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**Comment 1:**
Update the copyright year throughout the document to 2022.

**Proposed Response:** PROPOSED ACCEPT.

**Comment 2:**
Text reads "rate matching described at 119.2.4.1"

**Proposed Response:** PROPOSED ACCEPT.

**Comment 3:**
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?

**Proposed Response:** 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>.

**Proposed Response:** PROPOSED ACCEPT IN PRINCIPLE.

**Comment 4:**
Gray should be capitalized so change to "Gray mapped".

**Proposed Response:** PROPOSED ACCEPT.
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<td>Text reads &quot;defined in 45&quot;, missing Clause.</td>
<td>Issenhuth, Tom Huawei</td>
<td>Change to &quot;defined in Clause 45&quot;</td>
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<td>Table 156-1. The description of the 400GAUIs, does not appear to follow the format used in both Clause 151 and Clause 154 , where for example &quot;Chip-to-Module 400GAUI-8&quot; is referred to as &quot;400GAUI-8 C2M&quot;.</td>
<td>Nicholl, Gary Cisco Systems</td>
<td>Update all of the 400GAUI descriptions to use the same format as used in 802.3cu, Clause 151.</td>
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<td>11</td>
<td>&quot;….400GBASE-ZR PMA (155)&quot;. I believe the correct format when referencing another clause is &quot;see Clause X&quot;, so the text above should probably be &quot;….400GBASE-ZR PMA (see Clause 155)&quot;. I believe there is a cross-reference command in Frame Maker to insert a clause cross-reference.</td>
<td>Issenhuth, Tom Huawei</td>
<td>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.</td>
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<td>Issenhuth, Tom Huawei</td>
<td>Change existing cross reference from &quot;(155)&quot; to &quot;(Clause 155)&quot; and correct any other cross reference formatting issues through out the document</td>
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See response to comment 4.
### IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

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<td>Change to &quot;CFEC (see Clause 155)&quot;</td>
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<td>The first paragraph refers to &quot;FEC lanes&quot;. This appears to be the only two reference to &quot;FEC lanes&quot; 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 &quot;FEC lanes&quot; and only &quot;PCS lanes&quot; (as the PCS includes the FEC).</td>
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<td>In the first paragraph of 156.3.2, replace &quot;FEC lanes&quot; with &quot;PCS lanes&quot;. Another solution would go with the approach adopted in the equivalent section in Clause 122, and replace &quot;FEC lanes&quot; with &quot;lanes&quot;.</td>
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<td>Replace &quot;FEC lanes&quot; with &quot;lanes&quot;</td>
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<td>The second sentence refers to a &quot;CFEC sublayer&quot; and then references section 155.2.1. The is no separate &quot;FEC sub-layer&quot; in this draft. There is only the PCS sublyayer defined in Clause 155, which happens to include a CFEC.</td>
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<td>Change: &quot;The presence of a valid signal is determined only by the CFEC sublayer (see 155.2.1)&quot; To: &quot;The presence of a valid signal is determined only by the PCS sublayer (see 155.2.1)&quot;</td>
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<tr>
<td>Change the second sentence to &quot;The presence of a valid signal is determined only by the 400GBASE-ZR PCS (see 155.2.1).&quot;</td>
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**TYPE:** TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general

**COMMENT STATUS:** D/dispatched A/accepted R/rejected

**RESPONSE STATUS:** O/open W/written C/closed Z/withdrawn

**SORT ORDER:** Clause, Subclause, page, line

**Page 3 of 12**
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Cl 156 SC 156.6 P 81 L 40 # 7
Nicholl, Gary Cisco Systems

Comment Type E Comment Status D
"The 400GBASE-ZR PMD is specified on the basis that it can be connected to a DWDM black link that contains a portion where multiple DWDM optical channels are present, each connected to a separate 400GBASE-ZR transmitter." The text "that contains a portion" is confusing, possible incorrect, and may have been inserted by mistake.

Suggested Remedy
Change:
"The 400GBASE-ZR PMD is specified on the basis that it can be connected to a DWDM black link that contains a portion where multiple DWDM optical channels are present, each connected to a separate 400GBASE-ZR transmitter."
To:
"The 400GBASE-ZR PMD is specified on the basis that it can be connected to a DWDM black link where multiple DWDM optical channels are present, each connected to a separate 400GBASE-ZR transmitter."

Proposed Response Response Status W
POPROPOSED REJECT.

This language is consistent with the language used in P802.3ct 2021.

