IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl  FM  SC  FM  P 1  L 2  # 151
Grow, Robert  RMG Consulting

Comment Type  E  Comment Status  A  bucket
IEEE Std 802.3-2022 is both approved and published.

Suggested Remedy
Change all instances of 802.3-202x to 802.3-2022 (headers and draft text).
Response  Accept In Principle
See response to comment 1

Cl  FM  SC  FM  P 1  L 10  # 152
Grow, Robert  RMG Consulting

Comment Type  E  Comment Status  A  bucket
I think P802.3cw is currently identified as Amendment 8.

Suggested Remedy
Fill in assigned amendment number.
Response  Accept In Principle
See response to comment 21

Cl  FM  SC  FM  P 1  L 23  # 21
Marris, Arthur Cadence Design Systems

Comment Type  E  Comment Status  A  bucket
Change 802.3-202x to 802.3-2022 and correct list of amendments

Suggested Remedy
Change to "This draft is an amendment of IEEE Std 802.3-2022 as amended by IEEE Std 802.3dd-2022, IEEE Std 802.3cs-202x, IEEE Std 802.3db-202x, IEEE Std 802.3ck-202x, IEEE Std 802.3de-202x, and IEEE Std 802.3cx-202x."  
Response  Accept In Principle

Make the amendment order consistent with the order prescribed by the Working Group chair and update their descriptions as required.  See response to comment 1.  With editorial license.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Comment Type: ER Comment Status: A

This is not the current mandatory front matter. Because it contains legal disclaimers and notices it should be current.

Suggested Remedy
Replace mandatory frontmatter with that in the current IEEE SA templates.

Response
ACCEPT.

Comment Type: E Comment Status: A

The P802.3cw ballot group is now in own, and can be inserted so participants can review their names for proper presentation.

Suggested Remedy
Populate list with the P802.3cw ballot group (removing the officer names already listed in lines 5 through 16.

Response
ACCEPT.

Comment Type: E Comment Status: A

Section 9 goes up Clause 160

Suggested Remedy
Change to "Section Nine—Includes Clause 141 through Clause 160 and Annex 142A through Annex 154A. Clause 141 through Clause 144 and associated annexes specify symmetric and asymmetric operation of Ethernet passive optical networks over multiple 25 Gb/s channels. Clause 145 and associated annexes specify increased power delivery using all four pairs in the structured wiring plant. Clause 146 through Clause 149 and associated annexes specify Physical Layers for 10 Mb/s, 2.5 Gb/s, 5 Gb/s, and 10 Gb/s operation over a single balanced pair of conductors. Clause 150 and Clause 151 include additional 400 Gb/s Physical Layer specifications. Clause 153 and Clause 154 specify 100 Gb/s operation over DWDM channels. Clause 157 through Clause 160 include 10 Gb/s, 25 Gb/s, and 50 Gb/s bidirectional Physical Layer specifications."

Response
ACCEPT.

Comment Type: E Comment Status: A

802.3dd has been approved

Suggested Remedy
Change: IEEE Std 802.3dd(TM)-202x
To: IEEE Std 802.3dd(TM)-2022

Response
ACCEPT IN PRINCIPLE.

See response to comment #21.

Comment Type: E Comment Status: A

The expansion for PMA is physical medium attachment per 802.3-2022 1.5.

Suggested Remedy
Change: Physical Media Attachment (PMA)
To: Physical Medium Attachment (PMA)

Response
ACCEPT.

Comment Type: E Comment Status: A

P802.3cx is no longer designated as Amendment 5.

Suggested Remedy
Renumber and move to Amendment 6. P802.3de/D3.1 has been submitted to Revcom as Amendment 5. Reorder and number IEEE Std 802.3de-202x (or 2022 if approved).

Response
ACCEPT IN PRINCIPLE.

See response to comment 21.

TYPE: TR/technical required ER/editorial required GR/general required T/Technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Clause, Subclause, page, line

Page 2 of 128
10/24/2022 11:39:33 A
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Comment Type: E  Comment Status: A

Marris, Arthur  Cadence Design Systems

Swap cx and de and add cz

SuggestedRemedy

Make 802.3de amendment 5 and 802.3cx amendment 6. Add amendment 7 for "IEEE Std 802.3cz -202x Amendment 7 - This amendment to IEEE Std 802.3-2022 adds physical layer specifications and management parameters for 2.5 Gb/s, 5 Gb/s, 10 Gb/s, 25 Gb/s and 50 Gb/s operation on optical fiber for use in automotive applications."

Response  

ACCEPT IN PRINCIPLE.

See response to comment 21

Comment Type: E  Comment Status: A

Wienckowski, Natalie  General Motors

The description of cx doesn't match D3.0 of P802.3cx.

SuggestedRemedy

Change: transmit and receive path delays
To: transmit and receive path data delays

Response  

ACCEPT.

Comment Type: E  Comment Status: A

Grow, Robert  RMG Consulting

P802.3cz has been designated Amendment 7.

SuggestedRemedy

Insert self description from the current P802.3cz draft (D2.3 soon to be released, with D3.0 expected following September interim).

Response  

ACCEPT IN PRINCIPLE.

See response to comment 21

Comment Type: E  Comment Status: A

Wienckowski, Natalie  General Motors

cw is amendment 8

SuggestedRemedy

Change: Amendment x
To: Amendment 8

Response  

ACCEPT IN PRINCIPLE.

See response to comment 21

TYPE: TR/technical required  ER/editorial required  GR/general required  T/Technical  E/editorial  G/general
COMMENT STATUS: D/dispatched  A/accepted  R/rejected  RESPONSE STATUS: O/open  W/written  C/closed  U/unsatisfied  Z/withdrawn
SORT ORDER: Clause, Subclause, page, line

Page 3 of 128  10/24/2022  11:39:33 A
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

### Comment 411

**Comment Type:** E  
**Comment Status:** R  
Dawe, Piers  
Nvidia  

- **Comment:** For operation over DWDM systems - not. Figure 156-1 has it right: "PMD FOR DWDM CHANNEL OVER A DWDM BLACK LINK"

**Suggested Remedy:**
- Change "for operation over DWDM systems" to "for DWDM operation".  
  This should match the abstract on page 2.

**Response:** REJECT.  
See response to comment 410

### Comment 582

**Comment Type:** E  
**Comment Status:** A  
Dawe, Piers  
Nvidia  

- **Comment:** 8 could be p = 4, 8, or 16 as in Figure 120A-8. Or just 4

**Suggested Remedy:**
- ACCEPT IN PRINCIPLE.  
  Create annex 155A with title "400GBASE-ZR PCS/PMA sublayer partitioning examples"  
  Move figure 120A-9 from annex 120A to new annex 155A.  
  Change figure number to 155A-1  
  In figure 155A-1, in MMD10 change "16:8" to "16:4", in MMD9 change "8:16" to "4:16", change "400GAUI-8" to "400GAUI-4" and change figure title to "Example 400GBASE-ZR PCS/PMA layering with a 400GMII Extender using one 400GAUI-4 interface".

**Response:** ACCEPT IN PRINCIPLE.

### Comment 372

**Comment Type:** E  
**Comment Status:** A  
Wienckowski, Natalie  
General Motors  

- **Comment:** IEEE 802.3 has been approved

**Suggested Remedy:**
- Change: IEEE Std 802.3-202x  
  To: IEEE Std 802.3-2022 throughout the document

**Response:** ACCEPT IN PRINCIPLE.  
See response to comment 1

### Comment 372

**Comment Type:** E  
**Comment Status:** A  
Ran, Adee  
Cisco  

- **Comment:** P802.3 was approved as a revision standard by the IEEE SA Standards Board on 13 May 2022.  
  P802.3dd was approved as a new standard by the IEEE SA Standards Board on 16 June 2022.

**Suggested Remedy:**
- Change "IEEE Std 802.3™-202x" to "IEEE Std 802.3™-2022" in the page header.  
  Change "IEEE Std 802.3dd-202x" to "IEEE Std 802.3dd-2022" on line 25.  
  Apply in other places across the document as appropriate, with editorial license.

**Response:** ACCEPT IN PRINCIPLE.  
See responses to comments 1 and 21
"using 400GBASE-R encoding" doesn't represent what's in this draft: the BASE-R encoded signal is transported, but what is actually used is GMP, SC-FEC, SD-FEC, DP-16QAM and coherent transmission and detection. But we would call any 80 km-capable PHY "Z" anyway, whatever coding technology it used. The definitions for BASE-H, T, E, L, S don't discuss coding, they address medium, reach or wavelength.

Suggested Remedy
Change to:
1.4.144b 400GBASE-Z: IEEE 802.3 family of Physical Layer devices with reach up to at least 80 km on single-mode optical fiber. (See IEEE Std 802.3, Clause 156.)

ACCEPT IN PRINCIPLE.
See response to comment 170

Zimmerman, George
CME Consulting/APL Group, Cisco, Commscope, Ma

Comment Type: TR
Comment Status: A

The term 400GBASE-Z seems to only once in the specification, and there is no description of the "family" described in this definition. Further, based on where it is used appears to be in error. I only find it in connection with Figure 155-2 (page 35) in the sentence "A functional block diagram of the 400GBASE-Z PCS sublayer is shown in Figure 155-2". The figure itself calls this the 400GBASE-ZR PCS, and 400GBASE-ZR is used everywhere else. Suggest this definition may be left over from some earlier thought...

Suggested Remedy
Delete 1.4.144b definition. Alternatively, add text to the draft (likely 155) explaining the general family and its members...

Response
ACCEPT IN PRINCIPLE.
See response to comment 170

D'Ambrosia, John
Futurewei, US Subsidiary of Huawei

Comment Type: TR
Comment Status: A

As the 400GBASE-ZR PHY uses the 400GBASE-ZR PCS, and is the only device that uses it - there is no family. Furthermore, while it leverages the 400GBASE-R PCS, it is not really 400GBASE-R encoded.

Suggested Remedy
Delete 1.4.144b

Response
ACCEPT IN PRINCIPLE.

Delete 1.4.144b. Replace 400GBASE-Z with 400GBASE-ZR throughout draft.
The 400GBASE-ZR PHY is not encoded with the 400GBASE-R PCS.

**Suggested Remedy**

Modify definition to

IEEE 802.3 Physical Layer specification for 400 Gb/s dense wavelength division multiplexing (DWDM) PHY using 400GBASE-ZR encoding, dual polarization 16-state quadrature amplitude modulation (DP-16QAM) modulation, and coherent detection with reach up to at least 80 km. (See IEEE Std 802.3, Clause 155 and Clause 156.)

**Response**

ACCEPT IN PRINCIPLE.

D'Ambrosia, John Fuuturewei, US Subsidiary of Huawei

---

Defining this PHY as "using 400GBASE-R encoding ... DP-16QAM, and coherent detection" is highly misleading. The BASE-R encoded signal is transported, but what is actually used is GMP, SC-FEC, SD-FEC DP-16QAM and coherent transmission and detection. Although it is debatable whether GMP is useful, or just included because it's there. In a short definition we need to say something about the GMP and FEC because neither are BASE-R, but we don't need the detail.

**Suggested Remedy**

Change "using 400GBASE-R encoding, dual polarization 16-state quadrature amplitude modulation (DP-16QAM) modulation, and coherent detection" to "using 400GBASE-R encoding, GMP, strong FEC, dual polarization 16-state quadrature amplitude modulation (DP-16QAM) modulation, and coherent optical signalling".

**Response**

ACCEPT IN PRINCIPLE.

Dawe, Piers Nvidia

---

As the base 802.3 uses PAM2, PAM4, PAM5, PAM16, DSQ128, QAM8, QAM16 and QAM128

**Suggested Remedy**

Change 16QAM to QAM16 and DP-16QAM to DP-QAM16 throughout

**Response**

REJECT.

Dawe, Piers Nvidia

---

ADC is already used in IEEE Std 802.3 and is a well understood term. See later comments about use in this draft as well...

**Suggested Remedy**

delete inserted abbreviation

**Response**

REJECT.

Zimmerman, George CME Consulting/APL Group, Cisco, CommScope, MA

---

DAC is already used in IEEE Std 802.3 and is a well understood term. This is only used in a figure, and without expansion in the draft.

**Suggested Remedy**

delete inserted abbreviation

**Response**

REJECT.

Zimmerman, George CME Consulting/APL Group, Cisco, CommScope, MA

---

16QAM or DP-16QAM is commonly used in the industry for this optical modulation technique.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 1 SC 1.5 P 18 L 30 # 149
Lusted, Kent Intel Corporation

Comment Type TR Comment Status R

The term "GMP" is used 42 times in the draft and is not listed in the abbreviation table. The term "GMP" is loosely defined in 155.1.3 item c as "Generic mapping procedure". GMP is described in 155.2.4.3 (p38, line 8) but not formally defined

SuggestedRemedy
Add "GMP: generic mapping procedure" to the entries.

Response Response Status C
REJECT.

"GMP" is included in 1.5 of IEEE Std 802.3-2022

Cl 30 SC 30.5.1.1.2 P 19 L 17 # 24
Marris, Arthur Cadence Design Systems

Comment Type TR Comment Status A

MAU type needs to mention the medium

SuggestedRemedy
Change to "400GBASE-ZR PCS/PMA over single-mode fiber PMD with reach up to at least 80 km as specified in Clause 156"

Response Response Status C
ACCEPT IN PRINCIPLE.

As noted in 156.1 the medium is stated as a single-mode fiber-based dense wavelength division multiplexing (DWDM) channel which may contain one or more optical amplifiers and is specified using a black link approach (see 156.6).

Change to "400GBASE-ZR PCS/PMA over a DWDM channel PMD with reach up to at least 80 km as specified in Clause 156."

Cl 45 SC 45.2.1 P 20 L 14 # 374
Wienckowski, Natalie General Motors

Comment Type E Comment Status A

bucket type

SuggestedRemedy
Add an ellipses in the first blank row in Table 45-3. Delete the blank row after the row for 1.825 through 1.899.

Response Response Status C
ACCEPT.

Cl 45 SC 45.2.1.9 P 21 L 32 # 159
Grow, Robert RMG Consulting

Comment Type E Comment Status A

bucket Incorrect subclause number.

SuggestedRemedy
Change to 45.2.1.22

Response Response Status C
ACCEPT.

Cl 30 SC 30.5.1.1.2 P 19 L 12 # 196
Huber, Thomas Nokia

Comment Type E Comment Status A

bucket

The values of aMAUType are alphabetized by rate in 802.3-2022. 400GBASE-ZR should be inserted after 400GBASE-VR4 that 802.3db added.

SuggestedRemedy
Change SR16 to VR4 in the editing instruction

Response Response Status C
ACCEPT IN PRINCIPLE.

Change editing instruction to "Insert 400GBASE-ZR PHY type into the "APPROPRIATE SYNTAX" section of 30.5.1.1.2 after 400GBASE-VR4 (as inserted by IEEE Std 802.3db-202x) as follows"
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 45  SC 45.2.1.22.13  P 22  L 1  # 160
Grow, Robert  RMG Consulting
Comment Type  E  Comment Status  A  bucket
Incorrect insert point, subclauses are in decreasing register bit number order.

SuggestedRemedy
Insert new subclause 45.2.1.22.1c after 45.2.1.22.1b (as inserted by IEEE Std 802.3db-2022) as follows:
Renumber subclause as 45.2.1.22.1.c.

Response  Response Status  C
ACCEPT IN PRINCIPLE.

See response to comment 25

Cl 45  SC 45.2.1.22.13  P 22  L 1  # 25
Marris, Arthur  Cadence Design Systems
Comment Type  ER  Comment Status  A  bucket
Needs to reference modification made by 802.3db and change paragraph number to 45.2.1.22.1aa

SuggestedRemedy
Change editing instruction to: "Insert new subclause 45.2.1.22.1aa after 45.2.1.22.1 and before 45.2.1.22.1a (as inserted by IEEE Std 802.3db-2022) as follows:" 

Response  Response Status  C
ACCEPT IN PRINCIPLE.

