*Cl* **1** *SC* **1.4** *P* **22** *L* **40** # R1-1

Stassar, Peter — Huawei Technologies Co., Ltd

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

Concerns have been raised about the actual need for a definition for DWDM system, which can be regarded as generic and not specific. One potential option is to delete this definition or alternatively we would need a rewrite

*SuggestedRemedy*

Delete the definition for DWDM system

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **21** # R1-2

Stassar, Peter — Huawei Technologies Co., Ltd

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

During the review of comments to D3.0 it was agreed to add some text on bi-directional operation. Unfortanately the editor omitted to do that. Need to add text

*SuggestedRemedy*

Add "Furthermore bi-directional transmission over
the multi-channel fiber inside the black link is not precluded." to the Note on line 43 of page 111 in 154.6 and additionally add "Bi-directional transmission over the multi-channel fiber inside the black link is not precluded" to Figure 154-3

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.2** *P* **115** *L* **21** # R1-3

Stassar, Peter — Huawei Technologies Co., Ltd

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

In resolution to comment i-42 it was agreed to make new parameter Receiver sensitivity informative. Because Receiver OSNR tolerance is equivalent to Receiver sensitivity it is appropriate to make Receiver OSNR tolerance informative as well.

*SuggestedRemedy*

In Table 154-8 make Receiver OSNR tolerance "informative" by adding words to note b.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.16** *P* **119** *L* **21** # R1-4

Stassar, Peter — Huawei Technologies Co., Ltd

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

In resolution to comment i-86 it was agreed to add "the draft should be clarified to state that the OSNR tolerance has to be met with worst case EVM." However, this would apply to all parameters, and could be a precedent to unnecessarily copy material from G.698.2 into Clause 154. The parameter definitions in G.698.2 are quite explicit with respect to worst case EVM. Therefore the Note should be deleted

*SuggestedRemedy*

Delete the Note to Receiver OSNR tolerance in 154.9.16

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.160a** *P* **22** *L* **14** # R1-5

Trowbridge, Stephen — Nokia

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

"black link" refers to a method of link specification, not the link itself.

*SuggestedRemedy*

Remove the definition for "black link". In its place, insert "black link methodology - the specification of the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel, without specifying how the transmission path is implemented. (See, for example, IEEE Std 802.3, Clause 154, Figure 154–3)".
Replace all instances of "black link" used as a noun with "DWDM channel" throughout the draft.
Ensure that all instances of "black link" as an adjective use the consistent wording "black link methodology" (rather than "black link approach") throughout the draft.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237a** *P* **22** *L* **31** # R1-6

Trowbridge, Stephen Nokia

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

Since "DWDM channel" will replace most instances of "black link" as a noun, clarify that the behavior of a DWDM channel is specified using the black link methodology.

*SuggestedRemedy*

Add a sentence to the end of the definition of "DWDM channel" to read "The input, output, and transfer characteristics of the uni-directional transmission path between TP2 and TP3 for a DWDM channel are specified using the black link methodology."

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237b** *P* **22** *L* **34** # R1-7

Trowbridge, Stephen Nokia

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

"DWDM link" is an unnecessary term, which usually has identical meaning to "DWDM channel" where it is used in the draft.

*SuggestedRemedy*

Remove the definition for DWDM link. Related changes to the draft are covered in other comments.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237c** *P* **22** *L* **37** # R1-8

Trowbridge, Stephen Nokia

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

DWDM PHY is an unnecessary and misleading definition. The reference points adjacent to the PHY (TP2 and TP3) are single-channel reference points with no DWDM present. The fact that the transmission paths (DWDM channels) used by multiple PHYs may be combined using DWDM in the middle of the link doesn't need to be reflected in how the PHY is named.

*SuggestedRemedy*

Remove the definition DWDM PHY. Replace "DWDM PHY" with "100GBASE-ZR PHY" throughout the draft.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237d** *P* **22** *L* **40** # R1-9

Trowbridge, Stephen Nokia

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

"DWDM System" is an unnecessary term.

*SuggestedRemedy*

Delete the definition for "DWDM System". Related changes covered in other comments.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.400a** *P* **22** *L* **45** # R1-10

Trowbridge, Stephen Nokia

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

The definition of DWDM link is removed by another comment, but isn't really necessary for the definition of polarization dependent loss

*SuggestedRemedy*

Change the definition of polarization dependent loss to "The variation of insertion loss due to variation of the state of polarization of an optical signal over all states of polarization within the channel frequency or wavelength range."

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.2** *P* **29** *L* **8** # R1-11

Trowbridge, Stephen Nokia

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

Remove deleted definition "DWDM system" from explanation of 100GBASE-ZR aMAUType

*SuggestedRemedy*

Change "100GBASE-R PCS/100GBASE-ZR PMA over a DWDM system PMD with reach up to at least 80 km as specified in Clause 154" to "100GBASE-R PCS/100GBASE-ZR PMA over a PMD with reach up to 80km as specified in Clause 154"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **27** # R1-12

Trowbridge, Stephen Nokia

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

"black link" will have been changed to "DWDM channel" by an earlier comment. The term "DWDM link" is removed by another comment.

*SuggestedRemedy*

Change "Functions carried out by the DWDM link are …" to "Functions that may be contained within the DWDM channel include …"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **38** # R1-13

Trowbridge, Stephen Nokia

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

The term DWDM link is proposed to remove by another comment

*SuggestedRemedy*

Change "DWDM link" to "DWDM channel"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **112** *L* **15** # R1-14

Trowbridge, Stephen Nokia

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

Figure 154-3 inconsistent with terminology update resulting from other comments.