Cl 156 SC 156.7.1 P 84 L # 38
Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
Update Out-of-band OSNR (min) in table 156-6; with value TBD

Suggested Remedy
Update TBD in Table 156 with value 23 dB/0.1nm.
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.

Proposed Response Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

See responses to comments 20, 21 and 22.
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

Add New 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

Add parameter to table 156-6: TX clock Phase Noise, Maximum total integrated RMS
phase jitter between 1MHz and 200MHz
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 1MHz and 200MHz. With value (See 156.9.x)
Add definition and test methodology in 156.9.x: TX clock Phase Noise - Maximum total
integrated RMS phase jitter between 1MHz and 200MHz.

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

rms periodic jitter (spurs):
\[ \sigma_{\text{pj,i}} = \frac{1}{\sqrt{2} \pi f_c} \cdot 10^{(s_i/20)} \]
where,
\[ f_1=1\text{MHz}, f_2=200\text{MHz}, f_c=f_{\text{baud}}/128=467.53\text{MHz}, L(f)=\text{phase noise} \]
\[ s_i=\text{individual spur in [dBc]} \]

rms total jitter:
\[ \sigma_{\text{tj}} = \sqrt{\sigma_{\text{rj}}^2 + \sum_{i=1}^{N} \sigma_{\text{pj,i}}^2} \]
where,
\[ N=\text{total number of spurs} \]

Proposed Response   Response Status   W
PROPOSED REJECT.

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

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

rms periodic jitter (spurs):
\[ \sigma_{\text{pj,i}} = \frac{1}{\sqrt{2} \pi f_c} \cdot 10^{(s_i/20)} \]
where,
\[ f_1=1\text{MHz}, f_2=200\text{MHz}, f_c=f_{\text{baud}}/128=467.53\text{MHz}, L(f)=\text{phase noise} \]
\[ s_i=\text{individual spur in [dBc]} \]

rms total jitter:
\[ \sigma_{\text{tj}} = \sqrt{\sigma_{\text{rj}}^2 + \sum_{i=1}^{N} \sigma_{\text{pj,i}}^2} \]
where,
\[ N=\text{total number of spurs} \]
Add New Parameter: 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.

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

Add parameter to table 156-6: Transmit Ouput Power Stability (max) - New parameter required to address Xtalk when operating on 75 GHz Grid

Add New Parameter to Table 156-6: Transmit Ouput Power Stability (max). With value +1 dB.
Add definition and test methodology in 156.9.x: Transmit Ouput Power Stability:
Definition and test Methodology to be provided.
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

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

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

Cl 156 SC 156.7.1 P 84 L # 31
Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
Add parameter to table 156-6: TX Clock Phase Noise (PN)-
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) with value: (See 156.9.x);
Add Mask, definition and test methodology in 156.9.x: TX Clock Phase Noise (PN):
-1001.00E+04
-1201.00E+05
-1301.00E+06
-1401.00E+07

Phase noise, L(f),
f_c=f_baud/128=~467.53 MHz

Mask does not apply to spurs, broadband phase noise only. Spurs are considered separately.

Proposed Response Response Status W
PROPOSED REJECT.

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

Cl 156 SC 156.7.1 P 84 L # 32
Sluyski, Mike Cisco Systems

Comment Type TR Comment Status D
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)
Add definition and test methodology in 156.9.x - Tx Clock Phase Noise (PN) - Maximum total integrated RMS phase jitter between 10kHz and 10MHz:
rms random jitter:
\sigma_{rj}=1/(2\pi f_c ) \sqrt{\int_{f_1}^{f_2} 10^{(L(f))/10} df } 

de periodic jitter (spurs):
\sigma_{pj,i}=1/(\sqrt{2 \pi f_c }) \cdot 10^{(s_i/20)}

where,
\[ f_1=10kHz, f_2=10MHz, f_c=f_baud/128=-467.53MHz \]

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 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

**Comment Type: TR**
**Comment Status: D**
Out-of-band OSNR (min) has been set to a relaxed value (23 dB) in other specifications for DWDM links that do not include color-less add/drop components such as ROADMs. Since our intended use case does not include ROADMs in the network, we should adopt the same value.

**Suggested Remedy:**
Replace TBD with 23 dB.

**Proposed Response**
Replace TBD with 23 dB.

**Response Status:**
PROPOSED ACCEPT IN PRINCIPLE.

---

**Comment Type: TR**
**Comment Status: D**
Remove parameter in Table 156-6: Error Vector magnitude (max). 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.