Change editing instruction to "Insert new subclause 45.2.1.22.1c after 45.2.1.22.1b (as inserted by IEEE Std 802.3db-2022) as follows:" 

Cl 45  SC 45.2.1.150.1  P 22  L 11  # 161
Grow, Robert  RMG Consulting
Comment Type  E  Comment Status  A  bucket
The subclause title for this subclause number and the following text is: Tx optical channel index (1.800.5:0)

SuggestedRemedy
Correct title as in 802.3-2022.

Response  Response Status  C
ACCEPT IN PRINCIPLE.

Change subclause title to "Tx optical channel index (1.800.5:0)"

Cl 45  SC 45.2.1.150.1  P 22  L 17  # 416
Dawe, Piers  Nvidia
Comment Type  E  Comment Status  R  bucket
It would help to point out that these the channel plans differ in more ways than that one has more channels than the other.

SuggestedRemedy
Maybe NOTE--These two tables are significantly different?

Response  Response Status  C
REJECT.

The referenced tables provide the information necessary to understand how they are different.

Cl 45  SC 45.2.1.153.1a  P 23  L 4  # 221
Law, David  Hewlett Packard Enterprise
Comment Type  E  Comment Status  A  bucket
Subclause 45.2.1.153.1a 'Tx index ability 48 through 63 (1.804.0 through 1.804.15)’ says that 'Bits 1.804.1 through 1.804.15 indicate the equivalent for index values 48 through 63, respectively.' Bit 1.804.1 is Tx index ability 49, not Tx index ability 48 (see page 23, line 23).

SuggestedRemedy
Suggest that the text ‘... for index values 48 through 63 ...’ should read ‘... for index values 49 through 63 ...’

Response  Response Status  C
ACCEPT IN PRINCIPLE.

See response to comment 198
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 45 SC 45.2.1.153.1a P 23 L 31 # 376

Wienckowski, Natalie General Motors

Comment Type E Comment Status A

45.2.1.153.1a is not being placed under 45.2.1.153.1 in the base spec, it should be under 45.2.1.153a in this spec.

SuggestedRemedy

Change: 45.2.1.153.1a
To: 45.2.153a.1

Also in the instructions on P22L19.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment 162

Cl 45 SC 45.2.1.153.1a P 23 L 35 # 198

Huber, Thomas Nokia

Comment Type ER Comment Status A

The index value associated with bit 1.804.1 should be 49 rather than 48.

SuggestedRemedy

Change:
"Bits 1.804.1 through 1.804.15 indicate the equivalent for for index values 48 through 63, respectively." to
"Bits 1.804.1 through 1.804.15 indicate the equivalent for for index values 49 through 63, respectively."

Response Response Status C

ACCEPT.

Cl 45 SC 45.2.1.153.1a P 23 L 37 # 222

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A

Subclause 45.2.1.153.1a 'Tx index ability 48 through 63 (1.804.0 through 1.804.15)' includes the text 'For 400GBASE-ZR see Table 156–4.' at the end of the subclause. Similarly, subclause 45.2.1.157a 'Rx optical frequency ability 4 register (Register 1.824)' includes the text 'For 400GBASE-ZR see Table 156–4.' at the end of the subclause. Since Tx index ability 0 through 47 and Rx index ability 0 through 47 will now also apply to 400GBASE-ZR, as well as 100GBASE-ZR, suggest that similar text be added to the end of subclauses 45.2.1.151.1 through 45.2.1.157.1.

SuggestedRemedy

Suggest changes to subclauses 45.2.1.151.1 through 45.2.1.157 be added to the draft. These changes should change the text at the end of these existing subclauses that reads 'For 100GBASE-ZR see Table 154–5;' to read 'For 100GBASE-ZR see Table 154–5, for 400GBASE-ZR see Table 154–5.'

Response Response Status C

ACCEPT IN PRINCIPLE.

In 45.2.1.151.1, 152.1, 153.1, 155.1, 156.1, and 157.1 change the last sentence from "For 100GBASE-ZR see Table 154–5." to "For 100GBASE-ZR see Table 154–5 and for 400GBASE-ZR see Table 154–5." In 45.2.1.150.1 add a new last sentence "For 400GBASE-ZR the specific optical frequency corresponding to each channel index number is listed in Table 156–4." In 45.2.1.154.1 add a new second to last sentence "For 400GBASE-ZR the specific optical frequency corresponding to each channel index number is listed in Table 156–4." With editorial license.

Cl 45 SC 45.2.1.153a P 22 L 19 # 197

Huber, Thomas Nokia

Comment Type E Comment Status A

The numbering of the subclauses in the editing instruction is not consistent with the style guide. The subclause underneath new subclause 45.2.1.153a should be numbered as .1 rather than 1a.

SuggestedRemedy

Change 45.2.1.153.1a to 45.2.1.153a.1

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment 162
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<td><em>Change: 45.2.1.157.1a To: 45.2.1.157a.1 Also in the instructions on P24L3.</em></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 U/unsatisfied Z/withdrawn
SORT ORDER: Clause, Subclause, page, line
### IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

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

**EEE Clauses point to the respective PCS, PMA, and PMD sublayers of the PHY.**

Clause 118 is an extender sublayer but the DTE/PHY XS sublayers, which are essentially PCS functions. So it may be ok to leave - but this has never been done before.

Clause 120 is not part of the 400GBASE-ZR stack.

**Suggested Remedy**

Change entry in Clause field to:

| 155, 156 |

**Response** Response Status C

REJECT.

Overtaken by events. See response to comment 35.

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

As in an earlier comment; just saying "using 400GBASE-R encoding" is highly misleading. This PHY and its coding is very different to normal BASE-R.

**Suggested Remedy**

Either, change "using 400GBASE-R encoding" to "using 400GBASE-R encoding, GMP, strong FEC, dual polarization DP-16QAM, and coherent optical signalling", or delete "using 400GBASE-R encoding". People can follow the link to Clause 156 to find out more.

**Response** Response Status C

ACCEPT IN PRINCIPLE.

See response to comment 173.

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<thead>
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<th>SC</th>
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**Comment Type** TR  **Comment Status** A

All normal BASE-R PHYs use the same Clause 120 PMA, so it has not been mentioned in this table up to now. This one is different.

**Suggested Remedy**

Change "(see Clause 156)" to "(see Clause 155 and Clause 156)"

**Response** Response Status C

ACCEPT IN PRINCIPLE.

See response to comment 173.

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<thead>
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**Comment Type** TR  **Comment Status** A

The 400GBASE-ZR PHY leverages the 400GBASE-R PCS, but is not really 400GBASE-R encoded.

**Suggested Remedy**

modify description entry of Table 116-2 to:

400 Gb/s PHY using 400GBASE-ZR encoding capable of transmission over a specified channel on a defined DWDM grid in each direction of transmission with reach up to at least 80 km (see Clauses 155 and 156)

**Response** Response Status C

ACCEPT IN PRINCIPLE.

Change description Table 116-2 to

"400 Gb/s PHY using 400GBASE-ZR PCS and PMA encoding capable of transmission over a specified channel on a defined DWDM grid in each direction of transmission with reach up to at least 80 km (see Clauses 155 and 156)"
The manipulations described in this draft don't describe a BASE-R "native Ethernet"; rather, they are like 10GBASE-W. An Ethernet signal is packed into a telecoms wrapper (then, based on SONET, here, based on OTN). The combination is clumsy and messy. Starting from Ethernet building blocks, one would not engineer it like this. I understand that the rationale is because those designs were already there, and the cost of a clean design was thought to outweigh the inefficiencies of this scheme. But that calls "broad market potential" into question. 800G coherent will affect the market for this.

SuggestedRemedy:
I can think of three options:

1. Redo Clause 155, leaving out GMP and FAW and simplifying the training sequence and pilot sequence to make an Ethernet PHY;
2. Cancel this project, and encourage those interested to feed their learnings into OIF's "400GBASE-Z optical PHY" maintenance;
3. Rename this PHY to 400GBASE-ZW, which is more honest and leaves the "400GBASE-ZR" name available to any future native Ethernet PHY, should the broad market potential be found.

Response:
REJECT.

Brown, Matt
Nvidia

This table is wider than the defined margins. It would be better to create a new table for 400GBASE-Z optical PHYs. Note that 400GBASE-ZR is part of the family of physical layer devices called 400GBASE-Z as defined in 1.4.144b.

SuggestedRemedy:
Change title of Table 116-5 to "PHY type and clause correlation (400GBASE-R optical)" and remove the table from the draft. With editorial license.

Response:
ACCEPT IN PRINCIPLE.

Add column for 400GBASE-SR4 PMD under Clause 157 as found in the latest version of P802.3db/D3.2 inserted two columns under clause 167 (400GBASE-SR4 PMD is missing). The column is also missing from P802.3ck/D3.3

SuggestedRemedy:

Response:
ACCEPT IN PRINCIPLE.

See response to comment 4
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 116  SC 116.1.4  P 28  L 10  # 36
Ran, Adee  Cisco

Comment Type  E  Comment Status  A
Table 116-5 has been changed in 802.3db to have one column group for clause 167 (with its two PHYs).
Also, the table ruling should be cleaned up.

Suggested Remedy
Align the columns with 802.3db D3.2 and apply formatting as required to match the original table structure.

Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment 4

Cl 116  SC 116.1.4  P 28  L 42  # 175
D’Ambrosia, John  Futurewei, US Subsidiary of Huawei

Comment Type  TR  Comment Status  D
While the 400GMII Extender is optional, it may only be used above the 400GBASE-ZR PHY, and not within the PHY itself.

Suggested Remedy
Add note C to entry for Clause 118.
Note C - The 400GMII Extender SHALL only be used between the RS and 400GBASE-ZR PCS.

Proposed Response  Response Status  Z
REJECT.
This comment was WITHDRAWN by the commenter.

Cl 116  SC 116.1.4  P 28  L 42  # 174
D’Ambrosia, John  Futurewei, US Subsidiary of Huawei

Comment Type  TR  Comment Status  A
The table notes the following clauses as optional - 119, 120, 120B, 120C, 120D, 120E, 120F, and 120G. These layers are not directly used as part of the 400GBASE-ZR PHY, but are inferred through the use of the 400GMII Extender.

Suggested Remedy
Make entries for the following clauses blank: 119, 120, 120B, 120C, 120D, 120E, 120F, and 120G..

Response  Response Status  C
ACCEPT IN PRINCIPLE.
For the 400GBASE-ZR row in Table 116-5 delete "o" (optional) in following clauses (119, 120, 120B – 120G)
Comment Type TR Comment Status A

Subclause 155.2.4.11 'Hamming SD-FEC encoder' says that 'The 128-bit code words are sent as 8-bit symbols to the 400GBASE-ZR PMA sublayer on the PMA:IS_UNITDATA_0.request to PMA:IS_UNITDATA_7.request inter-sublayer signals.' Further, subclause 155.2.5.1 'Hamming SD-FEC decoder' says 'The incoming DP-16QAM symbols are digitized to an m-bit resolution by the PMA sublayer receive direction (see 155.3.3.5) and provided to the PCS receive direction by PMA:IS_UNITDATA_0.indication to PMA:IS_UNITDATA_m–1.indication inter-sublayer signals.' and that 'The Hamming SD-FEC decoder is a soft decision decoder and so requires a higher resolution than 2 bits / 4 levels for each of the signals XI, XQ, YI, and YQ.' Finally, Figure 155-10 '400GBASE-ZR PMA functional block diagram' says 'm is implementation dependent and is the number of bits of resolution of the DP-16QAM symbols.' Rather than operating as n parallel asynchronous PCS lanes that carry alignment markers and lane numbers that enable the original data to be restored or n lanes to be multiplex into m lanes, it appears the 400GBASE-ZR PMA service interface between the PCS and the PMA operates as an n-bit synchronous data path, transferring a single DP-16QAM symbol during each operation. This seems to be confirmed by subclause 155.2.4.3 'GMP mapper' that says '... 400GBASE-ZR frames are not mapped to 16 PCS lanes ...'. In the case of the transmit path, the DP-16QAM symbols are encoded as 8-bit words, 2 bits representing the 4 levels for each of XI, XQ, YI, and YQ. Based on the above, add footnotes to the 'O's in the 400GAUI columns of the 400GBASE-ZR row in Table 116–5 to note the 400GAUI is only supported 'above' the 400GBASE-ZR PCS.

Suggested Remedy
Add a footnote to the 'O's in the 400GAUI columns of the 400GBASE-ZR row in Table 116–5 that reads '400GAUI only supported as a physical instantiation of the 400GMII Extender (see 118.1.3).'

Response
ACCEPT IN PRINCIPLE.

See response to comment 174

Comment Type ER Comment Status A

The 400GBASE-ZR is part of the family of physical layer devices called 400GBASE-Z as defined in 1.4.144b, not 400GBASE-R. The editorial changes in 116.2.3 are therefore incorrect.

Suggested Remedy
Rather than changing the first paragraph, add the following new paragraph at the end of 116.2.3: "The term 400GBASE-Z refers to a specific family of Physical Layer devices using 400GBASE-R encoding, a combination of phase and amplitude modulation, and coherent detection. The 400GBASE-ZR PCS defined in Clause 155 performs encoding of data from the 400GMII, applies FEC, and transfers the encoded data to the PMA."

Response
ACCEPT IN PRINCIPLE.

Delete existing text in D2.0 for 116.2.3

Add a new last paragraph to 116.2.3: "The 400GBASE-ZR PHY uses the PCS specified in Clause 155. The 400GBASE-ZR PCS performs encoding of data from the 400GMII to the 400GBASE-ZR PMA service interface."

Response
ACCEPT IN PRINCIPLE.

See response to comment 5

Comment Type TR Comment Status A

The changes to the base text are incorrect as 400GBASE-ZR is not a member of 400GBASE-R family.

Suggested Remedy
Delete noted text in 802.3cw D2.0 116.2.3

recommended text will be provided in a follow-up presentation.

Response
ACCEPT IN PRINCIPLE.

See response to comment 5

---

**Table 116–5**

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**Table 116–2.3**

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**Table 116–2.3**

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This says "The term 400GBASE-R refers to a specific family of Physical Layer implementations based upon the 64B/66B coding method specified in Clause 119 or Clause 155 and the PMA specifications defined in Clause 120 or Clause 155." But these are two distinctly different "families".

**Suggested Remedy**

Revert this text and add a separate paragraph introducing 400GBASE-W

**Response**

**Response Status** C

ACCEPT IN PRINCIPLE.

See response to comment 5

---

This paragraph summarizing the PCS needs a new sentence specifically for the Clause 155 PCS, which does clock domain translation and uses a concatenated FEC scheme, neither part of which is a BASE-R FEC

**Suggested Remedy**

Add new sentence.

**Response**

**Response Status** C

ACCEPT IN PRINCIPLE.

See response to comment 5

---

The changes to the base text are incorrect as 400GBASE-ZR is not a member of 400GBASE-R family.

**Suggested Remedy**

Delete noted text in 802.3cw D2.0 116.2.4 recommended text will be provided in a follow-up presentation.

**Response**

**Response Status** C

ACCEPT IN PRINCIPLE.