*SuggestedRemedy*

Remove the words "Black link" from the grey box in Figure 154-3. Change the figure title to "DWDM channel example configuration"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **112** *L* **22** # R1-15

Trowbridge, Stephen Nokia

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

Reword the paragraph following Figure 154-3 to avoid the use of deleted terms "DWDM link" and "DWDM system"

*SuggestedRemedy*

Change the paragraph following Figure 154-3 to read:
"The 100GBASE-ZR PMD is specified for operation over a single DWDM channel. An individual DWDM channel operates on a frequency selected from the DWDM frequency grid defined by Table 154-5, which shows the mapping of 100GBASE_ZR channel index numbers to optical channel center frequencies. This grid corresponds to a subset of the DWDM frequency grid with 100 GHz spacing defined by Recommendation ITU-T G.694.1. The DWDM infrastructure may support between 1 and 48 DWDM channels, each operating on a different frequency. For a given DWDM channel, the 100GBASE-ZR Tx, the associated DWDM channel, and the 100GBASE-ZR Rx are configured to support the same channel center frequency.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.35b** *P* **22** *L* **9** # R1-16

Huber, Thomas Nokia

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

Since this is the first use of DP-DQPSK it should be expanded

*SuggestedRemedy*

Expand DP-DQPSK to dual polarization differential quadrature phase shift keying (DP-DQPSK)

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.28** *P* **28** *L* **13** # R1-17

Huber, Thomas Nokia

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

Missing an 's' in supports

*SuggestedRemedy*

Change from: "A read-only value that indicates if a PHY that support RS-FEC at the MDI…"
to: "A read-only value that indicates if a PHY that supports RS-FEC at the MDI…"

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.28** *P* **28** *L* **14** # R1-18

Huber, Thomas Nokia

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

There should be a clear specification of what value the attribute takes for a PHY that does not support RS-FEC at the MDI.

*SuggestedRemedy*

Add text to clarify - either indicate the value that the attribute takes for PHYs that don't support RS-FEC at the MDI, or indicate that the attribute doesn’t apply to such PHYs.

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.29** *P* **28** *L* **30** # R1-19

Huber, Thomas Nokia

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

Missing an 's' in supports

*SuggestedRemedy*

Change from: "A read-only value that indicates if a PHY that support RS-FEC at the MDI…" to: "A read-only value that indicates if a PHY that supports RS-FEC at the MDI…"

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.29** *P* **28** *L* **31** # R1-20

Huber, Thomas Nokia

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

There should be a clear specification of what value the attribute takes for a PHY that does not support RS-FEC at the MDI.

*SuggestedRemedy*

Add text to clarify - either indicate the value that the attribute takes for PHYs that don't support RS-FEC at the MDI, or indicate that the attribute doesn’t apply to such PHYs.

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.30** *P* **28** *L* **47** # R1-21

Huber, Thomas Nokia

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

Missing an 's' in supports

*SuggestedRemedy*

Change from: "A read-only value that indicates if a PHY that support RS-FEC at the MDI…" to: "A read-only value that indicates if a PHY that supports RS-FEC at the MDI…"

*Proposed Response* *Response Status* **O**

*Cl* **30** *SC* **30.5.1.1.30** *P* **28** *L* **48** # R1-22

Huber, Thomas Nokia

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

There should be a clear specification of what value the attribute takes for a PHY that does not support RS-FEC at the MDI.

*SuggestedRemedy*

Add text to clarify - either indicate the value that the attribute takes for PHYs that don't support RS-FEC at the MDI, or indicate that the attribute doesn’t apply to such PHYs.

*Proposed Response* *Response Status* **O**

*Cl* **45** *SC* **45.2.1.1.133a.1** *P* **33** *L* **30** # R1-23

Huber, Thomas Nokia

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

A channel index corresponds to a single (center) frequency

*SuggestedRemedy*

Change from: "The channel index number indicates the corresponding optical frequencies" to: "The channel index number indicates the corresponding optical frequency."

*Proposed Response* *Response Status* **O**

*Cl* **45** *SC* **45.2.1.1.133e.2** *P* **37** *L* **39** # R1-24

Huber, Thomas Nokia

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

A channel index corresponds to a single (center) frequency

*SuggestedRemedy*

Change from: "The channel index number indicates the corresponding optical frequencies" to: "The channel index number indicates the corresponding optical frequency."

*Proposed Response* *Response Status* **O**

*Cl* **153** *SC* **153.2.3.2.7** *P* **92** *L* **40** # R1-25

Huber, Thomas Nokia

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

Missing an article before FEC frame

*SuggestedRemedy*

Change from: "51 groups of 16 octets are distributed from FEC frame…" to: "51 groups of 16 octets are distributed from the FEC frame…"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.1** *P* **105** *L* **8** # R1-26

Huber, Thomas Nokia

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

Duplication of "fiber based", and missing a hyphen

*SuggestedRemedy*

Change from: "which is a single-mode fiber based fiber based dense wavelength division multiplexing (DWDM) channel…" to: "which is a single-mode fiber-based dense wavelength division multiplexing (DWDM) channel…"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **17** # R1-27

Huber, Thomas Nokia

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

Missing a comma

*SuggestedRemedy*

Change from: "...also referred to as a DWDM channel which is defined..." to::" …also referred to as a DWDM channel, which is defined…"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **22** # R1-28

Huber, Thomas Nokia

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

Second paragraph would read better if the first sentence was split into two.

*SuggestedRemedy*

Change from:
"Because in this application DWDM technology is used to transport multiple DWDM channels over a single fiber, a black link specification methodology is used to allow specification of the (single channel) DWDM
channel in a way that the effects of other DWDM channels, simultaneously present on the multi-channel part of the link, have been taken into account."

to:

"In this application, DWDM technology is used to enable the transport of multiple DWDM channels over a single fiber. A black link specification methodology is used to allow specification of the (single) DWDM channel in a way that takes into account the effects of other DWDM channels that may be simultaneously present on the multi-channel part of the link."

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **27** # R1-29

Huber, Thomas Nokia

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

Third and fourth paragraphs would read better if they were combined and reorganized.

*SuggestedRemedy*

Replace the paragraphs with this text: Figure 154–3 shows a generic example of a DWDM channel specified using the black link methodology and identifies the location of the single channel interfaces at TP2 and TP3. The DWDM channel includes wavelength division multiplexing and demultiplexing supporting simultaneous transport of a maximum of n DWDM channels on a single fiber, and may also include optical amplification. The grey-shaded box in Figure 154-3 is used to indicate that the implementation details of the DWDM channel are outside the scope of this clause. The arrangement of (DWDM) elements within the figure is not intended to place constraints on the construction of the link.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **112** *L* **28** # R1-30

Huber, Thomas Nokia

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

The grid that is defined for use by 100GBASE-ZR is a 48-channel subset of what G.694.1 specifies for 100 GHz spacing. While a deployment may use fewer than 48 channels, and thus have larger than 100 GHz spacing, there is no reason to discuss the channel spacing that the infrastructure supports

*SuggestedRemedy*

Replace: This grid corresponds to the DWDM frequency grid defined by Recommendation ITU-T G.694.1. The 100GBASE-ZR PMD specification covers a maximum of 48
channels over a DWDM system, supporting between 1 and 48 channels, with a channel spacing of at least
100 GHz.
With:
This grid corresponds to a subset of the DWDM frequency grid with 100 GHz spacing that is defined by Recommendation ITU-T G.694.1. The DWDM infrastructure may support between 1 and 48 channels.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.1** *P* **105** *L* **8** # R1-31

