Cl **1** *SC* **1.4.237a** *P* **23** *L* **32** # R2-1

Schmitt, Matthew — Cable Television Laboratories Inc. (CableLabs)

Comment Type **E** *Comment Status* **A**

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"

Response *Response Status* **C**

ACCEPT.

Cl **1** *SC* **1.4.237b** *P* **23** *L* **35** # R2-13

Dawe, Piers J G — NVIDIA

Comment Type **TR** *Comment Status* **R**

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.

Response *Response Status* **U**

REJECT.

As noted by the commenter this same change was proposed in D3.0 comment 87 and D3.1 comment 82. In both cases the wording of the definition was modified but the use of TP2 and TP3 was maintained. As consistent with existing IEEE language, the draft states "the optical transmit signal is defined at the output end of a single-mode fiber patch cord (TP2)" and "the optical receive signal is defined at the output of the fiber optic cabling (TP3) at the MDI" so the supporting medium which in this case is a DWDM channel, has to be from TP2 to TP3.

Cl **1** *SC* **1.4.237b** *P* **23** *L* **35** # R2-2

Schmitt, Matthew — Cable Television Laboratories Inc. (CableLabs)

Comment Type **E** *Comment Status* **A**

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:"

Response *Response Status* **C**

ACCEPT.

Cl **1** *SC* **1.4.237c** *P* **23** *L* **38** # R2-3

Schmitt, Matthew — Cable Television Laboratories Inc. (CableLabs)

Comment Type **E** *Comment Status* **A**

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:"

Response *Response Status* **C**

ACCEPT.

Cl **30** *SC* **30.5.1.1.28** *P* **29** *L* **13** # R2-15

Dawe, Piers J G — NVIDIA

Comment Type **T** *Comment Status* **A**

"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

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change "a PHY that supports RS-FEC at the MDI" to "a PHY that supports RS-FEC across the MDI".

Change all instances in clause 30 of "at the MDI" to "across the MDI" with editorial license.

Cl **153** *SC* **153.2.3.2.4** *P* **89** *L* **29** # R2-16

Dawe, Piers J G NVIDIA

Comment Type **E** *Comment Status* **R**

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.

Response *Response Status* **C**

REJECT.

The draft is technically correct and will be professionally edited for publication. The issue of the font size in Figure 153-3 will be referred to the Publication Editor for their consideration.

Cl **153** *SC* **153.2.3.2.5** *P* **92** *L* **36** # R2-9

Dawe, Piers J G NVIDIA

Comment Type **TR** *Comment Status* **R**

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.

Response *Response Status* **U**

REJECT.

The proposed change in the comment does not contain sufficient detail so that the CRG can understand the specific changes that would satisfy the commenter.

No file containing an example SC-FEC codeword has been submitted to the Task Force. Without a suitable file, the note should not be reinstated.

Cl **154** *SC* **154.6** *P* **112** *L* **33** # R2-4

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

Comment Type **E** *Comment Status* **A**

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.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.
Change "the grey shaded box" to "a grey shaded box".

Cl **154** *SC* **154.6** *P* **112** *L* **53** # R2-7

Huber, Thomas Nokia

Comment Type **E** *Comment Status* **A**

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"

Response *Response Status* **C**

ACCEPT.

Cl **154** *SC* **154.6** *P* **113** *L* **26** # R2-17

Dawe, Piers J G NVIDIA

Comment Type **T** *Comment Status* **A**

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."

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.
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
"The 100GBASE-ZR Tx, the associated DWDM channel, and the 100GBASE-ZR Rx connected to the output of the DWDM black link, are all selected to have the same channel center frequency."

Cl **154** *SC* **154.6** *P* **114** *L* **32** # R2-14

Dawe, Piers J G NVIDIA

Comment Type **ER** *Comment Status* **A**

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.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.
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:
"The mapping of the Tx_optical_channel_index, the Rx_optical_channel_index, and the Tx_Rx_diff_opt_chan_ability variables to the relevant optional MDIO variables and PMA/PMD register names is shown in 154.4."

Cl **154** *SC* **154.7.1** *P* **115** *L* **32** # R2-22

Ghiasi, Ali Ghiasi Quantum LLC,Inphi Corporation

Comment Type **TR** *Comment Status* **A**

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.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See resolution to comment R2-10.

The response to comment R2-10 was:

ACCEPT IN PRINCIPLE.
The addition of a corner frequency of a clock recovery unit is a useful improvement of the draft, because it will limit the amount of jitter that can be present at the transmitter.

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:
"The error vector magnitude shall be within the limits given in Table 154-7 and is as defined in Recommendation ITU-T G.698.2, with the exception that the samples are acquired with the effect of a clock recovery unit (CRU) with a corner frequency of 1.5 MHz and a slope of 20 dB/decade."