See response to comment 6
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 116  SC 116.2.4  P 29  L 12  # 422

Dawe, Piers  Nvidia
Comment Type  TR  Comment Status  A
"all 400GBASE-R PMAs other than 400GBASE-ZR" is making my point that this is not a type R PMA.
SuggestedRemedy
Add a new sentence to the first paragraph explaining what the Clause 155 PMA does - it's different (including, no loopback).
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment 6

Cl 116  SC 116.2.4  P 29  L 12  # 200

Huber, Thomas  Nokia
Comment Type  E  Comment Status  A
P802.3cw is introducing a second PMA for 400GBASE-R. While the text "all 400GBASE-R PMAs other than 400GBASE-ZR are specified in clause 120" is correct, it also implies that there are many 400GBASE-R PMAs besides the one in clause 155, which is not the case.
SuggestedRemedy
Change the first sentence to read "The 200GBASE-R PMA and 400GBASE-R PMA for PHYs other than 400GBASE-ZR are specified in Clause 120."
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment 6

Cl 116  SC 116.2.5  P 29  L 19  # 7

Brown, Matt  Huawei
Comment Type  ER  Comment Status  A
The 400GBASE-ZR is not a 400GBASE-R PMD, but rather a 400GBASE-Z PMD as defined in 1.4.144b. The editorial changes in 116.2.3 are therefore incorrect.
SuggestedRemedy
Change the editorial instructions to modify the contents of 116.2.5 as follows: Add the following sentence: "The 400GBASE-ZR PMD, which is a 400GBASE-Z PMD, and its corresponding media is specified in Clause 156."
Response  Response Status  C
ACCEPT IN PRINCIPLE.
Delete existing 116.2.5 D2.0 text
Add as new last paragraph:
"The 400GBASE-ZR PMD and its corresponding media is specified in Clause 156."

Cl 116  SC 116.4  P 29  L 27  # 8

Brown, Matt  Huawei
Comment Type  E  Comment Status  A
bucket
In the editorial instruction, statement "unchanged rows not shown" is incorrect since the two rows shown are inserted, not changed.
SuggestedRemedy
Change "unchanged rows not shown" to "some unchanged rows not shown".
Response  Response Status  C
ACCEPT.

Cl 116  SC 116.2.5  P 29  L 18  # 178

D'Ambrosia, John  Futurewei, US Subsidiary of Huawei
Comment Type  TR  Comment Status  A
The changes to the base text are incorrect as 400GBASE-ZR is not a member of 400GBASE-R family.
SuggestedRemedy
Delete noted text in 802.3cw D2.0 116.2.5 recommended text will be provided in a follow-up presentation.
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment 7

TYPE:  TR/technical required  ER/editorial required  GR/general required  T/technical  E/editorial  G/general
COMMENT STATUS:  D/dispatched  A/accepted  R/rejected  RESPONSE STATUS:  O/open  W/written  C/closed  U/unsatisfied  Z/withdrawn
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**Comment Type**: TR  **Comment Status**: A

As noted, 400GBASE-ZR is not a member of 400GBASE-R. It is also noted that per 1.4.215, the bit time is the reciprocal of the bit rate.

**Suggested Remedy**

Modify beginning of notes a and b to For 400GBASE-R and 400GBASE-ZR

**Response**  **Response Status**: C

ACCEPT IN PRINCIPLE.

Modify beginning of footnotes a and b from "For 400GBASE-R" to "For 400BASE-R".

Updated editing instruction to include modification of the footnotes.

With editorial license.

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

4688 pause_quanta equals 2400256 bit times, not 2400000, and 6000.64 ns, not 6000. So either BT and ns column or pause_quanta column should be changed.

The precedence (e.g. in 153.2.2) is to use integer pause_quanta and whatever time/BT that result from it.

**Suggested Remedy**

Change maximum in BT from 2400000 to 2400256 and maximum in ns from 6000 to 6000.64.

Also change in 155.6.

**Response**  **Response Status**: C

ACCEPT IN PRINCIPLE.

Implement suggested remedy in conjunction with clause 155 rewrite, see response to comment #346. With editorial license.

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

Note a and b for Table 116-7 only provide respective definitions for 400GBASE-R.

**Suggested Remedy**

Modify notes to provide definitions for 400GBASE-ZR.

**Proposed Response**  **Response Status**: Z

REJECT.

This comment was WITHDRAWN by the commenter.

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

400GBASE-ZR has no PCS lanes - all of these notes need to remove any references to clause 156

**Suggested Remedy**

Implement suggested remedy in conjunction with clause 155 rewrite, see response to comment #346. With editorial license.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Comment Type TR Comment Status A
Upon further review it is not clear how Table 116-8 actually ties into 400GBASE-ZR:
- The skew variation is tied to 400GBASE-R - 3rd column
- Unclear that there are PCS lanes in 400GBASE-ZR
- Both Fig 1164 and 116-5 are relevant to 400GBASE-ZR and these are not the same service interfaces that are defined for 400GBASE-ZR

SuggestedRemedy
Presentation to be provided to address topic.
Proposed remedy at this time:
1. Delete Table 116-8 in P802.3cw - not relevant to 400GBASE-ZR
2. Create new skew constraint table
3. A skew points diagram for 400GBASE-ZR is needed.

Response Response Status C
ACCEPT IN PRINCIPLE.
Update skew constraint requirements in conjunction with clause 155 rewrite, see response to comment #346. With editorial license.

Comment Type E Comment Status A
The change indicated to be made to the NOTE in 119.2.5.7 has already been made in 802.3-2022

SuggestedRemedy
Remove clause 119 (and all subclauses)

Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 165

Comment Type E Comment Status A
The strikethrough text does not appear in the published IEEE Std 802.3-2022 standard.

SuggestedRemedy
Delete Clause 119 from the draft.

Response Response Status C
ACCEPT.
Comment Type TR  Comment Status A  rewrite bucket
This is a single clause that covers both the PCS and PMA sublayers. Section 155.1 includes a summary of the PCS functions (in section 155.1.3). For consistency with previous standards I think this section should also include a summary of the PMA functions.

SuggestedRemedy
Add a new sub-section after 155.1.3 and before 155.1.4, to include a summary of the PMA functions.

Response  Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Comment Type E  Comment Status A  bucket
PHY name breaks across two rows.

SuggestedRemedy
In 400GBASE-ZR change hyphen to non-breaking hyphen ([ESC],([-],[-h]).
Same for "DP-16QAM" on line 18.

Response  Response Status C
ACCEPT.

---

Comment Type ER  Comment Status A  bucket
Use non-breaking hyphen for "400GBASE-ZR"

SuggestedRemedy
Use non-breaking hyphen for "400GBASE-ZR" throughout document.

Response  Response Status C
ACCEPT.

---

Comment Type E  Comment Status A  bucket
Missing space

SuggestedRemedy
Change "characters The" to "characters. The"

Response  Response Status C
ACCEPT.

---

Comment Type TR  Comment Status A  bucket
The 64B/66B code is transcoded to 256B/257B encoding to reduce the overhead before the addition of forward error correction (FEC): that's what true 400GBASE-R does. This is different.

SuggestedRemedy
before clock domain translation, addition of a CRC, the addition of forward error correction (FEC) and SC-FEC, scrambling, interleaving and a second FEC

Response  Response Status C
ACCEPT IN PRINCIPLE.
Replace 155.1.1 with

"This clause specifies the physical coding sublayer (PCS) and physical medium attachment (PMA) sublayer for the physical layer implementation known as 400GBASE-ZR. The 400GBASE-ZR PCS and 400GBASE-ZR PMA are sublayers of the 400GBASE-ZR PHY listed in Table 116–2. The term 400GBASE-ZR is used when referring to the 400GBASE-ZR PHY, which uses the PCS and PMA defined in this clause."

---

Comment Type T  Comment Status R  bucket
The QAM naming convention in the 802.3-2022 document employs a hyphen between the number of states and QAM (e.g. 16-QAM). See 45.2.1.208.3 for an example reference.

SuggestedRemedy
Globally replace "16QAM" with "16-QAM" and "DP-16QAM" with "DP-16-QAM".

Response  Response Status C
REJECT.
See response to comment 415
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155 SC 155.1.2 P 32 L 29 # 38
Ran, Adee Cisco
Comment Type E Comment Status A
Clause 119 is included in this amendment.
SuggestedRemedy
Make "Clause 119" an active cross reference.
Response Response Status C
ACCEPT.

Cl 155 SC 155.1.2 P 32 L 30 # 39
Ran, Adee Cisco
Comment Type E Comment Status A
Superfluous comma before "and"
SuggestedRemedy
Delete the comma
Response Response Status C
ACCEPT.

Cl 155 SC 155.1.2 P 32 L 30 # 375
Wienckowski, Natalie General Motors
Comment Type E Comment Status A
A comma is not needed after "and" when it is a list of only 2 items.
SuggestedRemedy
Change: staircase forward error correction (SC-FEC), and soft decision forward error correction
To: staircase forward error correction (SC-FEC) and soft decision forward error correction
Response Response Status C
ACCEPT.

Cl 155 SC 155.1.2 P 32 L 30 # 186
D'Ambrosia, John Fuuturewei, US Subsidiary of Huawei
Comment Type E Comment Status D
SC-FEC is used throughout the draft, but is not detailed in 1.5
SuggestedRemedy
Add abbreviation SD-FEC - staircase forward error correction
Proposed Response Response Status Z
REJECT.

This comment was WITHDRAWN by the commenter.

Cl 155 SC 155.1.2 P 33 L 18 # 181
D'Ambrosia, John Fuuturewei, US Subsidiary of Huawei
Comment Type ER Comment Status A
rewrite bucket
See Figure 155-1. The bottom of the stack should include a label that is the PMD.
Reference Figure 124-1 for a similar diagram.
SuggestedRemedy
Add 400GBASE-ZR under the box labeled "MEDIUM". Reference Figure 124-1 for a similar diagram.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.1.3 P 33 L 36 # 379
Wienckowski, Natalie General Motors
Comment Type E Comment Status A
wording
SuggestedRemedy
Change: Transcoding from 66-bit blocks to (from) 257-bit blocks.
To: Transcoding of 66-bit blocks to (from) 257-bit blocks.
Response Response Status C
ACCEPT.
Comment Type: T  Comment Status: D  references

Item d on the list references to "ITU-T G.709 Annex D". Is this a publically available document?

Suggested Remedy
This is just a question for clarification.

Proposed Response

Response Status: Z
REJECT.

This comment was WITHDRAWN by the commenter.

---

Comment Type: ER  Comment Status: A  rewrite bucket

Item e) and f) mention SC-FEC, but there is no definition of "SC-FEC" in the definitions section (1.4).

Suggested Remedy
Add a definition for "SC-FEC" into section 1.4 (unless it was added by a previous project).

Response

Response Status: C
ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Comment Type: ER  Comment Status: A  rewrite bucket

This section is under "overview" and is titled "Inter-sublayer interfaces". However it only mentions the inter-sublayer interfaces above and below the PCS. Shouldn't this section also cover the PMA inter-sublayer interfaces?

Suggested Remedy
Add a description of the PMA inter-sublayer interfaces to this section.

Response

Response Status: C
ACCEPT IN PRINCIPLE.

See response to comment #346.
<table>
<thead>
<tr>
<th>Cl</th>
<th>155</th>
<th>SC 155.1.4</th>
<th>P 34</th>
<th>L 2</th>
<th># 41</th>
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<td>The letter x should be replaced by the multiplication sign ? (twice)</td>
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<tr>
<td>SuggestedRemedy</td>
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<tr>
<td>Change per comment, and apply across the draft (search for &quot;x&quot; as a whole word)</td>
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<tr>
<td>The &quot;rate&quot; of the PCS output has been defined as per-lane transfer rate in previous PCS clauses, not as the aggregate bit rate as defined here. Consistency is preferable.</td>
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<td>SuggestedRemedy</td>
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<tr>
<td>Change to the per-lane rate (59.84375 ? 28/29 Gb/s on each of 8 PCS lanes).</td>
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<td>PCS description</td>
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<td>The nominal rate is a specific number, and should not include range (in ppm).</td>
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<td>Also in 155.3.2.</td>
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<td>SuggestedRemedy</td>
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<td>Either delete &quot;+/- 20 ppm&quot; or delete &quot;nominal&quot;, in both subclauses.</td>
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<th># 27</th>
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<td>SuggestedRemedy</td>
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<tr>
<td>Change to &quot;The PMA service interface&quot;</td>
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<td>Response</td>
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<th>L 15</th>
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<td>SuggestedRemedy</td>
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<td>Change: PMA service interface</td>
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<td>To: The PMA service interface</td>
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<td>Missing word &quot;The&quot; at beginning of first sentence.</td>
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<td>SuggestedRemedy</td>
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<tr>
<td>add &quot;The&quot; at the beginning of the sentence.</td>
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<tr>
<td>Response</td>
<td>Response Status</td>
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<tr>
<td>ACCEPT.</td>
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</tbody>
</table>
The inclusion of the word FEC in this sentence implies that the only encoding is FEC - The PMA Service Interface supports the exchange of FEC encoded data between the PCS and PMA sublayer. There is also the 64B/66B encoding.

**SuggestedRemedy**

delete the word FEC.

**Response**

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Grammar, you are talking about 2 sublayers, not 1 sublayer.

**SuggestedRemedy**

Change: between the PCS and PMA sublayer.

To: between the PCS and PMA sublayers.

**Response**

Response Status: C

ACCEPT.

---

This PCS is too complicated for just a “directive” specification. We need examples.

**SuggestedRemedy**

Create examples of e.g. FEC and other blocks before and after coding. Smallish ones can go in the document, all can be uploaded to the directory that IEEE provides for these things. They might need to cover some of the PMA.

**Response**

Response Status: U

REJECT.

A detailed suggested remedy containing an editor's instruction on how to modify the draft was not provided.

The following straw poll was taken: I would support rejecting comment #427

Yes - 10

N: 2

---

"400GBASE-Z" should be "400GBASE-ZR".

**SuggestedRemedy**

Change "400GBASE-Z" to "400GBASE-ZR".

**Response**

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.
Figure 155-2 is only a functional block diagram of the PCS. However section 155.1 is an overview for both the PCS and PMA sub-layers, so I think the functional block diagram should include both layers.

**SuggestedRemedy**
Either update Figure 155-2 to include the PMA functions, or add a separate functional block diagram of the 400BASE-ZR PMA.

Another option would be delete section 155.1.5, and include the functional block diagrams of the PCS and the PMA under sections 155.2 and 155.3 respectively.

**Response**
**Response Status C**
ACCEPT IN PRINCIPLE.

See response to comment #346.

The sentence says 400BASE-Z PCS sublayer, but the figure is labeled and used as the 400BASE-ZR PCS sublayer (also the "R" generally is used to refer to the BASE-R encoding used here.)

**SuggestedRemedy**
change 155.1.5, page 34 line 3, to "400BASE-ZR PCS sublayer" to agree with the figure

**Response**
**Response Status C**
ACCEPT IN PRINCIPLE.

See response to comment #346.

The sentence "The PCS can operate in normal mode or in test-pattern mode" is out of place in the first paragraph. These modes are only discussed in the third paragraph.

**SuggestedRemedy**
Move the last sentence of the first paragraph to a separate paragraph before the current third paragraph.

**Response**
**Response Status C**
ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155 SC 155.2.1 P 36 L 7 # 44
Ran, Adee Cisco

Comment Type E Comment Status A rewrite bucket

Line 5 says "PCS Transmit and PCS Receive processes", but then in lines 7,17, and 27 it is "transmit channel", and line 35 "receive channel". "channel" is an overloaded term, it is not defined in this clause and its other meanings are quite different.

Suggested Remedy
Change "transmit channel" to "Transmit process", 3 times. Change "receive channel" to "Receive function".

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 12 # 188
D'Ambrosia, John Futurewei, US Subsidiary of Huawei

Comment Type ER Comment Status A rewrite bucket

The following is stated -
When communicating with the PMA in the transmit direction, the 400GBASE-ZR PCS provides eight digital lanes, which the PMA encodes into two streams of 16QAM symbols.

What are eight digital lanes? Isn't this just the PMA Service Interface

Suggested Remedy
Reword
Transmit data-units are sent to the PMA service interfacee via the
PMA-IS_UNITDATA_i.request primitive. The PMA then encodes the data into two streams of 16QAM symbols.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 14 # 430
Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

"receives two streams of digitally encoded m-bit 16QAM symbols" we need an explanation of why "m-bit".