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

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

The phrase "fiber based" is repeated in the first sentence of the subclause, most likely due to a copy/paste error: "fiber based fiber based dense wavelength division multiplexing (DWDM) channel"

*SuggestedRemedy*

Delete one instance of "fiber based" in that sentence.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8** *P* **115** *L* **49** # R1-32

Schmitt, Matthew Cable Television Laboratories Inc. (CableLabs)

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

Given that both "Optical path OSNR penalty (max), for OSNR at TP3 < 35 dB (12.5 GHz)" and "Optical path penalty (max), for OSNR at TP3 >= 35dB (12.5 GHz)" have the same value -- in other words the, the OSNR penalty is the same regardless of the OSNR level -- it seems like these two parameters could be consolidated together into a single parameter and table entry.

*SuggestedRemedy*

Modify "Optical path OSNR penalty (max), for OSNR at TP3 < 35 dB (12.5 GHz)" to be "Optical path OSNR penalty (max)", and delete the table entry for "Optical path penalty (max), for OSNR at TP3 >= 35dB (12.5 GHz)".

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.3** *P* **133** *L* **29** # R1-33

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

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

The values chosen for the optical multiplexer, optical demultiplexer, and patch panel in Table 154A-2 all seem excessive. In an activity at CableLabs involving representatives from a variety of manufacturers from this product space, for example it was agreed that a loss of 5 dB for a 40 channel mux or demux was a safe value to use, and was probably excessive compared to modern equipment. Similarly, a value of 1 dB for an optical distribution frame (patch panel) was more than sufficient. As a result, while admittedly an example with suitable disclaimers, the resulting example distance reach significantly underestimates what is most likely commonly possible.

The same patch panel values are also used in Tables 154A-3, 154A-4, and 154A-5 and should be updated to remain consistent, while the mux/demux loss figures should be re-evaluated as well (as they may also be high).

I can bring a contribution to address this point in the future.

*SuggestedRemedy*

Modify the multiplexer and demultiplexer allocation loss figures in Table 154A-2 from 6 dB to 5 dB, and modify the patch panel loss from 2 dB to 1 dB and update the resulting calculations as appropriate.

Also modify the patch panel loss figure from 2 dB to 1 dB for each of Tables 154A-3, 154A-4, and 154A-5.

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.3** *P* **133** *L* **29** # R1-34

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

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

The use of the term "4:1 optical multiplexer" in Tables 154A-2, 154A-3, 154A-4, and 154A-5 implies that each table/calculation is using the exact same optical multiplexer; whereas the key difference between each table is the use of a different optical multiplexer.

I would suggest modifying those entries to match what is actually being used in that specific table.

*SuggestedRemedy*

In Table 154A-2, change "Allocation for loss of 4:1 optical multiplexer" to read "Allocation for loss of 40 channel optical multiplexer".

In Table 154A-2, change "Allocation for loss of 4:1 optical demultiplexer" to read "Allocation for loss of 40 channel optical demultiplexer".

In Table 154A-3, change "Allocation for loss of 4:1 optical multiplexer" to read "Allocation for loss of 16 channel optical multiplexer".

In Table 154A-3, change "Allocation for loss of 4:1 optical demultiplexer" to read "Allocation for loss of 16 channel optical demultiplexer".

In Table 154A-4, change "Allocation for loss of 4:1 optical multiplexer" to read "Allocation for loss of 4 channel optical multiplexer".

In Table 154A-4, change "Allocation for loss of 4:1 optical demultiplexer" to read "Allocation for loss of 4 channel optical demultiplexer".

In Table 154A-5, remove the entries for "Allocation for loss of 4:1 optical multiplexer" and "Allocation for loss of 4:1 optical demultiplexer" to reflect the fact that neither is present in the example.

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.3** *P* **133** *L* **6** # R1-35

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

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

It may be worth noting that these examples are all assuming worst case impairments: the receiver sensitivity without impairments is 30 dBm, but in the presence of the worst case optical impairments that the system is required to tolerate there is a maximum 3dB optical path penalty, resulting in the quoted "Average Receive Power" of 27 dB. That is probably the correct figure to use in the calculations, but there could be value in making it clear to the reader -- since it is an example -- that this is a worst case scenario, so to speak.

*SuggestedRemedy*

Modify the following sentences:

"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, and the loss of potentially present patch panel connectors. The maximum allowable loss over the black link 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."

To read as follows:

"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 penalty due to impairments. The maximum allowable loss over the 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."

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.3** *P* **133** *L* **35** # R1-36

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

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

In Tables 154A-2, 154A-3, 154A-4, and 154A-5, there are two sets of calculations: one for a fiber attenuation figure of 0.275 dB/km, and one for a fiber attenuation figure of 0.21 dB/km. However, in subclause 154A.2, the text makes reference to using a figure of 0.25 dB/km.

While this isn't technically wrong per se -- since they are all called out -- this creates an apparent disconnect or lack of consistency in the text. It may be desirable to keep these sections more aligned.

*SuggestedRemedy*

Several options are possible, including (but not limited to):
1. Modifying the text in 154A.2 to refer to the same range of values as used in the tables in 154A.3;
2. Modifying the 0.275 dB/km value to 0.25 dB/km in the 4 tables in 154.3, so that at least one of the values being used aligns with the text in 154A.2; or
3. Modifying the tables in 154A.3 to all use a single value of 0.25 dB/km.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **111** *L* **27** # R1-37

Maki, Jeffery — Juniper Networks, Inc.

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

The project objectives include, "Provide a physical layer specification supporting 100 Gb/s operation on a single wavelength capable of at least 80 km over a DWDM system." The draft defines DWDM system. See "Clause 1.4.237d DWDM system: An aggregate of DWDM links optically multiplexed and demultiplexed onto and off either a single optical fiber or a single optical fiber per direction." The text on line 27 of page 111 says, "Figure 154–3 shows a generic example of a black link." However, upon inspection, the example is not generic with respect to the definition of DWDM system. It depicts only one of the two cases. It depicts the case of "single optical fiber per direction." The case of "single optical fiber," which would correspond to bi-direction propagation over a single fiber, is not depicted. Accommodation is made in the draft for the Tx and Rx wavelengths of the PMD to be different to support bi-directional propagation with distinct wavelengths.

