IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Nicholl, Gary  
Cisco Systems  

Comment Type: E  Comment Status: A  
I am not sure what the "LDI<0:2>" at the bottom of the figure is referring to  ?  Is it supposed to indicate that LDI<0> corresponds to STAT<5>, LDI<1> corresponds to STAT<6>, etc ?  

Suggested Remedy:  
Please clarify, and if my understanding in the comment is correct then perhaps move the "LDI<0:2>" text to make it clear it is referring to STAT<5:7>. 

Also clean up some of the other formatting in Figure 155-4, eg the "JC" bytes are not aligned under Byte number 4 and 5.  

Response Status: C  
ACCEPT IN PRINCIPLE.  

Clean up Figure 155-4 to align JC bytes correctly. Delete LDI<0:2> since it causes the same bits to have 2 names. Check that only LD, and RD are used in text and correct as needed.  

--  

Nicholl, Gary  
Cisco Systems  

Comment Type: E  Comment Status: A  
Figure 155-9. Should this figure contain a breakout to detail the format of the STAT byte, as is done in Figure 155-4 in section 155.2.4.5 ?  

Suggested Remedy:  
Add breakout of STAT byte as done in Figure 155-4.  

Response Status: C  
ACCEPT IN PRINCIPLE.  

Add breakout of STAT to Figure 155-9 as per Figure 155-4 but with the other modificaitons made there in response to comment #1.  

Nicholl, Gary  
Cisco Systems  

Comment Type: E  Comment Status: D  
"...400GBASE-ZR PMA (155). I believe the correct format when referencing another clause is "see Clause X" , so the text above should probably be" ....400GBASE-ZR PMA (see Clause 155)" . I believe there is a cross-reference command in Frame Maker to insert a clause cross-reference.  

Suggested Remedy:  
Please use the correct format (according to the style manual) when cross-referencing another Clause. Review the rest of Clause 156 for similar issues, and fix where necessary.  

Response Status: W  
PROPOSED ACCEPT IN PRINCIPLE.  

Change existing cross reference from "(155)" to "(Clause 155)" and correct any other cross reference formatting issues through out the document.
The first paragraph refers to "FEC lanes". This appears to be the only two references to "FEC lanes" in the whole draft. There is also no separate FEC Sublayer in this draft, and Clause 155 only calls out a 400GBASE-ZR PCS. This appears to be similar as to what was done in Clause 119, in which case there are no "FEC lanes" and only "PCS lanes" (as the PCS includes the FEC).

It appears that the current wording might have been copied from 802.3ct, where there is a separate FEC sub-layer and "FEC lanes" is the correct terminology.

**Suggested Remedy**

In the first paragraph of 156.3.2, replace "FEC lanes" with "PCS lanes". Another solution would be to go with the approach adopted in the equivalent section in Clause 122, and replace "FEC lanes" with "lanes".

**Response**

ACCEPT IN PRINCIPLE.

Replace "FEC lanes" with "lanes".

The second sentence refers to a "CFEC sublayer" and then references section 155.2.1. The is no separate "FEC sub-layer" in this draft. There is only the PCS sublayer defined in Clause 155, which happens to include a CFEC.

**Suggested Remedy**

Change:

"The presence of a valid signal is determined only by the CFEC sublayer (see 155.2.1)"

To:

"The presence of a valid signal is determined only by the PCS sublayer (see 155.2.1)"

**Response**

ACCEPT IN PRINCIPLE.

Change the second sentence to "The presence of a valid signal is determined only by the 400GBASE-ZR PCS (see 155.2.1)."

**Table 156-11.** Should the pattern called out in the first three rows of this table be "400GBASE-ZR" and not "400GBASE-R" (see Clause 155 and Figure 155-1)?

**Suggested Remedy**

Replace "400GBASE-ZR" with "400GBASE-R" in the first three rows of Table 156-11.

**Response**

REJECT.