Suggested Remedy
Add sentence explaining that m is an implementation choice, for SD-FEC.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.
**IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments**

<table>
<thead>
<tr>
<th>CI</th>
<th>SC</th>
<th>P</th>
<th>L</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Suggested Remedy</th>
<th>Response</th>
<th>Response Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>155.2.1</td>
<td>36</td>
<td>20</td>
<td>T</td>
<td>R</td>
<td>Is 20 ppm necessary or useful? 100GEL introduced 50, and considering the raw BER, this is a very noisy signal. There is spare space in the GMP wrapper.</td>
<td>REJECT.</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>155.2.1</td>
<td>36</td>
<td>21</td>
<td>E</td>
<td>A</td>
<td>The current text refers to &quot;the +/- 100ppm 257-bit blocks&quot; Blocks don't have a frequency or ppm offset in and of themselves. Rather it is the block stream that has a rate with associate frequency tolerance.</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.1</td>
<td>36</td>
<td>22</td>
<td>T</td>
<td>A</td>
<td>&quot;transmit data is encoded with a concatenated forward error correction (CFEC) code consisting of an inner SC-FEC code and an outer Hamming code SD-FEC&quot;: this is intuitive but not the accepted (Forney's) use of inner and outer.</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
</tr>
</tbody>
</table>

**Comment Type Options:**
- **T:** Technical
- **ER:** Editorial
- **GR:** General
- **C:** Closed
- **P:** Open
- **D:** Unsatisfied
- **Z:** Withdrawn

**Comment Status Options:**
- **A:** Accepted
- **R:** Rejected
- **C:** Closed
- **S:** Submitted

**Page 26 of 128**
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Gustlin, Mark

Comment Type: TR

Comment Status: rewrite bucket

The use of inner and outer FEC codes seems to be backwards when compared to industry standards. Two industry books on FEC are: Error control coding (Shu Lin/Daniel Costello) and Error Control Coding (Peter Sweeney), both refer to the first code in a concatenation as the outer, and the 2nd code in a concatenation as the inner. This makes sense when you look at a diagram of the FEC codes, though it does not make sense when looking at the location of the codes in the concatenation.

SuggestedRemedy

Reverse the usage to: "an outer SC-FEC code" and "an inner Hamming code SD-FEC"

Response: Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Nicholl, Gary

Comment Type: ER

Comment Status: rewrite bucket

"Transmit data-units are sent to the service interface via the PMA:IS_UNITDATA_i.request primitive." I presume when we say "service interface here" we are referring to the PMA service interface and not the PCS service interface?

SuggestedRemedy

Change From: "Transmit data-units are sent to the service interface via the PMA:IS_UNITDATA_i.request primitive."

To: "Transmit data-units are sent to the PMA service interface via the PMA:IS_UNITDATA_i.request primitive."

Response: Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Dawe, Piers

Comment Type: T

Comment Status: rewrite bucket

As interleavers are a significant feature of this scheme

SuggestedRemedy

Mention the interleavers in the transmit direction. (There is one mention in the receive direction.)

Response: Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Ran, Adee

Comment Type: T

Comment Status: rewrite bucket

The scrambled idle pattern defined in 119.2.4.9 cannot be used here as is, because the PCS processes are different.

SuggestedRemedy

Add a new subclause based on 119.2.4.9 but specific to this clause, and refer to it instead.

Response: Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Dawe, Piers

Comment Type: E

Comment Status: bucket

Suddenly talking about receiver without warning - hard to understand at first.

SuggestedRemedy

Insert "in the receive direction."

Response: Response Status: C

ACCEPT.
### IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P 36</th>
<th>L 32</th>
<th># 436</th>
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<tr>
<td>155</td>
<td>155.2.1</td>
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**Comment Type:** E  
**Comment Status:** A  
**Comment:** PCS Synchronization process  
**Suggested Remedy:** PCS synchronization process?  
**Response:** ACCEPT.

<table>
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<tr>
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<th>P 36</th>
<th>L 35</th>
<th># 28</th>
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<tbody>
<tr>
<td>155</td>
<td>155.2.1</td>
<td></td>
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</table>

**Comment Type:** T  
**Comment Status:** A  
**Comment:** Should this be "128 bit"?  
**Suggested Remedy:** Consider changing "128-symbol" to "128 bit symbol". Similar issue with "119-symbol" on line 37.  
**Response:** ACCEPT IN PRINCIPLE.  
**Response Status:** C  
See response to comment #346.

<table>
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<tr>
<th>Cl</th>
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<th>P 36</th>
<th>L 35</th>
<th># 437</th>
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<tr>
<td>155</td>
<td>155.2.1</td>
<td></td>
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</table>

**Comment Type:** E  
**Comment Status:** A  
**Comment:** PCS Receive process  
**Suggested Remedy:** PCS Receive function or PCS receive process  
**Response:** ACCEPT IN PRINCIPLE.  
**Response Status:** C  
See response to comment #346.

<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P 36</th>
<th>L 38</th>
<th># 439</th>
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<tr>
<td>155</td>
<td>155.2.1</td>
<td></td>
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</table>

**Comment Type:** E  
**Comment Status:** A  
**Comment:** "SC-FEC blocks of 510 ? 512"  
**I assume is it the number of bits (otherwise, what is it?)**  
**Suggested Remedy:** Add "bits" after "510 ? 512".  
**Response:** ACCEPT IN PRINCIPLE.  
**Response Status:** C

<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P 36</th>
<th>L 38</th>
<th># 438</th>
</tr>
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<tr>
<td>155</td>
<td>155.2.1</td>
<td></td>
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</table>

**Comment Type:** T  
**Comment Status:** A  
**Comment:** SC-FEC blocks of 510 x 512  
**Suggested Remedy:** SC-FEC codewords (as on line 39)  
**Response:** ACCEPT IN PRINCIPLE.  
**Response Status:** C  
See response to comment #346.
The terms 'overhead fields' (page 36, line 40) and 'OH fields' (page 38, line 46), 'OH bytes' (page 38, line 2) then 'OH blocks' on the next line, and 'GMP overhead' (page 38, line 12), seem to be used interchangeable.

**SuggestedRemedy**
Please use a consistent term, 'overhead field' seems to be the most common.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Is "frame" the correct word to use here?

**SuggestedRemedy**
Consider changing "each 400GBASE-ZR frame" to "each 400GBASE-ZR PCS lane" or define what "frame" means in this context. Perhaps add a link to Figure 155-3.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

It is not clear to me from reading the descriptions as to how the 400GBASE-ZR base frame (Figure 155-3), 400GBASE-ZR OH frame (Figure 155-4) and the SC-FEC frame (Figure 155-5) are related and aligned?

**SuggestedRemedy**
Add a description or diagram to indicate how the various frame structures described in the comment are related and aligned (if indeed they are aligned).

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.
The only 'shall' statement regarding the PCS transmit path (155.2.4) is in subclause 155.2.4.9 'Frame synchronous scrambler', similarly the only 'shall' statement regarding the PCS receive path (155.2.5) is in subclause 155.2.5.3 'Descrambler' and 155.2.5.6 'CRC32 check and error marking'. Mandatory PCS transmit requirements, mandatory PCS receive requirements and other mandatory requirements need to be covered by 'shall' statements.

SuggestedRemedy
See comment.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.

The two paragraphs of 155.2.4.1 jump back and forth between 66b and 257b blocks in a way that could confuse a reader who is unfamiliar with the details of the clause 119 PCS.

SuggestedRemedy
Rewrite the text as follows:
The transmit PCS generates 66-bit blocks based upon the TXD<63:0> and <TXC<7:0> signals received from the 400GMII, as specified in the transmit state diagram shown in Figure 119-14. One 400GMII data transfer is encoded into one 66-bit block. The contents of each block are contained in a vector tx_code<65:0>, which is passed to the 64B/66B to 256B/257B transcoder. tx_code<1:0> contains the sync header and the remainder of the bits contain the block payload. The rate matching described in 119.2.4.1 is not required for the 400GBASE-ZR PCS because the mapping of the transcoded block stream into the 400GBASE-ZR frame structure performs clock compensation between the two clock domains.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.

Subclause 155.2.4.3 'GMP mapper' says that 'The GMP mapper inserts the serialized stream of 257B blocks into the payload area of a 400GBASE-ZR frame.' and that 'The frame is illustrated as a structure with 256 rows of 10 280 bits with a logical transmission order of left to right, top to bottom...'. This seems to imply that the stream of 257B blocks is inserted into one 400GBASE-ZR frame at a time.

Subclause 155.2.4.3 however then says that 'The Payload area of a four-frame multi-frame is divided into 10 220 GMP words of 4 x 257 = 1028 bits.' and that 'Each 1028-bit GMP word is either filled with data (the logically serialized 257B encoded stream produced according to 155.2.4.2)...'. This seems to imply that the 257B blocks are inserted into four 400GBASE-ZR frames, that form a single multi-frame, at a time.

Subclause '155.2.4.6 CRC32 and multi-block alignment signal (MBAS) insertion' then says 'The stream of 400GBASE-ZR frames, illustrated in Figure 155-3, provide the input...' seems to imply 400GBASE-ZR frames are formed one at a time, and does not reference multi-frames.

SuggestedRemedy
Clarify the definition of a multi-frame, potentially through a figure, how 257B blocks are mapped to it, and how it is mapped to the SC-FEC message.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155 SC 155.2.4.3 P 37 L 30 # 49
Ran, Adee Cisco
Comment Type E Comment Status A rewrite bucket
"The frame is illustrated as a structure with 256 rows of 10 280 bits with a logical
transmission order of left to right, top to bottom. This frame contains 5140 bits of overhead
and 10 220 257B blocks of payload. This frame is illustrated in Figure 155-3"

The order should be clearly defined in the text, not just "illustrated" in a figure.

The text can be made shorter and clearer.

SuggestedRemedy
Change the quoted text to:
"The frame is a structure that contains 5140 bits of overhead followed by 10 220 257-bit blocks of payload. This frame is illustrated in Figure 155-3, with transmission order from top row to bottom row and from left to right within each row".

Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.2.4.3 P 37 L 31 # 382
Slavick, Jeff Broadcom
Comment Type TR Comment Status A rewrite bucket
We traditionally refer to the 257b blocks as 257-bit blocks not 257B blocks (which could be
inferred as 257 Byte)

SuggestedRemedy
Change the seven instances of 257B block to 257-bit block

Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.2.4.3 P 37 L 44 # 441
Dawe, Piers Nvidia
Comment Type E Comment Status A bucket
"Base Frame": undefined term not used elsewhere, rogue capitals

SuggestedRemedy
Change to "frame"

Response Response Status C
ACCEPT.

Cl 155 SC 155.2.4.3 P 37 L 49 # 442
Dawe, Piers Nvidia
Comment Type E Comment Status A bucket
16 x 120b markers

SuggestedRemedy
120-bit
Response Response Status C
ACCEPT.

Cl 155 SC 155.2.4.3 P 38 L 1 # 586
Slavick, Jeff Broadcom
Comment Type E Comment Status A bucket
Section 155.2.4.5 defines/describes how the OH works

SuggestedRemedy
Change "discussed" to "described"
Response Response Status C
ACCEPT.

Cl 155 SC 155.2.4.3 P 38 L 1 # 30
Marris, Arthur Cadence Design Systems
Comment Type E Comment Status A bucket
Define OH acronym as it is the first use in the Clause

SuggestedRemedy
Change "OH bytes" to "overhead (OH) bytes"
Response Response Status C
ACCEPT.
### IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

<table>
<thead>
<tr>
<th>Cl</th>
<th>SC 155.2.4.3</th>
<th>P 38</th>
<th>L 2</th>
<th># 204</th>
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<td>Huber, Thomas</td>
<td>Nokia</td>
<td>Comment Type</td>
<td>T</td>
<td>Comment Status</td>
</tr>
<tr>
<td>The description of the 20-bit pad says it is inserted after the OH blocks, but the OH is a 1280 bit field (which is later described as four chunks of 320 bits that are interleaved). Since much of the text talks about 66b blocks or 257 blocks, it is probably better to refer to the OH bits rather than blocks.</td>
<td></td>
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<tr>
<td>SuggestedRemedy</td>
<td>Change &quot;A 20 bit pad of all zeros is added after the OH blocks&quot; to &quot;A 20 bit pad of all zeros is added after the 1280 OH bits.&quot;</td>
<td></td>
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<td></td>
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<tr>
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<td>Response Status</td>
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<th>P 38</th>
<th>L 5</th>
<th># 227</th>
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<td>Law, David</td>
<td>Hewlett Packard Enterprise</td>
<td>Comment Type</td>
<td>T</td>
<td>Comment Status</td>
</tr>
<tr>
<td>Subclause 155.2.4.3 says ‘The 400GBASE-ZR PCS payload is mapped …’ however this is the only use of the term '400GBASE-ZR PCS payload' in the draft.</td>
<td></td>
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<tr>
<td>SuggestedRemedy</td>
<td>Suggest that the text 'The 400GBASE-ZR PCS payload is mapped …' is changed to read 'The 400GBASE-ZR PCS payload of the serialized stream of 257B blocks is mapped …'.</td>
<td></td>
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<tr>
<td>Response</td>
<td>Response Status</td>
<td>C</td>
<td></td>
<td></td>
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<tr>
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<td>See response to comment #346.</td>
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<th>P 38</th>
<th>L 6</th>
<th># 294</th>
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<td>Slavick, Jeff</td>
<td>Broadcom</td>
<td>Comment Type</td>
<td>TR</td>
<td>Comment Status</td>
</tr>
<tr>
<td>in item 5 it refers to the PCS payload beginning at column 5141 which would be true for a indexing that begins at 1, but Table 155-1 appears to use column indexing that begins with 0</td>
<td></td>
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</tr>
<tr>
<td>SuggestedRemedy</td>
<td>Change &quot;column 5141 or row 0 and ending at column 10 280 of row 255&quot; to &quot;column 5140 of row 0 and ending at column 10 279 of row 255&quot;.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Response</td>
<td>Response Status</td>
<td>C</td>
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<td>See response to comment #346.</td>
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<td>Law, David</td>
<td>Hewlett Packard Enterprise</td>
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<td>E</td>
<td>Comment Status</td>
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<tr>
<td>The antepenultimate paragraph of subclause 155.2.4.3 'GMP mapper' seems to be an introduction to the GMP and would be better placed as the first paragraph.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SuggestedRemedy</td>
<td>Suggest that the antepenultimate paragraph of subclause 155.2.4.3 'GMP mapper' should be moved to be the first paragraph of subclause 155.2.4.3.</td>
<td></td>
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<td></td>
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<tr>
<td>Response</td>
<td>Response Status</td>
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<tr>
<td>See response to comment #346.</td>
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</tbody>
</table>
### IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P</th>
<th>L</th>
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<th>SuggestedRemedy</th>
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<tr>
<td>155</td>
<td>155.2.4.3</td>
<td>38</td>
<td>11</td>
<td>393</td>
<td>TR</td>
<td>A</td>
<td>CL 155</td>
<td>Issue found a Clause 9.4.3.2 in ITU-T G.709 but did find a 19.4.3.2 that talks about GMP.</td>
<td>Change 9.4.3.2 to 19.4.3.2</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.3</td>
<td>38</td>
<td>11</td>
<td>205</td>
<td>TR</td>
<td>A</td>
<td>Huber, Thomas</td>
<td>Issue found a Clause 9.4.3.2 in ITU-T G.709 does not discuss GMP. Since the GMP OH being used aligns with 400ZR, it is better to point to 155.2.4.5.3 (which then points to the OIF 400ZR IA). ITU-T G.709 and 709.x don't specifically discuss the GMP encoding that is used in 400ZR and 400GBASE-ZR.</td>
<td>Change the reference to the GMP overhead in ITU-T G.709.</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.3</td>
<td>38</td>
<td>12</td>
<td>229</td>
<td>E</td>
<td>A</td>
<td>Law, David</td>
<td>payload should not be capitalized.</td>
<td>payload should not be capitalized.</td>
<td>ACCEPT.</td>
<td>See response to comment #346.</td>
<td></td>
</tr>
</tbody>
</table>

**Comment Type Options:**
- TR: Technical Required
- ER: Editorial Required
- GR: General Required
- T: Technical
- E: Editorial
- G: General

**Comment Status Options:**
- A: Accepted
- R: Rejected
- D: Dispatched
- F: Final

**Response Status Options:**
- O: Open
- W: Written
- C: Closed
- U: Unsatisfied
- Z: Withdrawn
As a first time reader of this section, the term "stuff" and its use in this sub-clause is difficult to follow. It took me a while to understand what "stuff" was. In this case, I interpret "stuff" to mean non-data blocks or stuffing blocks. The last two paragraphs of the sub-clause could use wording improvements to make it clearer to the reader.