*SuggestedRemedy*

Expand Figure 154-3 to include the case of a DWDM system using a "single optical fiber" for both directions in addition to the single optical fiber per direction that is already depicted. Expand test describing Fig. 154-3 to cover the addition.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.1** *P* **114** *L* **8** # R1-38

Ran, Adee Intel Corporation

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

"fiber based" repeated twice

*SuggestedRemedy*

change "fiber based fiber based" to "fiber based"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.5.4** *P* **119** *L* **34** # R1-39

Ran, Adee Intel Corporation

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

"Fixing the value of SIGNAL_DETECT from the PMD sublayer at OK allows the upper layers to determine whether a valid signal is being received, e.g., according to the ability to acquire frame alignment."

This sentence does not make sense. The upper layers can "determine whether a valid signal is being received" regardless of the value of SIGNAL_DETECT; this is not the reason that SIGNAL_DETECT is fixed to OK. In fact, in this PHY the SC-FEC (a specific upper layer) is required to make this determination, as specified in 153.2.1 - so "ability to acquire frame alignment" is not a mere example.

The change of this subclause from the previous draft requires a clear statement that the signal detect functionality is the responsibility of the SC-FEC sublayer.

*SuggestedRemedy*

Change the quoted sentence to

"The presence of a valid signal is determined only by the SC-FEC sublayer (see 153.2.1)".

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **121** *L* **7** # R1-40

Ran, Adee Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.7 in the diff document)

"Because in this application DWDM technology is used to transport multiple DWDM channels over a single fiber, a black link specification methodology is used to allow specification of the (single channel) DWDM channel in a way that the effects of other DWDM channels, simultaneously present on the multi-channel part of the link, have been taken into account."

This is a long and awkward statement. With all the relative clauses, commas, and parentheses, it is difficult to understand the logic and the intent. Rephrasing may make it easier for the reader.

*SuggestedRemedy*

Change this sentence to

"In this application, DWDM technology is used to transport multiple channels over a single fiber. To specify a single DWDM channel in a way that the accounts for effects of other DWDM channels simultaneously present on the multi-channel part of the link, a black link specification methodology is used."

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **122** *L* **35** # R1-41

Ran, Adee — Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.7 in the diff document)

"The 100GBASE-ZR PMD specification covers a maximum of 48 channels over a DWDM system, supporting between 1 and 48 channels, with a channel spacing of at least 100 GHz."

This sentence reads as if a 100GBASE-ZR link can span multiple channels in a DWDM system. I assume this is not the intent.

"In a working DWDM link, the combination of a 100GBASE-ZR Tx, the associated DWDM channel, and a 100GBASE-ZR Rx are configured to support the same channel center frequency."

This should probably read 100GBASE-ZR link, and the same center frequency should be used, not just supported.

*SuggestedRemedy*

Change the quoted sentences to

"The 100GBASE-ZR PMD can use one of 48 channels (specified by center frequency) over a DWDM system, where the channel spacing is at least 100 GHz. In a working 100GBASE-ZR link, the 100GBASE-ZR Tx, the associated DWDM channel, and the 100GBASE-ZR Rx are all configured to have the same channel center frequency."

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.1** *P* **124** *L* **24** # R1-42

Ran, Adee — Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.8.1 in the diff document)

The transmit characteristics in Table 154–7 include "Average channel output power", shouldn't it be the transmitter power (at TP2)? The term "channel output" intuitively reads as the output of the DWDM channel (to which the transmitter is not responsible).

Note that 154.9.3 "Average channel output power" refers to "the test setup in Figure 53–6", which is in 53.9.2 "Optical power measurements", and 53.9 states that "All optical measurements shall be made through a short patch cable, between 2 m and 5 m in length." (as does 154.5.1) - so this measurement is at TP2. But it is not clear from the table or the text in this amendment.

*SuggestedRemedy*

Change "channel output power" to "output power", both in Table 154-7 and in 154.9.3.

If there is a good reason to keep the word "channel", state explicitly in the table "at TP2".

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7** *P* **123** *L* **48** # R1-43

Ran, Adee — Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.8 in the diff document)

"The operating range for the 100GBASE-ZR PMD is defined in Table 154–7. A 100GBASE-ZR compliant PMD operates over a black link meeting the specifications in Table 154–12."

Does it make sense to define the operating range of the PMD when the black link methodology is used? a black link can work over ranges larger than 80 km too.

Note that the 80 km in Table 154–7 does not make sense for an unamplified link with a maximum transmit power of 0 dBm (assuming this is what "Average channel output power" means).

*SuggestedRemedy*

If the text and table in the body of this subclause is kept, please clarify what the range means (I can't provide a detailed remedy).

Consider deleting the text and table (keeping only the subclause hierarchy below 154.7).

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.1** *P* **115** *L* **16** # R1-45

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Fig 154-1 is wrong. The line between the bottom of the physical layer in relation to the Ethernet stack is incorrectt. The bottom of the physical layer should be at the MDI / medium border

*SuggestedRemedy*

Redraw Fig 154-1 where the line at the bottom of the physical layer lines up with the MDI / medium border

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7** *P* **120** *L* **39** # R1-46

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Updated text for this subclause has essentially modified the defintion / name of the medium for the PHY, which disagrees with the defintion 1.4.237a DWDM channel.

Text in 154.7 reads - The medium associated with the 100GBASE-ZR PMD is also referred to as a DWDM channel which is defined as the transmission path on a single wavelength/frequency (referred to either by channel index number or channel center frequency) on a defined frequency grid between a DWDM PHY transmitting to another DWDM PHY over a black link."

Furthermore, the heading of the subclause has now been modified and indicates the new medium to be The DWDM Channel over a black link. The medium is the DWDM channel. There was no agreement to change the definition.

*SuggestedRemedy*

1. In Figure 154-1, modify "ZR = PMD FOR DWDM CHANNEL OVER A BLACK LINK" to "ZR = PMD FOR DWDM CHANNEL"
2. Change heading of 154.7 back to "The DWDM channel"
3. Modify noted sentence in comment to "The medium associated with the 100GBASE-ZR PMD is also referred to as a DWDM
channel which is defined as the transmission path on a single wavelength/frequency (referred to either by
channel index number or channel center frequency) on a defined frequency grid between a DWDM PHY
transmitting to another DWDM PHY.

The provided text in #3 is based on D3.1. Commenter will be submitting additional comment to address refinement of defintion of DWDM Channel, which may result in having to modify #3 above.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237a** *P* **26** *L* **31** # R1-47

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Definition of DWDM Channel can be improved.