Use of x00GBASE-R is consistent with 802.3ct and 802.3cu.
<table>
<thead>
<tr>
<th>Cl</th>
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<th>P</th>
<th>L</th>
<th>#</th>
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<th>Issue</th>
<th>Proposed Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>156</td>
<td>156.10.1</td>
<td>93</td>
<td>45</td>
<td>9</td>
<td>TR/tech</td>
<td>13</td>
<td>T</td>
<td>A</td>
<td>156</td>
<td>ACCEPT IN PRINCIPLE.</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>156</td>
<td>E</td>
<td>D</td>
<td>156</td>
<td>Change to &quot;defined in Clause 45&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>156.1</td>
<td>E</td>
<td>D</td>
<td>156.1</td>
<td>Change to &quot;PMA (see Clause 155)&quot;</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>156.1</td>
<td>E</td>
<td>D</td>
<td>156.1</td>
<td>Change to &quot;PMA (see Clause 155)&quot;</td>
</tr>
</tbody>
</table>

- **Comment Type:** T (Technical) | **Comment Status:** A (Accepted)
- **Comment:** The text tells you to connect the DP-16QAM transmitter to the "constellation analyzer" as shown in 156-6. However, Figure 156-6 shows the DP-16QAM transmitter being connected to an "EVM reference receiver" and not a "constellation analyzer".
- **Suggested Remedy:** Change the second sentence in 156.10.1 from: "Connect the 400 Gb/s DP-16QAM transmitter and constellation analyzer using a single-mode fiber patch cord between 2 m and 5 m in length..." To: "Connect the 400 Gb/s DP-16QAM transmitter to the EVM reference receiver using a single-mode fiber patch cord between 2 m and 5 m in length..."
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

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14. Cl 156 SC 156.1.1 P 76 L 42

Comment Type: E  Comment Status: D

Issenhuth, Tom  Huawei

Text reads "CFEC (155)", missing see and Clause.

SuggestedRemedy
- Change to "CFEC (see Clause 155)"

Proposed Response: Response Status: W
- PROPOSED ACCEPT IN PRINCIPLE.

See response to comment 4.

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15. Cl 156 SC 156.4 P 78 L 9

Comment Type: E  Comment Status: D

Issenhuth, Tom  Huawei

Text reads "described in 45", missing Clause.

SuggestedRemedy
- Change to "described in Clause 45"

Proposed Response: Response Status: W
- PROPOSED ACCEPT IN PRINCIPLE.

See response to comment 4.

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16. Cl FM SC FM P 2 L 46

Comment Type: E  Comment Status: D

Issenhuth, Tom  Huawei

Copyright is shown as 2021. This issue continues throughout the document.

SuggestedRemedy
- Update the copyright year throughout the document to 2022.

Proposed Response: Response Status: W
- PROPOSED ACCEPT.

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17. Cl 155 SC 155.2.4.1 P 40 L 13

Comment Type: E  Comment Status: D

Issenhuth, Tom  Huawei

Text reads "rate matching described at 119.2.4.1"

SuggestedRemedy
- Typical wording is "described in". Change to read "rate matching described in 119.2.4.1"

Proposed Response: Response Status: W
- PROPOSED ACCEPT.

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18. Cl 155 SC 155.2.5.10 P 51 L 40

Comment Type: E  Comment Status: D

Issenhuth, Tom  Huawei

Text reads "GMP de-mapper described at 155.2.5.8"

SuggestedRemedy
- Typical wording is "described in". Change to read "GMP de-mapper described in 155.2.5.8"

Proposed Response: Response Status: W
- PROPOSED ACCEPT.

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19. Cl 155 SC 155.3.3.3 P 56 L 29

Comment Type: E  Comment Status: D

Issenhuth, Tom  Huawei

Text reads "gray mapped".