**Suggested Remedy**

In the second to last paragraph, change:
*Each 1028-bit GMP word is either filled with data (the logically serialized 257B encoded stream produced according to 155.2.4.2) or stuff, which is transmitted as zero and ignored on receipt.*

to
*Each 1028-bit GMP word is either filled with data bits (the logically serialized 257B encoded stream produced according to 155.2.4.2) or stuffing blocks, which is transmitted as zero and ignored on receipt.*

In the last paragraph, change:
*While the GMP mechanism is generic, the particular clock rates and tolerances for this application result in only five cases, allowing the positions of data blocks and stuffing blocks to be pre-computed.*

to
*While the GMP mechanism is generic, the particular clock rates and tolerances for this application result in only five cases, allowing the positions of data blocks and stuffing blocks to be pre-computed.*

Update title of Table 155-1 to:
*GMP stuffing block locations in 400GBASE-ZR frame*

In Table 155-1, change column header from:
*GMP word numbers of stuff locations*

to
*GMP word numbers of stuffing block locations*

In Table 155-1, change column header from:
*{row, column} of stuff location starting bits*

to
*{row, column} of stuffing block starting location*

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

155.2.4.1 says "The rate matching described in 119.2.4.1 is not required", so the 257B encoded data can have a rate of 401.5625 Gb/s +/- 100 ppm, not 401.542892 Gb/s +/- 100 ppm

**Suggested Remedy**

Change 401.5625 to 401.542892 mention both

**Response**

REJECT.

No consensus to make a change.

---

The clock rate of the 400GBASE-ZR frame (GMP clock domain) is not given, although 155.1.4 gives the PMA service interface rate

**Suggested Remedy**

Define the GMP rate in the PCS section

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.
Comment Type E  Comment Status A  rewrite bucket
The space as thousands separator in numbers with fractional digits is unusual and confusing.
Also the tilde prefix with numbers with three fractional digits seems unnecessary, especially since these numbers are then bounded by integer values.

SuggestedRemedy
Change "between ~10 214.684 and ~10 217.136" to "between 10 214 and 10 218".
Alternatively keep the fractions and delete the space separators.

Response  Response Status C  ACCEPT IN PRINCIPLE.
See response to comment #346.

Comment Type E  Comment Status A  rewrite bucket
The "(row, column)" column seems redundant with the GMP word numbers. Also, "rows" is only used for illustration and "column" is not defined.

SuggestedRemedy
Consider deleting the third column. Otherwise, change "column" to "bit #".

Response  Response Status C  ACCEPT IN PRINCIPLE.
See response to comment #346.

Comment Type T  Comment Status A  rewrite bucket
It seems that the GMP word numbers start from 1 while the bits and rows start from 0.
If the starting index is inconsistent, it should at least be explicit.

SuggestedRemedy
Add "starting from 1" after "GMP word numbers".

Response  Response Status C  ACCEPT IN PRINCIPLE.
See response to comment #346.
This text could be clarified. GMP is converting from the clock domain of the payload (stream of 257b blocks) to the clock domain of the 400GBASE-ZR frame. Presumably the payload blocks are already aligned to the payload clock.

**Suggested Remedy**
Rewrite as follows: The AM, pad, and OH fields are populated after the GMP mapping process has rate-matched the 257B block stream to the payload area of the 400GBASE-ZR frame.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

The name of the section include 400GBASE-ZR, why? CI119 uses "for 200GBASE-R" and "for 400GBASE-R" since it has two different methods done for the different rates. But this is only 1 rate clause and Clause 91 and 135 don't attach the rate to it's section heading

**Suggested Remedy**
Remove "400GBASE-ZR" from the section title of 155.2.4.4.1 and 155.2.4.4.2

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

"The 400GBASE-ZR overhead is a 40-byte frame structure that uses a four-frame multi-frame, as shown in Figure 155-4" There are 3 occurrences of "frame" in this sentence, it's unclear what they mean (especially with "400GBASE-ZR frame" also being defined; "frame" is an overly overloaded term). Also, "byte" is not strictly defined in 802.3 and we typically use the more specific "octet" instead.

**Suggested Remedy**
Change to "The 400GBASE-ZR overhead is a 160-octet block that is divided into four 40-octet frames, as shown in Figure 155-4".

Change "byte" to "octet" globally.

In 151.2.4.5.1, change "a 256-frame multi-frame sequence" to "a 256-frame sequence".

In 155.2.4.5.3 change "four-frame multi-frame" to "OH".

Change elsewhere as appropriate. Implement with editorial license.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.
The OH section of the 400GBASE-ZR frame is 1280 bits in size. This intro sentence states that OH is only a 40-byte is only 320 bits of data.

**SuggestedRemedy**

Remove 155.2.4.5.4 and update 155.2.4.5 as follows (retaining Figure 155-4):

155.2.4.5 Overhead (OH)

The 400GBASE-ZR frame contains a 1280-bit OH field. This field is logically composed of four 320-bit structures. The 40-byte overhead frame described in 155.2.4.5.1 is the first such 320-bit structure. The second, third, and fourth 320-bit structures are all zeros. The four 320-bit structures are 10-bit interleaved to form the 1280-bit overhead field.

155.2.4.5.1 40-byte overhead frame

The 40-byte overhead frame is a 40-byte frame structure that uses a four-frame multi-frame, as shown in Figure 155-4 and described in 155.2.4.5.1.1 through 155.2.4.5.1.3. The contents of the 40-byte overhead frame is dependent upon the two LSB bits of the MFAS (see 155.2.4.5.1.1)

155.2.4.5.1.1 Multi-frame alignment signal (MFAS)

The MFAS is in the first byte of the 40-byte overhead frame. It is a wrapping counter that is incremented each frame to provide a 256-frame multi-frame sequence as defined by ITU-T G.709.1 Clause 9.2.1.

Renumber 155.2.4.5.2 and 155.2.4.5.3 to 155.2.4.5.1.2 and 155.2.4.5.1.3 keeping the text unchanged for those sections.

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

D'Ambrosia, John
Futurewei, US Subsidiary of Huawei

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

**SuggestedRemedy**

Add to 1.5
MFAS Multi-frame alignment signal

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Ran, Adee
Cisco

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

I assume the MFAS is an 8-bit counter, but figure 155-4 shows only 2 bits. This can confuse readers.

**SuggestedRemedy**

Change "It is a wrapping counter that is incremented each frame" to "It is an auto-wrapping 8-bit counter that is incremented on each 40-octet frame within the OH block".

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Ran, Adee
Cisco

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

ITU-T G.709.1 seems to be a normative reference. It does not appear in the list in 1.3 (the ones that appear are G.709 and G.709.2; these are separate documents).

**SuggestedRemedy**

Add a reference in 1.3.

**Response**

ACCEPT.

Add an entry in 1.3 as follows:

ITU-T Recommendation G.709.1 - Flexible OTN short-reach interfaces
### Comment #448

**Cl** 155  **SC** 155.2.4.5.1  **P** 39  **L** 41  **#** 448

**Dawe, Piers**  **Nvidia**

**Comment Type**  **TR**  **Comment Status**  **A**  **rewrite bucket**

G.709.1 is not a normative reference

**Suggested Remedy**
- Remove GMP, define the 256-frame multi-frame sequence here, or add the reference

**Response**  **Response Status**  **C**  **rewrite bucket**

ACCEPT IN PRINCIPLE.

See response to comment #346.

### Comment #390

**Cl** 155  **SC** 155.2.4.5.2  **P** 39  **L** 32  **#** 390

**Slavick, Jeff**  **Broadcom**

**Comment Type**  **TR**  **Comment Status**  **A**  **rewrite bucket**

Figure 155-4 shows the status field as having 4 different defined bits. But only 3 are specified in 155.2.4.5.2. The RES in the figure appears to be meant to be a "Reserved" field.

**Suggested Remedy**
- Remove the RES text from Figure 155-4 and change the color of the box to be grey

**Response**  **Response Status**  **C**  **rewrite bucket**

ACCEPT IN PRINCIPLE.

See response to comment #346.

### Comment #230

**Cl** 155  **SC** 155.2.4.5.2  **P** 39  **L** 48  **#** 230

**Law, David**  **Hewlett Packard Enterprise**

**Comment Type**  **T**  **Comment Status**  **A**  **rewrite bucket**

Subclause 155.2.4.5.2 says 'The RPF bit indicates signal fail status was detected by the remote 400GBASE-ZR receive function ...' which seems to imply that the RPF bit is mapped from the it is mapped from the SIGNAL_OK parameter of the PMA:IS_SIGNAL.indication primitive.

**Suggested Remedy**
- If the RPF bit is mapped from the PMA:IS_SIGNAL.indication primitive, replace the second sentence of the second paragraph of subclause 155.2.4.5.2 with 'The bit is set based on the most recently received SIGNAL_OK parameter of the PMA:IS_SIGNAL.indication primitive. It is "0" if the value was OK and "1" if the value was FAIL.'

If the RPF bit is not mapped from the PMA:IS_SIGNAL.indication primitive, please define where it is mapped from, or the conditions for when it is set and cleared.

**Response**  **Response Status**  **C**  **rewrite bucket**

ACCEPT IN PRINCIPLE.

See response to comment #346.

### Comment #450

**Cl** 155  **SC** 155.2.4.5.2  **P** 39  **L** 48  **#** 450

**Dawe, Piers**  **Nvidia**

**Comment Type**  **TR**  **Comment Status**  **A**  **rewrite bucket**

"The RPF bit indicates signal fail status was detected by the remote 400GBASE-ZR receive function": why is this here? Doesn't Ethernet RF do that job?

**Suggested Remedy**
- If the idea is that a 400GBASE-ZR PHY should continue to transmit data while its input is bad, then changes elsewhere would be needed for unidirectional operation

**Response**  **Response Status**  **C**  **rewrite bucket**

ACCEPT IN PRINCIPLE.

See response to comment #346.
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P</th>
<th>L</th>
<th>#</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Comment Content</th>
<th>Suggested Remedy</th>
<th>Response</th>
<th>Response Status</th>
<th>Comment Status</th>
<th>Response Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>155.2.4.5.2</td>
<td>39</td>
<td>48</td>
<td>449</td>
<td>T</td>
<td>rewrite bucket</td>
<td>A</td>
<td>&quot;signal fail status was detected by the remote 400GBASE-ZR receive function in the upstream direction&quot;. But see 1.4.586 upstream: In an access network, transmission away from the subscriber end of the link. Applicable to networks where there is a clear indication in each deployment as to which end of a link is closer to a subscriber. A status is generated, maybe based on detecting something.</td>
<td>SuggestedRemedy</td>
<td>The RPF bit is used by a 400GBASE-ZR PHY to indicate to its link partner the signal fail status at its receive function</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.5.2</td>
<td>39</td>
<td>50</td>
<td>232</td>
<td>T</td>
<td>rewrite bucket</td>
<td>A</td>
<td>Subclause 155.2.4.5.2 'Link status monitoring and signaling' says 'RPF is set to &quot;1&quot; to indicate a remote 400GBASE-ZR PHY defect indication' however there appears to be no definition of a 400GBASE-ZR PHY defect in the draft.</td>
<td>SuggestedRemedy</td>
<td>Please provide a definition of the conditions considered a 400GBASE-ZR PHY defect.</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.5.2</td>
<td>39</td>
<td>51</td>
<td>389</td>
<td>E</td>
<td>rewrite bucket</td>
<td>A</td>
<td>Isn't &quot;... 400GBASE-ZR receive function in the upstream direction ...&quot; duplicative as the 'upstream direction' is the receive path. And since there is only one 400GBASE-ZR receive function, it doesn't need to be qualified by 'in the upstream direction'.</td>
<td>SuggestedRemedy</td>
<td>Suggest that '... 400GBASE-ZR receive function in the upstream direction and ...' should read '... 400GBASE-ZR receive function and ...':</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.5.2</td>
<td>40</td>
<td>1</td>
<td>60</td>
<td>E</td>
<td>rewrite bucket</td>
<td>A</td>
<td>What do &quot;downstream&quot;, &quot;host interface signal&quot; and &quot;MDI&quot; signal&quot; mean? Perhaps &quot;downstream&quot; should be &quot;link partner&quot;? For signals, are these the signals received by the 400GAUI C2M (which is optional) and the MDI?</td>
<td>SuggestedRemedy</td>
<td>Please rephrase to clarify.</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>See response to comment #346.</td>
</tr>
</tbody>
</table>
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155  SC 155.2.4.5.2  P 40  L 5  # 451
Dawe, Piers  Nvidia
Comment Type  E  Comment Status  A  rewrite bucket
Two sections, both called "Link status monitoring and signaling", say different things about e.g. STAT<6> 155.2.5.7.2 says "in the received STAT<6>", this earlier Tx one doesn't have the equivalent.

SuggestedRemedy
Add extra words to make the context clear. "in the transmitted" would help, but more may be needed
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155  SC 155.2.4.5.2  P 40  L 9  # 452
Dawe, Piers  Nvidia
Comment Type  T  Comment Status  A  rewrite bucket
"the received status byte in the receive direction": eh?
SuggestedRemedy
Change "then the value of RD in STAT<6> is set to the value of LD in STAT<6> of the received status byte in the receive direction" to "then the value of RD in the transmitted STAT<6> is set to the value of LD in the received STAT<6>"?
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155  SC 155.2.4.5.2  P 40  L 10  # 453
Ran, Adee  Cisco
Comment Type  E  Comment Status  A  rewrite bucket
"If there is not an adjacent PHY 400GXS sublayer"
Also in 155.2.5.7.2.
SuggestedRemedy
Change to "If there is no adjacent PHY 400GXS sublayer" (2 places).
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155  SC 155.2.4.5.2  P 40  L 17  # 454
Ran, Adee  Cisco
Comment Type  T  Comment Status  A  rewrite bucket
"OIF-400ZR-01.0, March 10, 2020, subclause 8.9"
This should be a normative reference document (in addition to the ITU-T documents). I found a matching document in https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf.
Note that there are updates to this document (OIF-400ZR-01.0 Maintenance, https://www.oiforum.com/get/51820) where the subclause number seems to have changed. Consider whether the reference should be to a specific dated version or to the up-to-date one.
Preferably provide a URL to the specific document.
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 155  SC 155.2.4.5.2  P 40  L 9  # 455
Law, David  Hewlett Packard Enterprise
Comment Type  E  Comment Status  A  rewrite bucket
Suggest that '... connected to a MAC-RS ...' should be changed to read '... connected directly to a MAC-RS ...'.
SuggestedRemedy
See comment.
Response  Response Status  C
ACCEPT IN PRINCIPLE.
See response to comment #346.
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Page</th>
<th>Line</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>155.2.4.5.3</td>
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<td>40</td>
<td>17</td>
<td>453</td>
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<td>SC</td>
<td>Comment Type</td>
<td>Comment Status</td>
<td>Page</td>
<td>Line</td>
<td>#</td>
</tr>
<tr>
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<td>155.2.4.5.3</td>
<td>ER</td>
<td>rewrite bucket</td>
<td>40</td>
<td>22</td>
<td>396</td>
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<td>SC</td>
<td>Comment Type</td>
<td>Comment Status</td>
<td>Page</td>
<td>Line</td>
<td>#</td>
</tr>
<tr>
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<td>155.2.4.5.3</td>
<td>E</td>
<td>rewrite bucket</td>
<td>40</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
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<td>Comment Status</td>
<td>Page</td>
<td>Line</td>
<td>#</td>
</tr>
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<td>155.2.4.5.4</td>
<td>E</td>
<td>rewrite bucket</td>
<td>40</td>
<td>30</td>
<td>348</td>
</tr>
</tbody>
</table>

Comment: **Reference to OIF-400ZR-01.0, March 10, 2020, subclause 8.9. Note that this document is subject to active maintenance**

**Suggested Remedy:**
If feasible, write the specification here. If not, check that the reference is complete, correct and detailed enough, add a normative reference. Refer to a later OIF-400ZR if appropriate.