*SuggestedRemedy*

The transmission path between a DWDM PHY transmitting (TP2) to another DWDM PHY receiving (TP3).

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237b** *P* **26** *L* **34** # R1-48

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The definition of DWDM Link should not include the DWDM PHYs to align with ITU-T use of the term DWDM Link.

*SuggestedRemedy*

Change definition of DWDM Link to
DWDM Link – an aggregate of DWDM channels over either a single optical fiber or a single optical fiber per direction

This effectively changes the naming of the "gray box" , ie everything between TP2 and TP3 for all channels, from Black link to DWDM link - therefore all instances of the term Black link used to describe everything between TP2 and TP3 (and not the Black Link methodology) should be replaced with term DWDM link.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.237d** *P* **26** *L* **40** # R1-49

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The proposed modification of DWDM Link will impact the definition of DWDM System.

*SuggestedRemedy*

Delete definition if definition of DWDM Link is modfied.

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.160a** *P* **26** *L* **14** # R1-50

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The term Black Link is used to represent the aggregate of DWDM Channels, as well as the methodology to describe the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel are specified, without specifying how the transmission path is implemented.

It is felt that this will cause future readers confusion.

*SuggestedRemedy*

Modify term Black Link to Black Link Methodology to focus on the specification methodology, and change definition to - the specification of the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel within a DWDM Link, without specifying how the transmission path is implemented. (See, for example, IEEE Std 802.3, Clause 154, Figure 154–3)

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.1** *P* **114** *L* **8** # R1-51

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Redundant wording - which is a single-mode fiber based fiber based dense wavelength

*SuggestedRemedy*

deleted second instance of "fiber based"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7** *P* **122** *L* **37** # R1-52

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The following sentence has several problems
1. A 100GBASE-ZR PHY is required to support 1 to 48 channels, so therefore, a valid implementation could support only a single wavelength. Therefore, the use of the word "configured" is problematic for these types of PHY devices. In this instance the user would need to select the PHY that supports the wavelength that matches the desired DWDM channel.
2. A user might interpret the 100GBASE-ZR Rx to be in the same PHY device as the 100GBASE-ZR Tx.

*SuggestedRemedy*

Suggested rewording - The channel center frequency of the 100GBASE-ZR transmitting and 100GBASE-ZR receiving should be selected to support the same channel center frequency as the DWDM channel to which the two 100GBASE-ZR PHYs are connected.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154-7** *P* **121** *L* **7** # R1-53

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

This statement is problematic -
Because in this application DWDM technology is used to transport multiple DWDM channels over a single fiber.....

While it is true that multiple DWDM channels may happen over a single fiber - 100 Gb/s Ethernet is full duplex - so a 100GBASE-ZR PHY will utilize two DWDM channels, and these two channels may exist on either one fiber or two fibers.

*SuggestedRemedy*

Proposed revision-
DWDM technology allows the transport of multiple DWDM channels over a single fiber. For communication between two 100GBASE-ZR PHYs two channels will be required - one channel in each direction of transmission. These two channels may reside on a single optical fiber or a single fiber per direction. A black link methodology is used to allow specificaiton.....
Add two figures showing single direction or bidirection support as noted in next comment

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7** *P* **121** *L* **45** # R1-54

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Fig 154--4 is labeled as an example configuration of the black link approach - which according to the draft is not intended to place any constraints on the implementation inside. Therefore, the best way to not place any constraints on the contents would be to not show anything within the box.

*SuggestedRemedy*

Delete all content within the gray box area of Fig 154-4. Change the blox to solid black. Label inside the box "DWDM Link" in white font.
Furthermore, it would be helpful if one diagram illustrated all signals going in one direction as shown, but then showing a second figure with Tx / Rx on both sides of the DWDM link. The current Fig 154-4 is best used as an example of the types of DWDM links supported, and could be moved to the information annex 154A.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7** *P* **122** *L* **30** # R1-55

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Sentence states
"The 100GBASE-ZR PMD is specified on the assumption that it is part of a DWDM system where on the multichannel part inside the black link multiple DWDM optical signals are present, each sourced by a separate 100GBASE-ZR transmitter."
Three issues
1. Replace DWDM system with DWDM link
2. Appropriate operation of 100GBASE-ZR could be a single channel, and does not have to support multiple DWDM channels
3. Clarity of sentence could be improved

*SuggestedRemedy*

Reword paragraph
Each DWDM channel in a DWDM link supports unidirectional transmission between a pair of 100GBASE-ZR PMDs. Full duplex operation between a pair of 100GBASE-ZR PMDs will require two DWDM channels. Each DWDM channel operates on a DWDM frequency grid, defined by Table 154–6, which shows the mapping of the 100GBASE-ZR channel index numbers to the optical channel center frequencies. This grid corresponds to the DWDM frequency grid defined by Recommendation ITU-T G.694.1. The channel center frequency of the 100GBASE-ZR PMD transmitting and 100GBASE-ZR PMD receiving should be selected to support the same channel center frequency as the DWDM channel to which the two 100GBASE-ZR PMDs are connected.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8..1** *P* **124** *L* **47** # R1-56

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The transmit characteristics 1)Average launch power of OFF transmitter and 2) transmitter reflectance are not defined in 154.10

*SuggestedRemedy*

add definitions.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8.2** *P* **125** *L* **31** # R1-57

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The receive characteristic receiver reflectance is not defined in 154-10

*SuggestedRemedy*

add definition

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.10** *P* **127** *L* **26** # R1-58

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The black link characteristic Fiber chromatic dispersion slope at channel center frequencies is not defined in 154-10

*SuggestedRemedy*

add definition

*Proposed Response* *Response Status* **O**

*Cl* **154a** *SC* **154a.2** *P* **145** *L* **18** # R1-59

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

The wording "The black link in this operation space…." can be misinterpretted to mean the application space.

*SuggestedRemedy*

The DWDM link designed for this region of operation

*Proposed Response* *Response Status* **O**

*Cl* **154a** *SC* **154a.2** *P* **145** *L* **24** # R1-60

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

It is unclear what is meant by - "needs to be dimensioned.."

*SuggestedRemedy*

change dimensioned to designed

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.181a** *P* **26** *L* **21** # R1-61

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

*Comment Type* **GR** *Comment Status* **X**

This is a pile-on to comment I-3
Commenter agrees with CRG that comment I-3 should be rejected, but does not fully agree with the provided reasoning for rejecting the comment as being too limited.
I-3 commenter argues that the term "channel spacing" is adequate for use in this standard, and redefining the term to be WDM specific is a bad idea. Commenter also points at the IEE-SA Standards Definition.