**Suggested Remedy:**
Remove parameter from 156-6: Error Vector magnitude (max).

**Proposed Response**
Remove parameter from 156-6: Error Vector magnitude (max).

**Response Status:**
PROPOSED REJECT.

**Comment Status:**
D/dispatched

---

**Comment Type: T**
**Comment Status: D**
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.

**Proposed Response**
Remove Damage threshold from Table 156-7

**Response Status:**
PROPOSED ACCEPT IN PRINCIPLE.

---

**Comment Status:**
D/dispatched

---

**Comment Type: T**
**Comment Status: D**
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.

**Suggested Remedy:**
Replace TBD with 28 dB

**Proposed Response**
Replace TBD with 28 dB.

**Response Status:**
PROPOSED ACCEPT IN PRINCIPLE.

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**Comment Status:**
D/dispatched

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**Comment Type: TR**
**Comment Status: D**
Address TBD value

**Suggested Remedy:**
Given the methodology adopted in 802.3ct, suggest the following two categories. For average receive power < -12dBm, min Receiver OSNR is 34dB. For average receive power >= -12dBm, min Receiver OSNR is 29dB.

**Proposed Response**
PROPOSED ACCEPT IN PRINCIPLE.

**Response Status:**
See response to comment 23

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

**Comment Status:** D/dispatched  A/accepted  R/rejected

**Response Status:** O/open  W/written  C/closed  Z/withdrawn

**Sort Order:** Clause, Subclause, page, line

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**Page** 8 of 12

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**Date:** 3/17/2022  10:04:27 AM
Cl 156 SC 156.8 P 86 L 43 # 26
Lewis, David Lumentum
Comment Type T Comment Status D
Set the value of ripple max to a practical value.

Suggested Remedy
Suggest a max value of 2.5 dB

Proposed Response Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

In Table 156-8, for Ripple (max) replace TBD with 2.5

Cl 156 SC 156.8 P 87 L 7 # 27
Lewis, David Lumentum
Comment Type T Comment Status D
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.

Proposed Response Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

In Table 156-8, for Average output power at TP3 (min) for OSNR at TP3 (12.5GHz) replace
TBD with -12

Cl 156 SC 156.8 P 87 L 10 # 28
Lewis, David Lumentum
Comment Type T Comment Status D
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

Proposed Response Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

In Table 156-8, for OSNR at TP3 (min) replace TBD with 28 dB. See response to
comment 23
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

**Comment Type** ER  **Comment Status** D
Remove optical path OSNR penalty parameter

**Suggested Remedy**
Given there is no such parameter defined in the optical spec table, there is no need to list it in Table 156-11.

**Proposed Response** Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

Delete optical path OSNR penalty from Table 156-11.

---

**Comment Type** TR  **Comment Status** D
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 interoperability. A supporting presentation will be presented into the Task Force for review.

**Suggested Remedy**

- 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

**Proposed Response** Response Status W
PROPOSED ACCEPT.

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**Comment Type** TR  **Comment Status** D
Provide Receiver OSNR tolerance definition

**Suggested Remedy**

- ... 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."

**Proposed Response** Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

Change the second sentence of 156.9.17 to: "Receiver OSNR tolerance is defined as minimum OSNR that the receiver can withstand 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."
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Cl 156 SC 156.9.18 P 93 L 9 # 25
Lewis, David Lumentum

Comment Type T Comment Status D
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.

Proposed 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.

PROPOSED ACCEPT IN PRINCIPLE.

Change 156.9.18 to read "The ripple is the maximum peak-to-peak insertion loss variation between points in the channel passband, spaced +/- 32 GHz from the nominal channel center frequency."

Cl 156 SC 156.10.1 P 93 L 45 # 9
Nicholl, Gary Cisco Systems

Comment Type T Comment Status D
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".

Proposed 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."

Proposed Response Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

Cl 156 SC 156.10.1.1 P 94 L 43 # 48
Zhang, Bo Marvell

Comment Type ER Comment Status D
Remove optical path OSNR penalty definition

Proposed Remedy
Given there is no such parameter defined in the optical spec table, there is no need to define it.

Proposed Response Response Status W
PROPOSED ACCEPT IN PRINCIPLE.

Delete 156.9.19 Optical path OSNR penalty
IEEE P802.3cw D1.4 400 Gb/s over DWDM systems 5th Task Force review comments

Cl 156  SC 156.10.1.1  P 94  L 44  # 49
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"

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 sampling rate of 1.15 samples per symbol

Proposed Response  Response Status  W
PROPOSED ACCEPT IN PRINCIPLE.
Replace "TBD(1) times the symbol rate" with "1.15(1) times the symbol rate"