**Response:**
*ACCEPT IN PRINCIPLE.*

See response to comment #346.

---

Comment: **Everywhere else uses the word four not the number**

**Suggested Remedy:**
Change "4-frame multi-frame" to "four-frame multi-frame"

**Response:**
*ACCEPT.*

---

Comment: **It seems worthwhile to provide some basic context regarding the meaning of Cm(t) and Scn(t). Although G.709 provides the details, it may be worthwhile expanding this statement somewhat.**

**Suggested Remedy:**
I suggest adding the following sentences to the end of this paragraph: "Note that Cm(t) indicates the number of 1028-bit GMP data words that will be transmitted during the next multi-frame, with Scn(t) nominally indicating the running remainder. Averaging the Cm(t) plus Scn(t) values across multiple multi-frames, the average represent the incoming serial stream rate as the number of information bytes arriving at the GMP encoder per multi-frame."

**Response:**
*ACCEPT IN PRINCIPLE.*

See response to comment #346.

---

Comment: **The 'nD' in CnD(t) should be subscripted**

**Suggested Remedy:**
Change the nD to subscript.

**Response:**
*ACCEPT IN PRINCIPLE.*

See response to comment #346.

---

Comment: **A figure showing the interleaving of the 4 OH instances would help clarify the OH structure.**

**Suggested Remedy:**
Add a figure showing the interleaved OH mapping

**Response:**
*ACCEPT IN PRINCIPLE.*

See response to comment #346.
It appears that the 10-bit interleaver isn't specified.

Suggested Remedy

- Specify the 10-bit interleaver.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Suggested Remedy

- Suggest that:
  
  1. The first paragraph of subclause 155.2.4.6 should be changed to read 'The stream of 400GBASE-ZR frames, illustrated in Figure 155-3, provide the information bits for the calculation of SC-FEC input blocks. To conform with the format of the input SC-FEC block, 119 rows from the stream of 400GBASE-ZR frames are mapped to the information bits in 5 successive SC-FEC input blocks. Each SC-FEC input block has 119 x 10 280 / 5 bits = 244 664 information bits.'
  
  2. The text '... cyclic redundancy code is calculated over 244 664 input bits as ...' in the second paragraph of subclause 155.2.4.6 should be changed to read '... cyclic redundancy code is calculated over the 244 664 information bits as ...'.
  
  3. The term 'SC-FEC block' be changed to read 'SC-FEC input block' in subclause 155.2.4.6.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Suggested Remedy

- Suggest that:
  
  1. The text '... the CRC value are placed with the x31 term as the left-most bit...', however, it doesn't specify where. In addition, it also says, 'Following the CRC32 a 6-bit MBAS is added.', without specifying the bit order. Finally, the CRC is referred to as a field (page 40, line 44) whereas the MBAS is referred to as overhead.
  
  2. The first sentence of the last paragraph of subclause 155.2.4.6 should be moved to the end of the paragraph and changed to read 'The 6 bits of the MBAS field are placed immediately after the CRC with the most significant bit as the left-most bit of the MBAS field and the least significant bit as the right-most bit of the MBAS field. The bits of the MBAS are transmitted in the order of most significant bit first, least significant bit last.'.
  
  3. The two instances of 'MBAS overhead' should be changed to read 'MBAS field'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

**Comment Type:** E  **Comment Status:** A  **rewrite bucket**

"The 32 bits of the CRC value are placed with the x31 term as the left-most bit of the CRC32 field and the x0 term as the right-most bit of the CRC32 field"

There is no illustration of the CRC32 block, so "right" and "left" are not really meaningful; The subsequent sentence defines the transmission order, so this sentence seems redundant.

**SuggestedRemedy**

Delete the quoted sentence.

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

See response to comment #346.

---

**Comment Type:** E  **Comment Status:** A  **rewrite bucket**

IEEE Std 802.3 doesn't specify implementations.

**SuggestedRemedy**

Suggest that '... staircase FEC implementation uses ...' should read '... staircase FEC uses ...'!

**Response**  **Response Status:** C  **ACCEPT.**

See response to comment #346.

---

**Comment Type:** T  **Comment Status:** A  **rewrite bucket**

Needs a figure showing the 400GBASE-ZR frame rows, SC-FEC blocks, CRC32 and MBAS

**SuggestedRemedy**

Please add a figure per comment.

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

See response to comment #346.
There is no specification of how the 8 parity blocks are mapped into bits 10280 to 10970 of the 400GBASE-ZR SC-FEC encoded frames.

**Suggested Remedy**

Add a new paragraph to subclause 155.4.7 to specify the mapping of the 16384 parity bits into bits 10280 to 10970 of the 400GBASE-ZR SC-FEC encoded frames.

Response

**ACCEPT IN PRINCIPLE.**

See response to comment #346.

Both instances of block 7.11 in figure 155-6 are marked with an asterisk which, I assume, is meant to reference a footnote that says that only the information bits of block 7.11 are included, that the CRC32 and MBAS bits are appended after the parity bits, and the pad is discarded.

**Suggested Remedy**

Add a new paragraph to subclause 155.4.7 to specify the mapping of the CRC32 and MBAS bits from block 7.11 and add a suitable footnote to figure 155-6.

Response

**ACCEPT IN PRINCIPLE.**

See response to comment #346.

The "dark" line appears to be on the wrong side of the CRC+MBAS grey box. Should be on the right edge of all boxes but that's not true for 3 of them. And the last one isn't part of its Bj+3 box.

**Suggested Remedy**

Thicken the right edge of the grey boxes that represent the CRC+MBAS.

Response

**ACCEPT IN PRINCIPLE.**

See response to comment #346.

**Cl 155 SC 155.2.4.7 P 42 L 5 # 253**

Law, David

Hewlett Packard Enterprise

**Comment Type** T **Comment Status** A **rewrite bucket**

**Cl 155 SC 155.2.4.7 P 42 L 11 # 254**

Law, David

Hewlett Packard Enterprise

**Comment Type** T **Comment Status** A **rewrite bucket**

Both instances of block 7.11 in figure 155-6 are marked with an asterisk which, I assume, is meant to reference a footnote that says that only the information bits of block 7.11 are included, that the CRC32 and MBAS bits are appended after the parity bits, and the pad is discarded.

**Suggested Remedy**

Add a new paragraph to subclause 155.4.7 to specify the mapping of the CRC32 and MBAS bits from block 7.11 and add a suitable footnote to figure 155-6.

Response

**ACCEPT IN PRINCIPLE.**

See response to comment #346.

**Cl 155 SC 155.2.4.8 P 43 L 4 # 391**

Slavick, Jeff

Broadcom

**Comment Type** TR **Comment Status** A **rewrite bucket**

What is the contents of the PAD?

**Suggested Remedy**

Change "pad bits added" to "pad bits of all zeroes added"

Response

**ACCEPT IN PRINCIPLE.**

See response to comment #346.

**Cl 155 SC 155.2.4.9 P 43 L 9 # 456**

Dawe, Piers

Nvidia

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

sequence 65 535

**Suggested Remedy**

sequence length 65 535?

Response

**ACCEPT.**

See response to comment #346.
### Comment 65

**Comment Type:** T  
**Comment Status:** A  
**Comment:** "a frame-synchronous scrambler of sequence 65 535"  
**Suggested Remedy:**  
Rewrite as appropriate.

**Response:**  
Rewrite as appropriate.

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

*See response to comment #346.*

### Comment 460

**Comment Type:** T  
**Comment Status:** A  
**Comment:**  
**Suggested Remedy:**  
Rewrite as appropriate.

**Response:**  
Rewrite as appropriate.

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

*See response to comment #346.*

### Comment 461

**Comment Type:** T  
**Comment Status:** A  
**Comment:**  
**Suggested Remedy:**  
Rewrite as appropriate.

**Response:**  
Rewrite as appropriate.

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

*See response to comment #346.*
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P</th>
<th>L</th>
<th>#</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>SuggestedRemedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>155.2.4.9</td>
<td>43</td>
<td>12</td>
<td>457</td>
<td>E</td>
<td>A</td>
<td>italic ACCEPT.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.9</td>
<td>43</td>
<td>13</td>
<td>383</td>
<td>E</td>
<td>A</td>
<td>Accept in principle.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.9</td>
<td>43</td>
<td>14</td>
<td>31</td>
<td>T</td>
<td>A</td>
<td>rewrite bucket Consider changing &quot;resets&quot; to &quot;shall be reset&quot; ACCEPT IN PRINCIPLE. See response to comment #346.</td>
</tr>
<tr>
<td>155</td>
<td>155.2.4.10</td>
<td>43</td>
<td>20</td>
<td>255</td>
<td>E</td>
<td>A</td>
<td>rewrite bucket Suggest that ‘... SC-encoder ...’ should read ‘... SC-FEC encoder ...’. ACCEPT IN PRINCIPLE. See response to comment #346.</td>
</tr>
</tbody>
</table>
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

CI 155 SC 155.2.4.10 P 43 L 21 # 67
Ran, Adee Cisco
Comment Type T Comment Status A rewrite bucket
ITU-T G.709.3 seems to be a normative reference.
SuggestedRemedy
Add a reference in 1.3.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

CI 155 SC 155.2.4.10 P 43 L 21 # 462
Dawe, Piers Nvidia
Comment Type TR Comment Status A rewrite bucket
G.709.3 is not a normative reference
SuggestedRemedy
Add the content locally or add the reference and any information that is needed to make
the definition accessible, complete and unambiguous
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

CI 155 SC 155.2.4.10 P 43 L 21 # 68
Ran, Adee Cisco
Comment Type T Comment Status A rewrite bucket
"The convolutional interleaver is described in ITU-T G.709.3 subclause 15.4.3"
The text in this subclause and figure 155-7 are insufficient to understand/implement the
interleaver function.
If it isn't fully defined (defined only in an external document) then there is no need for this
text and figure.
SuggestedRemedy
Preferably add the detailed definitions from the referenced document.
Otherwise, delete the whole subclause except for the quoted sentence.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

CI 155 SC 155.2.4.10 P 43 L 22 # 256
Law, David Hewlett Packard Enterprise
Comment Type T Comment Status A rewrite bucket
IEEE Std 802.3 doesn't specify implementations.
SuggestedRemedy
Suggest, based on the in subclause 155.2.4.9 above (page 43, line 8), that the text The
convolutional interleaver is described in ITU-T G.709.3 subclause 15.4.3. It contains 16
parallel delay lines that are accessed sequentially for each block of 119 bits.' is changed to read
'The convolutional interleaver shall be functionally equivalent to the convolutional
interleaving process described in ITU-T G.709.3 subclause 15.4.3.'
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

CI 155 SC 155.2.4.10 P 44 L 30 # 208
Huber, Thomas Nokia
Comment Type TR Comment Status A rewrite bucket
The convolutional interleaver and Hamming encoder are working with 10976 rows, but
figure 155-7 indicates 10970 rows
SuggestedRemedy
Change 10970 to 10976 in Figure 155-7.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

CI 155 SC 155.2.4.11 P 44 L 36 # 32
Marris, Arthur Cadence Design Systems
Comment Type E Comment Status A bucket 119b
SuggestedRemedy
Change "119b" to "119-bit"
Response Response Status C
ACCEPT.
Subclause seems to use the terms '119b', '119-bit block' and '119-bit message' interchangeably. Suggest that '119-bit message' is used to match subclause 155.2.5.1.

Suggested Remedy
Suggest that:

[1] The text 'The 119b outputs of the convolutional interleaver are encoded ...' is changed to read 'The 119-bit messages output by the convolutional interleaver are encoded ...'

[2] The text '... to each of the 10 976 119-bit blocks as output ...' is changed to read '... to each of the 10 976 119-bit messages as output ...'.

Accept in principle.

See response to comment #346.

The generic operation of the Hamming SD-FEC scheme is specified in ITU-T G.709.3 Annex D but that contains undefined symbols and terms.

Suggested Remedy
As it seems it is not very long, write it out cleanly here

Response
Accept in principle.

See response to comment #346.

The 128-bit code word referenced in subclause 155.2.4.11 'Hamming SD-FEC encoder' is called the 'SD-FEC codeword' in Figure 155-8, subclause 155.2.5.1 (page 46, line 5) and subclause 155.3.3.2 (page 53, line 36). Suggest the same terminology should be used in subclause 155.2.4.11 'Hamming SD-FEC encoder'.

Suggested Remedy
Suggest that:

[1] The text '... results in 10 796 128-bit blocks.' be changed to read '... results in 10 796 128-bit SD-FEC codewords.'.

[2] The text '... is encoded to the 128-bit code word ...' be changed to read '... is encoded to the 128-bit SD-FEC codeword ...'.

[3] The text 'The 128-bit code words are ...' should be changed to read 'The 128-bit SD-FEC codewords are ...'.

Response
Accept in principle.

See response to comment #346.
This says 8-bit symbols, 155.2.1 says two streams of 4-bit data. PMA:IS_UNITDATA_i.request is 7 wide.

**Suggested Remedy**

The difference may matter when we are discussing Skew limits

**Response**

**Response Status** C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Suggest that Figure 155-8 and the last paragraph of subclause 155.2.4.11 be updated to describe how the 128-bit code word from the SD-FEC encoder is passed across the PMA service interface. In addition, the fourth paragraph of subclause 155.3.3.1 should be updated to note that the 128-bit code word is passed across the PMA service interface to the PMA where the Gray mapping and polarization distribution described occurs.

**Suggested Remedy**

[1] Suggest that the PMA service interface be added to Figure 155-8. To do this suggest that the label 'PMA:IS_UNITDATA_0.request' be added to the leftmost arrow at the bottom of the figure, with the label 'PMA:IS_UNITDATA_1.request' and 'PMA:IS_UNITDATA_2.request' staggered above on the next two arrows to the right. The label 'PMA:IS_UNITDATA_7.request' should be added to the rightmost arrow. As an existing example, see Figure 119-10 '200GBASE-R Transmit bit ordering and distribution'.

[2] Suggest that the last paragraph of subclause 155.2.4.11 be changed to read 'The 128-bit code word is then passed across the 8 lane PMA service interface to the PMA sublayer as 16 groups of 8 bits, each representing a DP-16QAM symbol. The first group of 8 bits are c0 through c7, the last group of 8 bits are c120 through C127, with the LSB through the MSB or each group of 8 bits mapped in order to the tx_symbol parameter of the PMA:IS_UNITDATA_0.request through the PMA:IS_UNITDATA_7.request primitive respectively (see Figure 155-8)'.