The current and only definition of "channel spacing" provided in the IEEE Standards Dictionary Online is - "The difference between the center frequencies of two nonoverlapping and adjacent channels of the radio transmitter." It is clear that the current definition is not applicable, as it is specific to a radio transmitter.

As noted in A.2 Item C of the 2020 IEEE SA Standards Style Manual - New definitions that serve to add a new definition to an existing term(s) of the same name should be different enough from the other term(s) so as to justify the addition. Having more than two or three acceptable definitions for any term is discouraged.

THerefore, as noted, in the comment, this definition is an industry accepted term and the definition is referenced back to ITU-T G.694.1

*SuggestedRemedy*

Make no change to document.

*Proposed Response* *Response Status* **O**

*Cl* **153** *SC* **153.2.3.2.5** *P* **100** *L* **37** # R1-62

D'Ambrosia, John — Futurewei Technologies, U.S. Subsidiary of Huawei

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

Note reads - A file containing an example SC-FEC codeword is available at http://standards.ieee.org/downloads/802.3/

There is no file at the provided link. It is understood that this note was added in anticipation of a document being provided.

*SuggestedRemedy*

If no contribution is provided to be used at the URL - then the note and link will need to be deleted

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.1** *P* **124** *L* **42** # R1-63

Ran, Adee — Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.8.1 in the diff document)

Error vector magnitude (max) can be interpreted as a peak value. But EVM is defined in G.698.2 as an RMS value.

The definition in 154.8.1 does not include RMS either. However, 154.9.14 and 154.9.16 mention EVM_RMS (which is what should be used everywhere).

*SuggestedRemedy*

Change "Error vector magnitude" to "Error vector magnitude (RMS)" and EVM to EVM_RMS (subscript) everywhere.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.2** *P* **126** *L* **18** # R1-64

Ran, Adee — Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.8.2 in the diff document)

Table 154–10 has "Receiver OSNR (min)" and the associated definition in 154.9.15 has a "shall" so it seems that the receiver is required to something. But is OSNR (not OSNR tolerance) a characteristic of the receiver? from the definition of OSNR in 154.9.11 it seems out of the receiver's control.

G.698.2 only defines OSNR tolerance (in 7.4.3). Is anything required from the receiver other than OSNR tolerance?

*SuggestedRemedy*

Clarify the requirements in 154.9.15, or remove Receiver OSNR (min) from the table and delete 154.9.15.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.12.4.6** *P* **139** *L* **22** # R1-65

Ran, Adee Intel Corporation

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

(Subcluase number is from the clean document - it appears as 154.13.4.6 in the diff document)

In "black link requirement", black should be capitalized as a first word (though not in the title).

*SuggestedRemedy*

Per comment.

*Proposed Response* *Response Status* **O**

*Cl* **A** *SC* **A** *P* **140** *L* **14** # R1-66

Ran, Adee Intel Corporation

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

Recommendation ITU-T G.698.2 is referenced multiple times but is not included in the normative reference list (in the current 2018 revision).

*SuggestedRemedy*

Add ITU-T G.698.2.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.4** *P* **108** *L* **47** # R1-67

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

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

The PMA/PMD register name for "Tx Rx different optical channel ability" is incorrect as "Rx optical channel control register".

*SuggestedRemedy*

Replace the PMA/PMD register name with "Tx Rx different optical channel ability".

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.1** *P* **117** *L* **7** # R1-68

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

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

Missing space in "centerfrequency"

*SuggestedRemedy*

Change to "center frequency"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.1** *P* **114** *L* **8** # R1-69

Zhang, Bo Inphi Corporation

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

The current table 154-7 transmit characteristics lack the important Tx jitter specification, without which the interoperability cannot be guaranteed.

*SuggestedRemedy*

Recommend follow the jitter spec methodologies detailed in published 802.3 100GBASE-xx Tx tables. Please refer to an earlier contribution for more background and details. https://www.ieee802.org/3/ct/public/tf_interim/20_0917/zhang_3cw_01_200917.pdf

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8** *P* **115** *L* **40** # R1-70

Zhang, Bo Inphi Corporation

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

for channel spacing line spec, the value and unit are swapped.

*SuggestedRemedy*

set 100 under the value column and set GHz under the Unit column.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8** *P* **115** *L* **51** # R1-71

Zhang, Bo — Inphi Corporation

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

optical path penalty is a newly defined parameter in the black link table and could be confused with the optical path OSNR penalty for ASE limited link. This new parameter as the way it is defined could be viewed as a superset of optical path OSNR penalty. Also, the 3dB value lacks some data support, and could require more discussion to converge.

*SuggestedRemedy*

Recommend change the naming of 'optical path penalty' to 'optical path power penalty' or 'optical path receive sensitivity penalty' to be more specific.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8** *P* **116** *L* **7** # R1-72

Zhang, Bo — Inphi Corporation

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

The unit of fiber chromatic dispersion slope at channel center frequencies (min) is incorrect.

*SuggestedRemedy*

change from 'ps/nm2km' to 'ps/nm2/km' or 'ps/(nm2*km)'

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.2** *P* **115** *L* **18** # R1-73

Zhang, Bo — Inphi Corporation

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

Receiver OSNR (min) specs (35dB and 19.5dB) are redundant information as already specified in table 154-9. For example, 35dB min OSNR for average receive power < -16dBm is already specified in line#45 in table 154-9, and 19.5dB min OSNR for power >-16dBm is already specified in line #47-48 in the same table on page 115.
Furthermore, these specs are really link requirements and the naming should be indicating 'link-delivered OSNR' instead of 'Receiver OSNR'

*SuggestedRemedy*

Recommend completely remove 'Receiver OSNR (min') line specs in table 154-8

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.3** *P* **133** *L* **46** # R1-74

Zhang, Bo — Inphi Corporation

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

Regarding table 154A-2, 154A-3, 154A-4, while one can appreciate the change of the table title from 40 channels, down to 16 channels and then 4 channels, the line items 'allocation for loss of 4:1 optical multiplexer/demultiplexer' remain the same in description yet the values are reduced from 6, to 4 and then 2dB, which does not make sense for a 4 channel multiplexers.

*SuggestedRemedy*

Recommend modify the description name 'allocation for loss of 4:1 optical multiplexer/demultiplexer', and adjust their values accordingly to make practical sense (for example, a 50/50 coupler would incur 3.x dB loss).