Cl **154** *SC* **154.9.7** *P* **119** *L* **13** # R2-19

Dawe, Piers J G NVIDIA

Comment Type **T** *Comment Status* **R**

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.

Response *Response Status* **C**

REJECT.
This was extensively discussed in relation to comment R1-88 to D3.1 and the resolution was:

Change parameter name to "Power difference between X and Y polarizations"

Cl **154** *SC* **154.9.8** *P* **119** *L* **18** # R2-20

Dawe, Piers J G NVIDIA

Comment Type **T** *Comment Status* **R**

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.

Response *Response Status* **C**

REJECT.
This was extensively discussed in relation to comment R1-88 to D3.1 and the resolution was:

Change parameter name from "Skew between X-Y polarizations" to "Skew between X and Y polarizations"

Cl **154** *SC* **154.9.9** *P* **119** *L* **23** # R2-10

Dawe, Piers J G NVIDIA

Comment Type **TR** *Comment Status* **A**

*** 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.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.
The addition of a corner frequency of a clock recovery unit is a useful improvement of the draft, because it will limit the amount of jitter that can be present at the transmitter.

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:
"The error vector magnitude shall be within the limits given in Table 154-7 and is as defined in Recommendation ITU-T G.698.2, with the exception that the samples are acquired with the effect of a clock recovery unit (CRU) with a corner frequency of 1.5 MHz and a slope of 20 dB/decade."

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

Dawe, Piers J G NVIDIA

Comment Type **TR** *Comment Status* **A**

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

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

In 154.9.15 change the end of the last sentence from "includes effects from impairments inside the DWDM black link" to "includes effects associated with impairments of the transmitter and inside the DWDM black link."

Cl **154** *SC* **154.9.19** *P* **120** *L* **42** # R2-18

Dawe, Piers J G NVIDIA

Comment Type **TR** *Comment Status* **R**

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.

Response *Response Status* **U**

REJECT.
Even though the wording of Annex A in Recommendation ITU-T G.698.2 is somewhat different than common in IEEE 802.3 documents, it still is sufficient and adequate.
The definition of EVM in G.698.2 does not include compensating for effects of the optical path (and thus chromatic dispersion) while for the definition of "Maximum optical path OSNR penalty", for which the reference receiver in Annex A is specifically defined, it is necessary to compensate for the effects of the path.
The conditions for the defintion of "Optical path power penalty" in 154.9.19, are similar to the definition of "optical path OSNR penalty" and therefore the same reference receiver can be used.

Improving the text of G.698.2 is out of scope of IEEE 802.3.

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

Dawe, Piers J G — NVIDIA

Comment Type **T** *Comment Status* **R**

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.

Response *Response Status* **C**

REJECT.
This comment is treated as Editorial and not Technical. No technical change has been proposed.
The current text is not broken and adequate to describe the intent of the Annex. Making the proposed changes would not improve the quality of the draft.

Cl **154A** *SC* **154A.4** *P* **135** *L* **40** # R2-5

Schmitt, Matthew — Cable Television Laboratories Inc. (CableLabs)

Comment Type **E** *Comment Status* **A**

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.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.
It is specifically the intent of the sentence referred to, to express that one can calculate the maximum distance from the total loss between TP2 and TP3 and then subtracting the losses of optical (de)multiplexers, patch panel losses and optical path penalty.
However, the maximum distance is the sum of any transmission fiber between TP2 and multiplexer, the multi channel fiber between the multiplexer and demultiplexer, and any transmission fiber between the demultiplexer and TP3.

Change:
"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. 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."
to:
“The achievable distances across the fiber between TP2 and TP3 will be determined by the total loss from TP2 to TP3, minus the total loss of the optical multiplexer and demultiplexer

and the loss of potentially present patch panel connectors. The maximum allowable loss from TP2 to TP3 can 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."

Cl **154A** *SC* **154A.4** *P* **135** *L* **43** # R2-6

Schmitt, Matthew — Cable Television Laboratories Inc. (CableLabs)

Comment Type **E** *Comment Status* **R**

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.

Response *Response Status* **C**

REJECT.
The suggested remedy implies that additional loss can be accommodated by taking into account devices which have better performance than the specified worst case. In this case the link would not meet the requirements in 154.8, with a risk that after replacement of a transmitter and/or receiver, the link may fail.

Cl **154A** *SC* **154A.4** *P* **137** *L* **1** # R2-8

Issenhuth, Tom — Issenhuth Consulting, LLC,Huawei Technologies Co.,

Comment Type **E** *Comment Status* **A**

The table number is missing from the table title

SuggestedRemedy

Add the Table number "Table 154A-5" to the table title

Response *Response Status* **C**

ACCEPT.