[3] Suggest that the text 'Each 128-bit code word from the SD-FEC encoder $c = [c_0, c_1, \ldots, c_{127}]$, is mapped ...' in the fourth paragraph of subclause 155.3.3.1 should be changed to read 'Each 128-bit code word from the SD-FEC encoder is passed across the PMA service interface as described in 155.2.4.11. Each 128-bit code word $c = [c_0, c_1, \ldots, c_{127}]$, is mapped ...'.

**Response**

**Response Status** C

ACCEPT IN PRINCIPLE.

See response to comment #346.
The format of the text in Figure 155-8 is all over the place. I know in 802.3df we are using a constant font for all text in figures.

Suggested Remedy
Update Figure 155-8 to use a constant font for all text.

Response
Response Status C
ACCEPT IN PRINCIPLE.

The vast majority of references to the in-phase and quadrature-phase X and Y polarization use the symbols I<subscript>X</subscript>, Q<subscript>X</subscript>, I<subscript>Y</subscript>, and Q<subscript>Y</subscript> (e.g., Figure 155-10 on page 51, line 28 and subclause 155.3.3, page 52, line 9). There, however, seem to be a few instances where the X and Y are not in subscript, or the phase and polarization symbols are reversed.

Suggested Remedy
On the assumption that they are referencing the same signals, please use I<subscript>X</subscript>, Q<subscript>X</subscript>, I<subscript>Y</subscript>, and Q<subscript>Y</subscript> in the following locations:

- Subclause 155.2.5.1, page 46, line 12
- Table 155-3, page 55, line 38
- Table 155-4, page 56, line 35
- Table 155-7, page 59, line 5 through 16

Response
Response Status C
ACCEPT IN PRINCIPLE.

Lewis, Jon Dell Technologies

What requires this? a sensitivity / OSNR tolerance spec? Please refer to wherever the reason is given.

Response
Response Status C
ACCEPT IN PRINCIPLE.
Comment Type: E  Comment Status: A  rewrite bucket
You should refer to the equation.

Suggested Remedy
- Change: polynomial given in 155.2.4.9.
- To: polynomial given by Equation (155-1).

Response  Response Status: C  ACCEPT IN PRINCIPLE.
See response to comment #346.

Comment Type: T  Comment Status: A  rewrite bucket
"The SC-FEC decoder function is described in ITU-T G.709.2 Annex A" The text in this subclause is insufficient to understand/implement the SD-FEC decoder function. If it isn't fully defined (defined only in an external document) then there is no need for the details in the first paragraph.

Suggested Remedy
- Preferably add the detailed definitions from the referenced document. Otherwise, delete the first two paragraphs, retaining the quoted sentence.

Response  Response Status: C  ACCEPT IN PRINCIPLE.
See response to comment #346.

Comment Type: E  Comment Status: A  rewrite bucket
incoming block 10 ...

Suggested Remedy
incoming block of 10 ...

Response  Response Status: C  ACCEPT IN PRINCIPLE.
See response to comment #346.
Comment Type TR  Comment Status A  rewrite bucket

Last paragraph of this section states that link degrade status is provided, but there's no MDIO mapping provided in the text to indicate it's status bits or control of thresholds.

Suggested Remedy
Add references to the MDIO registers to control and observe link degrade.

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Comment Type TR  Comment Status A  rewrite bucket

The last paragraph states that the link degrade function is provided and that the bit error ratio is used to indicate this. But in the MDIO mapping (Table 155-8) points to fields that exist but reference 119.2.5.3 which specifies the thresholds in terms of rs-symbol error rates and FEC codewords.

Suggested Remedy
Replace the last paragraph of 155.2.5.5 with the following:

The 4000GBASE-ZR PCS may optionally provide the ability to signal degradation of the received signal. The presence of this option is indicated by the assertion of the \texttt{FEC\_degraded\_SER\_ability\_variable} (see 155.4.2.1). When the option is provided it is enabled by the assertion of the \texttt{FEC\_degraded\_SER\_enable\_variable} (see 155.4.2.1).

When \texttt{FEC\_degraded\_SER\_enable} is asserted, additional error monitoring is performed by the PCS. The PCS counts the number of bits corrected by the SC-FEC decoder in consecutive nonoverlapping SC-FEC frames of \texttt{FEC\_degraded\_SER\_interval} (see 155.4.2.1). If the SC-FEC decoder determines that a codeword is uncorrectable or errors are detected by the CRC32 check (see 155.2.5.6), the number of symbol errors detected is increased by 957 x 257. When the number of bit errors exceeds the threshold set in \texttt{FEC\_degraded\_SER\_activate\_threshold} (see 155.5.1), the \texttt{FEC\_degraded\_SER} bit (see 155.5.1) is set. At the end of each interval, if the number of symbol errors is less than \texttt{FEC\_degraded\_SER\_deactivate\_threshold}, the \texttt{FEC\_degraded\_SER} bit is cleared. If either \texttt{FEC\_degraded\_SER\_ability} or \texttt{FEC\_degraded\_SER\_enable} is de-asserted then the \texttt{FEC\_degraded\_SER} bit is cleared.

Bring in 45.2.3.60.1 and add "155.2.5.5" to the see list
Bring in 45.2.3.61.1 and add "155.4.2.1" to the see list
Bring in 45.2.3.61.3 and add "155.2.5.5" to the see list
Bring in 45.2.3.61.4 and add "155.4.2.1" to the see list

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155 SC 155.2.5.6 P 46 L 53 # 470
Dawe, Piers Nvidia
Comment Type T Comment Status A rewrite bucket
base block*: not defined, used only once

SuggestedRemedy
I think this means the "B" blocks of 155.2.5.5. Are they "SC-FEC codewords", and are they named?
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.6 P 47 L 53 # 402
Slavick, Jeff Broadcom
Comment Type TR Comment Status A rewrite bucket
Uncorrectable blocks are not tracked in MDIO registers

SuggestedRemedy
Add references to the MDIO register for counting corrected and uncorrected FEC CW and bits
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7 P 47 L 7 # 134
Nicholl, Gary Cisco Systems
Comment Type E Comment Status A rewrite bucket
in "952 x 257B" does the "B" stand for bits? If so I am not sure this follows the 802.3 style manual?

SuggestedRemedy
Change "952 x 957B" into "952 x 957 bits". Similar comment in the rest of this section where "B" is used.
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7 P 47 L 9 # 471
Dawe, Piers Nvidia
Comment Type E Comment Status A rewrite bucket
will have

SuggestedRemedy
has
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7 P 47 L 9 # 72
Ran, Adee Cisco
Comment Type E Comment Status A rewrite bucket
"will" is deprecated.

SuggestedRemedy
Change "will have" to "has".
Change other instances as necessary.
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7 P 47 L 14 # 73
Ran, Adee Cisco
Comment Type E Comment Status A rewrite bucket
There are multiple state machines (diagrams) in 155.4.
I assume Figure 155-16 is the one.

SuggestedRemedy
Change "follows the state machine in 155.4" to "is depicted by the state diagram in Figure 155-16".
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
Cl 155 SC 155.2.5.7 P 47 L 14 # 403
Slavick, Jeff Broadcom
Comment Type TR Comment Status A rewrite bucket
Reference is to 155.4 which is all the FSM blocks, call out the specific AM lock one.

Suggested Remedy
Change 155.4 to Figure 155-16

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7 P 47 L 14 # 261
Law, David Hewlett Packard Enterprise
Comment Type E Comment Status A rewrite bucket
Suggest a direct reference to the Alignment marker lock state diagram is provided in subclause 155.2.5.7.

Suggested Remedy
Suggest that the first sentence of the penultimate paragraph of subclause 155.2.5.7 be changed to read 'The process of locking to the AM field is described in the Alignment marker lock state diagram in Figure 155-16.'

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7 P 47 L 19 # 211
Huber, Thomas Nokia
Comment Type T Comment Status A rewrite bucket
Figure 155-9 is identical to Figure 155-4. It is also not referenced in the text at all, though it is obvious how it relates to the text. To avoid potential divergence of the figures, it would be better to refer to the earlier figure rather than replicate it.

Suggested Remedy
Remove figure 155-9. Add "(see Figure 155-4)" to the end of last paragraph

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7.1 P 47 L 33 # 473
Dawe, Piers Nvidia
Comment Type E Comment Status A rewrite bucket
Figure 155-9 seems to be identical to Figure 155-4

Suggested Remedy
Remove it, refer to 155-4 instead

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7.1 P 47 L 33 # 395
Slavick, Jeff Broadcom
Comment Type TR Comment Status A rewrite bucket
Figure 155-9 is identical to 155-4 and is not referenced

Suggested Remedy
Delete Figure 155-9. Add "(see Figure 155-4)" to the end of last paragraph

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.7.1 P 47 L 33 # 472
Dawe, Piers Nvidia
Comment Type E Comment Status A rewrite bucket
Figure 155-9 is an orphan

Suggested Remedy
Reference it or remove it. See another comment.

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
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<td>&quot;LF ordered sets&quot; are not defined in this draft.</td>
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<td>I assume it is the &quot;Local Fault&quot; RS ordered set.</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   U/unsatisfied   Z/withdrawn  
**SORT ORDER:** Clause, Subclause, page, line
### IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

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<td>This sentence appears to incorrectly imply that the CRC8 is the sole protection against errors in JC1-3. Although G.709 provides the details, it may be worthwhile expanding this statement somewhat.</td>
<td>ACCEPT IN PRINCIPLE.</td>
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<td>The first several sub-sections of 155.3.1 appear to repeat the same format as section 155.1. It appears that this overview information for the PCS sublayer is in 155.1 and the same overview information for the PMA sublayer is in 155.3.</td>
<td>ACCEPT IN PRINCIPLE.</td>
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<td>See response to comment #346.</td>
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### Commenter Information

- Gorche, Steve: Microchip Technology
- Dawe, Piers: Nvidia
- Nicholl, Gary: Cisco Systems
- Law, David: Hewlett Packard Enterprise

### Comment Status

- ACCEPT IN PRINCIPLE: The comment is accepted in principle.
-iew bucket: The comment is a rewrite bucket.

### Response Status

- C: Closed
- O: Open
- W: Written

### Type of Comment

- TR: Technical required
- GR: General required
- ER: Editorial required

### Comment Dispatched Status

- D: Dispatched
- A: Accepted
- R: Rejected

### Response Written Status

- O: Open
- W: Written

### Date

- 10/24/2022 11:39:34 A

### Page Number

- Page 56 of 128
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<td>The interfaces for the inputs of</td>
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<td>The term &quot;symbol&quot; seems to be overloaded in the PMA subclause, sometimes meaning bit, other times an element of the set {-3, -1, +1, +3}, and other times a pair of such elements (DP-16QAM symbol). [2.00]</td>
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<td>This is confusing.</td>
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<td>SuggestedRemedy</td>
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<td>Define a clear terminology (e.g. bits, quaternary symbols, DP-16QAM symbols) and apply it across 155.3.</td>
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<td>Response</td>
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<td>155</td>
<td>155.3.1.3</td>
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<td>Align CFEC and FAW/TS symbols (X) remove</td>
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<td>Align CFEC and remove FAW/TS symbols (X) ?</td>
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Zimmerman, George
CME Consulting/APL Group, Cisco, Commscope, Ma

Figure 155-10 is separated from the text which describes it, by the intervening description of the service interface.

SuggestedRemedy
Beat on frame, and move the figure 155-10 be after 155.3.1.3 and before 155.3.2 (one way to do this may be forcing a page break before 155.3.2)

SuggestedRemedy
"m is ... the number of bits of resolution of the DP-16QAM symbols"

SuggestedRemedy
Is a symbol for one polarisation or both? Is this off by 2?

Response
Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
This figure is supposed to be a functional block diagram, not an implementation diagram. There are no characteristics for the DAC blocks defined in the specification. The closest thing in the text is 155.3.3.4 which are called the 16QAM encode and signal drivers. However, most other 802.3 PHY clauses leave out signal drivers, DACs, and the like, and there are no specific requirements in 155.3.3.4, so deleting the blocks seems the right approach to making a functional block diagram.

**Suggested Remedy**

Preferably, delete the "DAC" blocks from Figure 155-10 (going straight to the output is fine). Alternatively, Relabel "16QAM Encoder and Signal Driver" (probably drawing as 2 blocks since you show I&Q paths)

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Subclause 155.2.4.11 'Hamming SD-FEC encoder' says that 'The 128-bit code words are sent as 8-bit symbols to the 400GBASE-ZR PMA sublayer on the PMA:IS_UNITDATA_0.request to PMA:IS_UNITDATA_7.request inter-sublayer signals.' Further, subclause 155.2.5.1 'Hamming SD-FEC decoder' says 'The incoming DP-16QAM symbols are digitized to an m-bit resolution by the PMA sublayer receive direction (see 155.3.3.5) and provided to the PCS receive direction by PMA:IS_UNITDATA_0.indication to PMA:IS_UNITDATA_m-1.indication inter-sublayer signals.' and that 'The Hamming SD-FEC decoder is a soft decision decoder and so requires a higher resolution than 2 bits / 4 levels for each of the signals Xi, XQ, Yi, and YQ.' Finally, Figure 155-10 400GBASE-ZR PMA functional block diagram' says 'm is implementation dependent and is the number of bits of resolution of the DP-16QAM symbols.'

Rather than operating as n parallel asynchronous PCS lanes that carry alignment markers and lane numbers that enable the original data to be restored or n lanes to be multiplexed into m lanes, it appears the 400GBASE-ZR PMA service interface between the PCS and the PMA operates as an n-bit synchronous data path, transferring a single DP-16QAM symbol during each operation. This seems to be confirmed by subclause 155.2.4.3 'GMP mapper' that says '... 400GBASE-ZR frames are not mapped to 16 PCS lanes ...'. In the case of the transmit path, the DP-16QAM symbols are encoded as 8-bit words, 2 bits representing the 4 levels for each of the in-phase and quadrature components of the X and Y polarizations. In the case of the receive path, the DP-16QAM symbols are encoded as p bits representing q levels, where p and q are implementation dependent.

It, therefore, doesn't seem correct to define the 400GBASE-ZR PMA service interface through reference to the lane-based PMA service interface definition in 116.3 when it doesn't support the features of a lane-based service interface. Based on this, suggest that the 400GBASE-ZR PMA service interface be defined using a single .request and .indicate primitive, with a tx_symbol and rx_symbol parameter respectively, to reflect the synchronous data path nature of the interface.

**Suggested Remedy**

Specify the 400GBASE-ZR PMA as a single .request and .indicate primitive, with a tx_symbol and rx_symbol parameter respectively as follows:

- Change the three instances of 'PMA:IS_UNITDATA_1.request' to read 'PMA_UNITDATA.request' in subclause 155.2.1 'Functions within the PCS'.

- Change subclause 155.1.4.2 'Physical Medium Attachment (PMA) service interface' to read as follows:

The 400GBASE-ZR PMA service interface provided by the 400GBASE-ZR PMA for the 400GBASE-ZR PCS is described in an abstract manner and does not imply any particular implementation. The 400GBASE-ZR PMA Service Interface supports the exchange of...
encoded DP-16QAM symbols between the PCS and PMA sublayer. The 400GBASE-ZR
PMA service interface is defined in 155.3.2.

- Change the last paragraph of subclause 155.2.4.11 ‘Hamming SD-FEC encoder’ to read:
The 128-bit code words are sent as 8-bit encoded DP-16QAM symbols to the 400GBASE-ZR
PMA sublayer using sixteen PMA_UNITDATA.request messages.

- Change the text ‘... by PMA:IS_UNITDATA_0.indication to PMA:IS_UNITDATA_m-
1.indication inter-sublayer signals.’ to read ‘... by the PMA_UNITDATA.indication primitive.’
in subclause 155.2.5.1 ‘Hamming SD-FEC decoder’.