SuggestedRemedy
- Gray should be capitalized so change to "Gray mapped"

Proposed Response: Response Status: W
- PROPOSED ACCEPT.
<table>
<thead>
<tr>
<th>Cl</th>
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<th>Comment Status</th>
<th>Response Status</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>SuggestedRemedy</th>
<th>Response Status</th>
<th>SuggestedRemedy</th>
</tr>
</thead>
</table>
| 156 | 156.7.1 | TR | A | C | TR | A | Insert a new subclause after 156.9.14 with the following text: "The transmitter out-of-band OSNR shall be within the limits given in Table 156-6. Out-of-band OSNR is the ratio of transmit signal power between the -20 dB spectral mask points of Figure 156-4 to the maximum optical noise power within any optical bandwidth of 0.1 nm at 193.7 THz or 12.5 GHz outside of the -20 dB spectral mask points."

Accept in principle.

Add a row for Transmitter out-of-band OSNR with pattern 5 in Table 156-11 after transmitter in-band OSNR, and a new related subclause 156.9.xx

Accept in principle.

Add a row for Transmitter out-of-band OSNR with pattern 5 in Table 156-11 after transmitter in-band OSNR, and a new related subclause 156.9.14a.

With editorial license.

Back-to-back measurements on multiple receivers with multiple different transmitters were reported in rahn_3cw_01a_220223. Those results support the receiver OSNR tolerance of 26 dB in Table 156-7. The value for receiver OSNR with transmitter and DWDM link impairments needs to be set higher than the tolerance value by a reasonable margin, say 2 dB.

Replace TBD with 28 dB

Accept in principle.

See response to comment 44.
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Comment Type: T  Comment Status: A

Comment: Receiver damage threshold is a component rating specification rather than a required characteristic for link operation. Coherent receiver optics have very high ratings, e.g. +17 dBm, but are intended to operate normally at much lower power levels, e.g. -12 to 0 dBm.

Suggested Remedy:
Remove the damage threshold value from the table.

Response: Response Status: C
ACCEPT IN PRINCIPLE.
Retain Damage threshold in Table 156-7 and replace TBD with 6.

Comment ID: 25
Page 6 of 12
3/21/2022 10:43:06 AM

Comment Type: T  Comment Status: A

Comment: Ripple as defined in ITU-T G.698.2 is not the right definition for the 802.3cw DWDM black link. G.698.2 defines ripple as the roll-off of the channel characteristic at the maximum spectral excursion of the transmitter. For 802.3cw we have replace transmitter spectral excursion with parameters for transmit spectral shaping, including transmit spectrum (max) and transmit spectrum (min) in Table 156-6. This means that ripple of the DWDM black link needs to be defined with respect to the channel passband (max) and (min) parameters in Table 156-8.

Suggested Remedy:
Define ripple as the maximum peak-to-peak insertion loss variation between points in the channel passband, spaced +/- 32 GHz from the nominal channel center frequency.

Response: Response Status: C
ACCEPT IN PRINCIPLE.

Change 156.9.18 to read "The ripple is the maximum peak-to-peak insertion loss variation between 3dB points in the channel passband."

Comment ID: 27
Page 6 of 12
3/21/2022 10:43:06 AM

Comment Type: T  Comment Status: A

Comment: Average output power at TP3 needs to cover a range that will be encountered at the demux outputs of the DWDM link. The line system providers set that power by adjusting the gain of the pre-amplifier to account for the loss through the demux and any line protection and/or patchcords. A good minimum value is -12 dBm.

Suggested Remedy:
Replace TBD with -12 dBm.

Response: Response Status: C
ACCEPT IN PRINCIPLE.

In Table 156-8, for Average output power at TP3 (min) replace TBD with -12

Comment ID: 28
Page 6 of 12
3/21/2022 10:43:06 AM

Comment Type: T  Comment Status: A

Comment: OSNR at TP3 (min) needs to be the same value as OSNR at TP3 listed in Table 156-7. Another comment proposes a value of 28 dB and if accepted, the same value is needed here.

Suggested Remedy:
Replace TBD with 28 dB.

Response: Response Status: C
ACCEPT IN PRINCIPLE.