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.1** *P* **131** *L* **40** # R1-75

Zhang, Bo — Inphi Corporation

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

The figure 154A-1 is a black link requirement and the current title could be confusing. the Y axis naming lacks TP3 test point and could confuse reader as compared to other parameters such as receive OSNR tolerance, etc.

*SuggestedRemedy*

Recommend change the Figure 154A-1 title to '100GBASE-ZR link requirements for link-delivered OSNR at TP3 versus link-delivered power at TP3'

Suggest change the Y axis naming to 'link-delivered OSNR at TP3 (dB/12.5GHz)'
Suggest change the X axis naming to 'link-delivered power at TP3 (dBm)'

*Proposed Response* *Response Status* **O**

*Cl* **153** *SC* **153.2.3.2.5** *P* **91** *L* **37** # R1-76

Dawe, Piers J G — NVIDIA

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

While the hyperlink appears to point to the right place, it doesn't seem right

*SuggestedRemedy*

Correct the hyperlink

*Proposed Response* *Response Status* **O**

*Cl* **153** *SC* **153.2.3.2.5** *P* **91** *L* **37** # R1-77

Dawe, Piers J G NVIDIA

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

Before a file containing an example SC-FEC codeword is published at http://standards.ieee.org/downloads/802.3/ 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*

Upload a draft file for review, e.g. in the P802.3ct web area, before the penultimate draft or at the same time at the latest.

*Proposed Response* *Response Status* **O**

*Cl* **45** *SC* **45.2.1.186aa** *P* **41** *L* **22** # R1-78

Dawe, Piers J G NVIDIA

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

"1 = IFEC decoder does not indicate errors" gave me the impression that it meant that there are no errors to be indicated - until I saw that this was a RO bit in a control register.

*SuggestedRemedy*

To make this clearer, please change:
1 = IFEC decoder does not indicate errors
0 = IFEC decoder indicates errors
to
1 = IFEC decoder does not indicate any FEC errors
0 = IFEC decoder indicates any FEC errors

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.16** *P* **119** *L* **22** # R1-79

Dawe, Piers J G NVIDIA

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

With respect to D3.0 comment 85 about jitter bandwidth: there is a jitter bandwidth implied in the EVMrms definition, although it is done in a way that is very specific to a real-time scope, unlike other 802.3 optical clauses. "worst-case values of EVMrms" could mean worst distortion/noise but little jitter or worst jitter but little distortion/noise. Different receivers will react differently to these alternatives.

*SuggestedRemedy*

Clarify the signal jitter in the definition of receiver OSNR tolerance. It may be that two conditions will be needed, analogous to the stressed sensitivity/RITT and jitter tolerance requirements in other clauses.

*Proposed Response* *Response Status* **O**

*Cl* **80** *SC* **80.2.2** *P* **56** *L* **2** # R1-80

Dawe, Piers J G NVIDIA

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

Clause 82 PCSs ... transfer the encoded data to the PMA.

*SuggestedRemedy*

Clause 82 PCSs ... transfer the encoded data to the PMA or FEC

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A** *P* **131** *L* **9** # R1-81

Dawe, Piers J G NVIDIA

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

This (welcome) annex is not about applications.

*SuggestedRemedy*

Change to the following (where "black link" could also be omitted as shown by square brackets, by the way):
Examples of 100GBASE-ZR compliant black links"
154A.2 [Black link] examples with OSNR at TP3 between 19.5 dB (12.5 GHz) and 35 dB (12.5 GHz)
For any [black link] distance (twice)
Specifically in an example of 40 channels
154A.3 [Black link] example with OSNR at TP3 greater than or equal to 35 dB (12.5 GHz) four examples with OSNR at TP3
is not a multi-channel link, but rather a single channel link, and therefore a conventional point-to-point Ethernet link where
Table 154A-2--40 channel example [black link] with OSNR (TP3) >= 35 dB (12.5 GHz)

*Proposed Response* *Response Status* **O**

*Cl* **1** *SC* **1.4.160a** *P* **22** *L* **15** # R1-82

Dawe, Piers J G NVIDIA

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

As D3.0 comment 87 said, the path between PMDs is not from TP2 to TP3 because TP2 is not at the PMD

*SuggestedRemedy*

Change "between TP2 to TP3" to something else e.g. "between PMDs", "between MDIs", "between PHYs" or "between transmitter and receiver".

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.6** *P* **113** *L* **31** # R1-83

Dawe, Piers J G NVIDIA

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

What variable?

*SuggestedRemedy*

Please add cross-reference to 154.5 (new section(s)) where variables such as Tx_optical_channel_index, Rx_optical_channel_index and Tx_Rx_diff_opt_chan_ability are introduced/defined.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.1** *P* **114** *L* **3** # R1-84

Dawe, Piers J G NVIDIA

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

With regard to D3.0 comment 58, tolerance to chromatic dispersion was not enforced: optical clauses usually have something like TDP or TDECQ involving a measurement of the transmitted after chromatic dispersion to enforce good transmitter behaviour. I believe EVMrms does not do this, so is there a gap that needs to be filled? Does the maximum spectral excursion provide the necessary protection?

*SuggestedRemedy*

Ensure that the combination of transmitter and max / min dispersion will deliver a usable signal.

*Proposed Response* *Response Status* **O**

*Cl* **153** *SC* **153.2.3.2.4** *P* **88** *L* **30** # R1-85

Dawe, Piers J G NVIDIA

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

Some text in Fig 153-3 is too small.

*SuggestedRemedy*

Make the smallest text (MFAS and column numbers) the same size as the other text (this will make row 0 deeper, and that's OK).

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.2** *P* **115** *L* **18** # R1-86

Dawe, Piers J G NVIDIA

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

In Table 154-8, 100GBASE-ZR receive characteristics, there are entries for:
Receiver sensitivity (max) (informative), Receiver OSNR (min), and Receiver OSNR tolerance (not max or min).
154.9.13, Average receive power, says:
The average receive power shall be within the limits given in Table 154–8. These limits define the range of average receiver input power over which the BER requirement must be met at the values of minimum OSNR defined in Table 154–8.
154.9.15, Receiver OSNR, says:
The Receiver OSNR shall be within the limits given in Table 154–8 over the average receive power range specified in Table 154–8. OSNR is defined in 154.9.11.
154.9.16, Receiver OSNR tolerance, says:
Receiver OSNR tolerance shall be within the limit given in Table 154–8 and is defined in Recommendation ITU-T G.698.2...

