

Proposed Response Response Status O

Cl 154 SC 154.7.1 P115 L32 # R2-22

Ghiasi, Ali

Ghiasi Quantum LLC, Inphi Corporation

Comment Type TR Comment Status D

Error vector magnitude of 23% per ITU-T G.698.2 test procedure is measured with real time scope with B=1000 symbols. The issue with B=1000 is that in effect the equivalent CDR BW is 15.2 MHz which is about an order of magnitude larger than typical coherent DSP. Unless DSP suppliers can commit to 15 MHz timing recovery BW the standard will have major interoperability issue.

SuggestedRemedy

To overcome this shortcoming recommend B=10000 symbols resulting in ~1.5 MHz corner frequency BW. Recommendation is to keep B=1000 for computation of carrier phase to avoid laser phase noise changing the EVM, but I/Q[mean] and I/Q(AC) are computed with 10000 symbols, see Dawes presentation.

Proposed Response Response Status O