In Table 156-8, for OSNR at TP3 (min) replace TBD with 28.
Interferometric crosstalk is defined in ITU-T G.698.2 to be the ratio of disturbing power to the wanted power within a single channel. The disturbing power is the power (not including ASE) that would remain if the wanted signal were removed from the link, while leaving all other link conditions the same. Because we are defining limits for adjacent channel isolation in Table 156-9, we should not need to define a value for interferometric crosstalk.

**Suggested Remedy**
Delete the parameter "interferometric crosstalk at TP3 (max)".

**Response**
REJECT.

Based on task force discussion it was decided to retain interferometric crosstalk at TP3 (max) in Table 156-8 with a TBD value.

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**Comment ID** 30

**Comment Type** TR

**Comment Status** D

Remove parameter in Table 156-6: Error Vector magnitude (max).

**Proposed Response**

Insufficient justification provided to remove EVM and replace it with separate TX parameters.
Add parameter to table 156-6: Tx clock phase noise (PN) - Maximum total integrated RMS phase jitter between 10kHz and 10MHz.

The proposed changes is part of a general proposal to modify the current draft’s approach of using EVM methodology, and instead replacing it with a known industry approach that can support the goal of ensuring interop. A supporting presentation will be presented into the Task Force for review.

**Suggested Remedy**

Add Parameter to Table 156-6: Tx clock phase noise (PN) - Maximum total integrated RMS phase jitter between 10kHz and 10MHz. With value: (See 156.9.x)

rms random jitter:

\[ \sigma_{rj} = \frac{1}{\sqrt{2\pi f_c}} \sqrt{2 \int_{f_1}^{f_2} 10^{(L(f)/10)} df} \]

rms periodic jitter (spurs):

\[ \sigma_{pj,i} = \frac{1}{\sqrt{2\pi f_c}} \cdot 10^{(s_i/20)} \]

where,

\[ f_1 = 10kHz, f_2 = 10MHz, c = f_{baud}/128 = 467.53MHz, L(f) = \text{phase noise (PN)}, s_i = \text{individual spur in [dBc]} \]

rms total jitter:

\[ \sigma_{tj} = \sqrt{(\sigma_{rj})^2 + \sum_{i=1}^{N} (\sigma_{pj,i})^2} \]

where,

\[ N = \text{total number of spurs}. \]

**Proposed Response**

Insufficient justification provided to remove EVM and replace it with separate TX parameters
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
Comment 34
Add parameter to table 156-6: IQ amplitude imbalance (mean)-The proposed changes is part of a general proposal to modify the current draft's approach of using EVM methodology, and instead replacing it with a known industry approach that can support the goal of ensuring interop. A supporting presentation will be presented into the Task Force for review.

Suggested Remedy
Add New Parameter to Table 156-6: IQ amplitude imbalance (mean). With value 1 dB
Add definition and test methodology in 156.9.x: IQ amplitude imbalance (mean). Definition and test methodology to be provided.

Proposed Response Response Status W
PROPOSED REJECT.
Insufficient justification provided to remove EVM and replace it with separate TX parameters

Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
Comment 35
Add parameter to table 156-6: IQ amplitude imbalance (mean)-The proposed changes is part of a general proposal to modify the current draft's approach of using EVM methodology, and instead replacing it with a known industry approach that can support the goal of ensuring interop. A supporting presentation will be presented into the Task Force for review.

Suggested Remedy
Add New Parameter to Table 156-6: IQ amplitude imbalance (mean). With value 1 dB
Add definition and test methodology in 156.9.x: IQ amplitude imbalance (mean). Definition and test methodology to be provided.

Proposed Response Response Status W
PROPOSED REJECT.
Insufficient justification provided to remove EVM and replace it with separate TX parameters

Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
Comment 36
Add parameter to table 156-6: IQ phase error (min)-The proposed changes is part of a general proposal to modify the current draft's approach of using EVM methodology, and instead replacing it with a known industry approach that can support the goal of ensuring interop. A supporting presentation will be presented into the Task Force for review.

Suggested Remedy
Add New Parameter to Table 156-6: IQ phase error (min). With value -5 deg
Add definition and test methodology in 156.9.x: IQ phase error (min). Definition and test Methodology to be provided.