As the receiver can't choose the OSNR it receives, it seems the entries for "Receiver OSNR (min)" are not specifications for the receiver to meet, as the PICS puts it, but that they are conditions for average receive power (or average receive power are conditions for receiver OSNR), similar to the conditions of a stressed receiver sensitivity test or a receiver interference tolerance test for other PMDs. The "shall" in 154.9.15 is unworkable as the text stands, unlike the "shalls" in 154.7.1 and 154.8 for Transmitter in-band OSNR (min) and OSNR at TP3 (min).

*SuggestedRemedy*

Combine 154.9.13 and 154.9.15 and make the terminology consistent, e.g.:
In Table 154-8, change "Receiver OSNR (min)" to "Minimum OSNR at TP3". In 154.9.13, change "minimum OSNR" to "minimum OSNR at TP3", and add "OSNR is defined in 154.9.11.". Delete 154.9.15.
Table 154-8 could be clarified, e.g. with a footnote linking average receive power and receiver OSNR, or by putting these rows next to each other.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.19** *P* **119** *L* **36** # R1-87

Dawe, Piers J G NVIDIA

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

Need to specify what receiver would be used.

*SuggestedRemedy*

Is it the reference receiver in Annex A of G.698.2?

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.1** *P* **114** *L* **29** # R1-88

Dawe, Piers J G NVIDIA

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

"Power difference between X-Y polarizations": What's an X minus Y polarization?

*SuggestedRemedy*

Call it "Power difference between polarizations", aligning with G.698.2 which provides the definition. Similarly for "Skew between X-Y polarizations".

*Proposed Response* *Response Status* **O**

*Cl* **154A** *SC* **154A.2** *P* **132** *L* **33** # R1-89

Dawe, Piers J G NVIDIA

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

For a total black link passive loss of 34 dB, Tx -8 to 0 dBm, Rx -16 to 0 dBm, the net gain must be between -8 to 0 dBm so the amplification must be between 34-8 = 26 and 34-0 = 34 dB unless the link knows or reacts appropriately to the input power, channel by channel -- not 18 to 42 dB.

*SuggestedRemedy*

Provide more explanation as to how this is to work, or change to the simple conservative example

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.8** *P* **116** *L* **18** # R1-90

Dawe, Piers J G NVIDIA

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

This says "The applicable channel center frequencies are specified in Table 154-5", which shows 48 channels, but it is not clear whether a compliant 100GBASE-ZR black link has to comply for all 48 channels, as implied here, or whether a subset is allowed (154A.2 has "an example application of 40 channels").

*SuggestedRemedy*

Please clarify.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.15** *P* **116** *L* **10** # R1-91

Dawe, Piers J G NVIDIA

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

This says "DGD (max)" while many other clauses and footnote b say DGD_max.

*SuggestedRemedy*

Reconcile. E.g., change "Differential group delay, DGD (max)" to "Maximum differential group delay, DGD_max"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.15** *P* **116** *L* **19** # R1-92

Dawe, Piers J G NVIDIA

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

This first sentence "Differential Group Delay (DGD) is the time difference at reception between the fractions of a pulse that were transmitted in the two principal states of polarization of an optical signal" has been in the definitions (1.4.228) for years; readers should be used to it by now.

*SuggestedRemedy*

Delete this first sentence.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.5** *P* **109** *L* **32** # R1-93

Dawe, Piers J G NVIDIA

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

154.5, PMD functional specifications, should introduce or define all the PMD control and status variables

*SuggestedRemedy*

Add text for the missing PMD control and status variables such as Tx_optical_channel_index, Rx optical channel index, Tx_index_ability_i, Tx_Rx_diff_opt_chan_ability, Rx_index_ability_i .

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.4** *P* **108** *L* **47** # R1-94

Dawe, Piers J G NVIDIA

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

String search doesn't find Tx_Rx_diff_opt_chan_ability

*SuggestedRemedy*

Select table, adjust column widths to contents. There's a menu item in Frame for doing just that.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.15** *P* **119** *L* **13** # R1-95

Dawe, Piers J G NVIDIA

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

I could not find a statement as to whether signals for average receive power and receiver OSNR qualification include chromatic dispersion, interferometric crosstalk, reflections... or not. As the path penalty may be 3 dB, this seems like a large ambiguity. Considering that the numbers in Table 154-8 (receiver) and 154-9 (black link) match, I would think the major ones should be included. D3.0 comment 58 pointed out this or a similar issue.

*SuggestedRemedy*

Please clarify.
Preferably, explain more fully how this measurement would be done: e.g. that it should be after max / min chromatic dispersion.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.7.2** *P* **115** *L* **21** # R1-96

Maniloff, Eric ciena

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

The optical power for Receiver OSNR Tolerance is not stated.

*SuggestedRemedy*

Add a footnote, "Receiver OSNR Tolerance must be met for optical powers >= -16dBm"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.14** *P* **119** *L* **5** # R1-97

Maniloff, Eric ciena

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

The definition of Receiver Sensitivity states that it "does not have to be met in the presence of dispersion or reflections from the optical path". It should clarify that it does not have to be met for any of the Black Link Impairments.

*SuggestedRemedy*

Modify Sentence to clarify that the Receiver Sensitivity does not have to be met in the presence of any of the impairments defined for the Black Link.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.15** *P* **119** *L* **13** # R1-98

Maniloff, Eric ciena

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

This section should clearly state that this OSNR tolerance must be met after the black link impairments.

*SuggestedRemedy*

Modify "The Receiver OSNR shall be within the limits given in Table 154–8 over the average receive power range specified in Table 154–8" to indicate that this includes the black link impairments.

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.15** *P* **119** *L* **13** # R1-99

Maniloff, Eric ciena

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

The statement does not make clear that this is an OSNR tolerance, rather it sounds like it's what is delivered by the link.

*SuggestedRemedy*

Modify "The Receiver OSNR shall be within" to "The Receiver shall be able to tolerate an OSNR >= this value…"

*Proposed Response* *Response Status* **O**

*Cl* **154** *SC* **154.9.16** *P* **119** *L* **18** # R1-100

Maniloff, Eric ciena

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

This section does not indicate that the Receiver OSNR tolerance does not need to be met in the presence of the black link optical impairments.

*SuggestedRemedy*

Add text ti this section indicating that this OSNR Tolerance does not need to be met in the presence of the Black Link impairments.

*Proposed Response* *Response Status* **O**