Proposed Response Response Status W
PROPOSED REJECT.
Insufficient justification provided to remove EVM and replace it with separate TX parameters

Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
Comment 37
Add parameter to table 156-6: IQ phase error (max)-The proposed changes is part of a general proposal to modify the current draft's approach of using EVM methodology, and instead replacing it with a known industry approach that can support the goal of ensuring interop. A supporting presentation will be presented into the Task Force for review.

Suggested Remedy
Add New Parameter to Table 156-6: IQ phase error (max). With value +5 deg
Add definition and test methodology in 156.9.x: IQ phase error (max). Definition and test Methodology to be provided.

Proposed Response Response Status W
PROPOSED REJECT.
Insufficient justification provided to remove EVM and replace it with separate TX parameters
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Sluyski, Mike Cisco Systems

**Comment Type** TR  **Comment Status** D
Add parameter to table 156-6: Transmit Output Power Stability (min) - New parameter required to address Xtalk when operating on 75 GHz Grid

**Suggested Remedy**
Add New Parameter: Transmit Output Power Stability (min) to Table 156-6. With value -1 dB.

Add definition and test methodology in 156.9.x: Transmit Output Power Stability: Definition and test Methodology to be provided.

Output power stability over time (EOL) when operating at a fixed wavelength and temperature.

**Proposed Response** **Response Status** W
PROPOSED REJECT.

Insufficient justification provided to remove EVM and replace it with separate TX parameters.

Sluyski, Mike Cisco Systems

**Comment Type** TR  **Comment Status** D
Add parameter to table 156-6: Transmit Output Power Stability (max) - New parameter required to address Xtalk when operating on 75 GHz Grid

**Suggested Remedy**
Add New Parameter to Table 156-6: Transmit Output Power Stability (max). With value +1 dB.

Add definition and test methodology in 156.9.x: Transmit Output Power Stability: Definition and test Methodology to be provided.

Output power stability over time (EOL) when operating at a fixed wavelength and temperature.

**Proposed Response** **Response Status** W
PROPOSED REJECT.

Insufficient justification provided to remove EVM and replace it with separate TX parameters.

Sluyski, Mike Cisco Systems

**Comment Type** TR  **Comment Status** D
Add parameter to table 156-6: Transmit Output Power Absolute Accuracy (min) - New parameter required to address Xtalk when operating on 75 GHz Grid

**Suggested Remedy**
Add New Parameter to Table 156-6: Transmit Output Power Absolute Accuracy (min). With value -1 dB.

Add definition and test methodology in 156.9.x: Transmit Output Power Accuracy: Definition and test Methodology to be provided.

Absolute accuracy of delivered transmit output power relative to the TX Target Output Power setting. When operating at a fixed wavelength over temperature and over time (EOL).

When operating at a fixed wavelength over temperature and over time (EOL).

**Proposed Response** **Response Status** W
PROPOSED REJECT.

Insufficient justification provided to remove EVM and replace it with separate TX parameters.

Sluyski, Mike Cisco Systems

**Comment Type** TR  **Comment Status** D
Add parameter to table 156-6: Transmit Output Power Absolute Accuracy (max) - New parameter required to address Xtalk when operating on 75 GHz Grid

**Suggested Remedy**
Add New Parameter to Table 156-6: Transmit Output Power Absolute Accuracy (max). With value +1 dB.

Add definition and test methodology in 156.9.x: Transmit Output Power Accuracy: Definition and test Methodology to be provided.

Absolute accuracy of delivered transmit output power relative to the TX Target Output Power setting. When operating at a fixed wavelength over temperature and over time (EOL).

**Proposed Response** **Response Status** W
PROPOSED REJECT.

Insufficient justification provided to remove EVM and replace it with separate TX parameters.
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
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<th>L</th>
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<tr>
<td>156</td>
<td>156.7.1</td>
<td>84</td>
<td>L</td>
<td>42</td>
<td>TR</td>
<td>A</td>
<td>Update Out-of-band OSNR (min) in table 156-6; with value TBD</td>
<td>Update TBD in Table 156 with value TBD. Add definition and test methodology in 156.9.x: Out-of-band OSNR(min): Out-of-Band OSNR is defined as the Tx signal power between the -20dB Tx Spectral Mask frequency points, referenced to the maximum optical noise power within any optical bandwidth of 0.1nm @ 193.7 THz or 12.5 GHz outside of the -20dB Tx Spectral Mask.</td>
<td>ACCEPT IN PRINCIPLE. See responses to comments 20, 21 and 22.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>156</td>
<td>156.9.10</td>
<td>92</td>
<td>L 3,4, 8</td>
<td>43</td>
<td>TR</td>
<td>D</td>
<td>Change Text in Clause 156.9.10: - The proposed change is part of a general proposal to modify the current draft's approach of using EVM methodology, and instead replacing it with a known industry approach that can support the goal of ensuring interop. A supporting presentation will be presented into the Task Force for review.</td>
<td>Remove sentence: The error vector magnitude shall be within the limits given in Table 156–6 if measured using the methods specified in 156.10.1.1 and 156.10.1.2. Removal is not required if TF can agree that EVM can be considered a supplementary (optional) specification and test. Change Line 8 as: The components of the (optional) EVM test setup are described in 156.10.1.</td>
<td>PROPOSED REJECT. Insufficient justification provided to remove EVM and replace it with separate TX parameters.</td>
<td></td>
<td></td>
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<td>156</td>
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<td>89</td>
<td>L 19</td>
<td>45</td>
<td>ER</td>
<td>A</td>
<td>Remove optical path OSNR penalty parameter</td>
<td>Given there is no such parameter defined in the optical spec table, there is no need to define it.</td>
<td>REJECT. Given there is no such parameter defined in the optical spec table, there is no need to define it.</td>
<td></td>
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<tr>
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<td>156.9.19</td>
<td>96</td>
<td>L 13</td>
<td>46</td>
<td>ER</td>
<td>R</td>
<td>Remove optical path OSNR penalty definition</td>
<td>Given there is no such parameter defined in the optical spec table, there is no need to define it.</td>
<td>REJECT. Given there is no such parameter defined in the optical spec table, there is no need to define it.</td>
<td></td>
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</tr>
</tbody>
</table>
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Cl 156  SC 156.9.17  P 93  L 1  # 47
Zhang, Bo  Marvell
Comment Type  TR  Comment Status  A
Provide Receiver OSNR tolerance definition

SuggestedRemedy
... is defined as "minimum OSNR that the receiver can withhold while maintaining a pre-FEC BER level lower than the CFEC threshold. The tolerance has to be met with a worst-case compliant transmitter, but it does not have to be met with the line impairments such as CD, PMD, PDL or optical crosstalk, etc."

Response  Response Status  C
ACCEPT IN PRINCIPLE.

Change the second sentence of 156.9.17 to "Receiver OSNR tolerance is defined as minimum OSNR that the receiver can tolerate while maintaining a pre-FEC BER level lower than the CFEC threshold. The tolerance has to be met with a worst-case compliant transmitter, but it does not have to be met with the line impairments such as CD, PMD, PDL or optical crosstalk, etc."

Cl 156  SC 156.10.1.1  P 94  L 43  # 48
Zhang, Bo  Marvell
Comment Type  TR  Comment Status  A
Address TBD value

SuggestedRemedy
Suggest coherent receiver bandwidth of at least 30GHz (roughly half the symbol rate)

Proposed Response  Response Status  W
PROPOSED ACCEPT IN PRINCIPLE.

Replace "TBD GHz" with "30 GHz"

Cl 156  SC 156.10.1.1  P 94  L 44  # 50
Zhang, Bo  Marvell
Comment Type  TR  Comment Status  D
Address TBD value

SuggestedRemedy
Suggest digitizer ENOB of at least 4 bit (over frequency)

Proposed Response  Response Status  W
PROPOSED ACCEPT IN PRINCIPLE.

Replace "TBD bits" with "4 bits"