- Change subclause 155.3.2 ‘400GBASE-ZR PMA service interface’, adding new
subclauses 155.3.2.1 through 155.3.2.2.3, to read:

155.3.2 400GBASE-ZR PMA service interface

The 400GBASE-ZR PMA Service Interface supports the exchange of encoded DP-16QAM
symbols between the PCS and PMA sublayer. The inter-sublayer 400GBASE-ZR PMA
service interface is described in an abstract manner and does not imply any particular
implementation. The inter-sublayer service interface primitives are defined as follows:

PMA_UNITDATA.request
PMA_UNITDATA.indication
PMA_SIGNAL.indication

The PMA_UNITDATA.request primitive is used to define the transfer of a DP-16QAM
symbol from the 400GBASE-ZR PCS to the 400GBASE-ZR PMA. The
PMA_UNITDATA.indication primitive is used to define the transfer of a DP-16QAM symbol from
the 400GBASE-ZR PMA to the 400GBASE-ZR PCS. The PMA_SIGNAL.indication
primitive is used to define the transfer of signal status from the 400GBASE-ZR PMA to the
400GBASE-ZR PCS.

155.3.2.1 PMA_UNITDATA.request

This primitive defines the transfer of encoded DP-16QAM symbols in the tx_symbol
parameter from the 400GBASE-ZR PCS to the 400GBASE-ZR PMA.

155.3.2.1.1 Semantics of the primitive

PMA_UNITDATA.request (tx_symbol)

During transmission, the PMA_UNITDATA.request simultaneously conveys 8 bits of a 128-
bit code word generated by the SD-FEC encoder (see 155.2.4.11) representing an
encoded DP-16QAM symbol to the PMA. The encoding used for the in-phase and
quadrature-phase components of the X and Y polarization is defined in subclause

155.3.2.2 When generated

The PCS generates sixteen PMA_UNITDATA.request messages for each 128-bit code
word from the PCS SD-FEC encoder. The messages convey the least significant octet
C<7:0> first, most significant octet C<127:120> last, with code word bits C<n+7:n>
mapped to tx_symbol<7:0>. The nominal rate of PMA_UNITDATA.indication messages is
57.78 GBd.

155.3.2.2.3 Effect of receipt

The PCS continuously forms the tx_symbol parameters received in sixteen consecutive
PMA_UNITDATA.indication messages into 128-bit code words that are passed to the PMA
Gray mapping and polarization distribution function (see 155.3.3.1).

155.3.2.2 PMA_UNITDATA.indication

This primitive defines the transfer of encoded DP-16QAM symbols in the rx_symbol
parameter from the 400GBASE-ZR PMA to the 400GBASE-ZR PCS.

155.3.2.2.1 Semantics of the primitive

PMA_UNITDATA.indication (rx_symbol)

During reception, the PMA_UNITDATA.indication simultaneously conveys m bits of an n-
bite code word generated by the symbol de-interleaving function (see 155.3.3.8)
representing an encoded DP-16QAM symbol to the 400GBASE-ZR PCS where m is
implementation dependent, representing the number of bits of the encoded DP-16QAM
symbol, and n = 16 x m.

155.3.2.2.2 When generated

The PMA generates sixteen PMA_UNITDATA.indication messages for each n-bit code
word generated by the PMA symbol de-interleaving function. The messages convey the
least significant m bits of the n-bit code word first. The nominal rate of
PMA_UNITDATA.indication messages is 57.78 GBd.

155.3.2.2.3 Effect of receipt

The PCS continuously forms the rx_symbol parameters received in sixteen consecutive
PMA_UNITDATA.indication messages into n-bit code words that are passed to the PCS
Hamming SD-FEC decoder function (see 155.2.5.1).

155.3.2.3 PMA_SIGNAL.indication

This primitive defines the transfer of the status of the PMA receive process in the
SIGNAL_OK parameter from 400GBASE-ZR PMA to the 400GBASE-ZR PCS.
155.3.2.3.2 When generated
The PMA generates a PMA_SIGNAL.indication message whenever there is change in the value of the SIGNAL_OK parameter (see 155.3.3.9).

155.3.2.2.3 Effect of receipt
The PCS Synchronization process monitors the PMA_SIGNAL.indication primitive for a change in the SIGNAL_OK parameter (see 155.2.1).

- Move the last paragraph of the current subclause to a new subclause 155.3.3.9 titled 'Signal Indication Logic (SIL)'.

- Change the last paragraph of subclause 155.3.3.8 'Polarization combining and symbol de-interleaving' to read:

The sixteen encoded DP-16QAM symbols are transferred to the 400GBASE-ZR PCS sublayer as m-bit DP-16QAM symbols using sixteen PMA_UNITDATA.indication messages.

- Change 'PMA:IS_UNITDATA_0.request to PMA:IS_UNITDATA_7.request' to read 'PMA_UNITDATA.request' and 'PMA:IS_UNITDATA_0.indication to PMA:IS_UNITDATA_m-1.indication' to read 'PMA_UNITDATA.indication' in Figure 155-2 'Functional block diagram'.

- Change 'PMA:IS_UNITDATA_0.request to PMA:IS_UNITDATA_7.request' to read 'PMA_UNITDATA.request' and 'PMA:IS_UNITDATA_0.indication to PMA:IS_UNITDATA_m-1.indication' to read 'PMA_UNITDATA.indication' in Figure 155-10 '400GBASE-ZR PMA functional block diagram'.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.

Law, David
Hewlett Packard Enterprise

Comment Type E
Comment Status A rewrite bucket
Since subclause 155.3.2 only summarizes the primitives, a cross reference to where they are defined should be added.

SuggestedRemedy
Suggest that 'The 400GBASE-ZR PMA service interface is provided ...' should be changed to read 'The 400GBASE-ZR PMA service interface (see 155.1.4.2) is provided ...'.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.

Ran, Adee
Cisco

Comment Type T
Comment Status A rewrite bucket
"The primitives are defined for i = 0 to 7, and for j = 0 to m-1, where m is the number of bits of resolution of the received digitized DP-16QAM symbols"

The next paragraph says the nominal signaling rate is approximately 57.78 Gb/s in the transmit side and 57.78 Gbd in the receive side.

Each DP-16QAM symbol corresponds to 4 bits, so with this definition, the rate of the receive direction DP-16QAM symbols should be a quarter of the transmit direction bit rate.

Alternatively m should be the number of bits of resolution per bit of information.

The meaning of tx_symbol and rx_symbol is unclear in this subclause, and may be changed e.g. if the tx_symbols are defined as Gray-coded PAM4 symbols or SD-FEC encoder codewords (suggested by another comments).

SuggestedRemedy
Rewrite this subclause as necessary such that the meaning of tx_symbol and rx_symbol is clear, and the rates match the meaning.

Response
ACCEPT IN PRINCIPLE.
See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Comment on line 50, page 16, comment # 482

Comment Type: TR  Comment Status: A

* ~50.212875 Gb/s: too vague, signaling rate should be in GBd

Suggested Remedy
Specify the rate without approximation

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Comment on line 50, page 16, comment # 136

Comment Type: T  Comment Status: A

Why is the approximate sign used in the term "(512/511) x (5485/5140) x (5488/5485) x (128/119) x ~50.212875 Gb/s"? Isn't the nominal signaling rate known exactly?

I don't remember seeing the "approximate" sign used in other IEEE standards when referring to the nominal signaling rate?

Suggested Remedy
This is more of a question of clarification?

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Comment on line 50, page 16, comment # 206

Comment Type: E  Comment Status: A

There is a rectangle to the right of the 'Carrier phase recovery', 'PMD equalizer' and 'chromatic dispersion equalizer' within the 400GBASE-ZR PMA sublayer box in Figure 155-10 '400GBASE-ZR PMA functional block diagram' that is unlabelled.

Suggested Remedy
Either label the rectangle or delete it.

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Comment on line 50, page 16, comment # 15

Comment Type: E  Comment Status: A

Empty box without any function

Suggested Remedy
Remove empty fbox from figure 155-10

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #346.
Subclause 155.3.3.4.1 says that 'All of the coherent signal to physical lane mappings in Table 155-7 are allowed for the Tx signal. This is because receivers can determine which physical lane is carrying which signal based on the contents of the FAW.' As a result, it seems that the in-phase and quadrature-phase components of the X and Y polarizations can be mapped to the receive PMD service interface primitives in any of the eight ways listed in Table 155-7.

Further, subclause 155.3.3.7 'FAW, TS, and PS symbol removal' says 'The 400GBASE-ZR PMA receive path attains alignment lock to the 22-symbol FAW that is transmitted on each of the two transmission polarizations on the in-phase and quadrature-phase lanes.' and 'When the X and Y polarization symbol streams are identified and aligned to the super-frame format of Figure 155-12, the FAW, TS, and PS symbols are removed ...'. As a result, it seems the X and Y polarizations identification is performed by the FAW lock function, and pilot removal occurs after the FAW lock function.

SuggestedRemedy

1. Suggest that the labels 'IX', 'QX', 'IY' and 'QY' be removed from below the 'ADC' block in Figure 155-10.

2. Suggest that the Pilot removal (X) Pilot removal (Y) block be removed from Figure 155-10.

3. Suggest that the label 'Align CFEC and FAW/TS symbols (X) remove' be changed to read:

   FAW alignment
   Remove FAW, PS, TS symbols

4. Suggest that the label 'Align CFEC and FAW/TS symbols (Y) remove' be changed to read:

   FAW alignment
   Remove FAW, PS, TS symbols

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.
Comment Type: T
Comment Status: A

Signal health should not be "based on receipt of the PMD:IS_SIGNAL.indication from the 400GBASE-ZR PMD sublayer" because this indication is always OK.

Suggested Remedy:
Delete "receipt of the PMD:IS_SIGNAL.indication from the 400GBASE-ZR PMD sublayer," and the comma after "functions".

In Figure 155-10 delete PMD:IS_SIGNAL.indication as input to the SIL.

Response: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Comment Type: TR
Comment Status: A

Subclause 155.3.2 '400GBASE-ZR PMA service interface' says that 'The PMD:IS_SIGNAL.indication primitive is generated through a signal indication logic (SIL) that reports signal health based on receipt of the PMD:IS_SIGNAL.indication from the 400GBASE-ZR PMD sublayer, data being processed successfully by the signal processing functions, and symbols being sent to the PCS on all of the output lanes.' however subclause 156.5.4 'PMD global signal detect function' says that 'The PMD global signal detect function shall set the state of the SIGNAL_DETECT parameter to a fixed OK value.' and that 'The presence of a valid signal is determined only by the 400GBASE-ZR PCS (see 155.2.1).'. In addition, subclause 155.2.1 says 'The PCS Synchronization process continually monitors PMD:IS_SIGNAL.indication(SIGNAL_OK). When SIGNAL_OK indicates OK, then the PCS synchronization process accepts the streams of symbols via the PMA:IS_UNITDATA_i.indication primitive.'.

Based on the signal indication logic (SIL) contained in the PMA sublayer described in subclause 155.3.2, and subclause 155.2.1 describing only the use of the SIGNAL_DETECT parameter in the PCS sublayer, it doesn't seem correct to say in subclause 156.5.4 that a valid signal is determined only by the PCS sublayer. And based on subclause 156.5.4 setting the SIGNAL_DETECT parameter of the PMD:IS_SIGNAL.indication to a fixed 'OK' value, it doesn't seem correct to say that the SIL will report signal health based on the PMD:IS_SIGNAL.indication primitive since it is fixed.

Suggested Remedy:

Suggest that:

[1] The PMD:IS_SIGNAL.indication primitive is disconnected from the SIL box in figure 155-10 and is shown as not used by the PMA sublayer.

[2] In subclause 155.3.2 the text '... reports signal health based on receipt of the PMD:IS_SIGNAL.indication from the 400GBASE-ZR PMD sublayer, data being processed successfully by the signal ...' be changed to read '... reports signal health based on data being processed successfully by the signal ...'.

[3] In subclause 156.5.4 the text 'The presence of a valid signal is determined only by the 400GBASE-ZR PCS (see 155.2.1).' should be changed to read 'The presence of a valid signal is determined only by the SIL function in the PMA (see 155.3.2).'.

Response: C

ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

**Comment Type**: E  **Comment Status**: A  **rewrite bucket**

**SuggestedRemedy**

SIGNAL_OK is a parameter that is passed by the PMA-IS_SIGNAL.indication primitive.

**SuggestedRemedy**

Suggest that '... the SIGNAL_OK primitive has the value FAIL.' should be changed to read '... the SIGNAL_OK parameter has the value FAIL.'.

**Response**  **Response Status**: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

**Comment Type**: E  **Comment Status**: A  **rewrite bucket**

**SuggestedRemedy**

Awkward grammar in the first sentence

**SuggestedRemedy**

Change "... adapt between the PCS layer digital symbols to and from the four analog signals." to "... adapt the PCS layer digital symbols to and from the four analog signals."

**Response**  **Response Status**: C

ACCEPT IN PRINCIPLE.

See response to comment #346.

**Comment Type**: E  **Comment Status**: A  **rewrite bucket**

**SuggestedRemedy**

I don't see any loopback here. The only test signal comes from the PCS.

**SuggestedRemedy**

Delete "and optionally to provide test signals and loop-back"

**Response**  **Response Status**: C

ACCEPT IN PRINCIPLE.

See response to comment #346.
It is not clear how the "Gray-coded symbol" defined here is used in the remainder of the process - the subsequent DP-16QAM mapping is defined in terms of bits, not symbols.

Suggested Remedy
Consider defining the Gray code mapping as a function from bit-pairs to bit-pairs, instead of the set {-3, -1, +1, +3}, or removing it completely since it is embedded in the mapping defined in Table 155-2.

Response
ACCEPT IN PRINCIPLE.

Comment Type: T  Comment Status: A  rewrite bucket
Ran, Adee  Cisco

"Gray-coded signals" should be "Gray-coded symbols".

Suggested Remedy
Per comment

Response
ACCEPT.

Comment Type: E  Comment Status: A  rewrite bucket
Ran, Adee  Cisco

This says the PMA does Gray de-mapping then it says it doesn't the PCS does it.

Suggested Remedy
Remove lines 20-25, add appropriate material to PCS section.

Response
ACCEPT IN PRINCIPLE.

Comment Type: TR  Comment Status: A  rewrite bucket
Zimmerman, George  CME Consulting/APL Group, Cisco, CommScope, Ma

The received symbol signals are digitized into more than 4 discrete levels by the analog to digital converters (ADC) in the PMA sublayer and the number of bits for each signal is m/4 bits. This is a description of an implementation and is inappropriate for an interoperability standard. If some description is needed, one could rewrite this more generally, as is suggested in the remedy. Further, it appears that the "m/4 bits" is a detail that is unused in the draft (I searched). If it is used somewhere, please provide a pointer to where it is relevant. Otherwise delete the unnecessary detail which looks like a specification but isn’t.

Suggested Remedy
Preferably - delete the indicated sentence. Alternatively, change the indicated sentence to read "The received symbol signals are sampled and quantized in the PMA sublayer." If the m/4 bits is used somewhere, provide a reference.

Response
ACCEPT IN PRINCIPLE.
The terms 'DP-16QAM symbol' (e.g., page 52, line 32 and line 48), 'Gray-coded signals' (e.g., page 52, line 44) and 'Gray mapped' symbols (e.g., page 54, line 29) seem to be used interchangeably in the subclauses of 155.3.3 'Functions within the PMA'. For example, subclause 155.3.3.2 Symbol interleaving' says 'The DP-16QAM symbols are time interleaved ...' yet the following subclause 155.3.3.3 'Insert FAW, TS and PS symbols' says ... the stream of Gray mapped, interleaved symbols are ...'. It, however, appears the symbols in both cases are the same.

Suggested Remedy

Suggest that a consistent terminology should be used for DP-16QAM symbols.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.

The terms '128-bit code word' (e.g., page 52, line 32), 'FEC codeword' (e.g., page 52, line 44), SD-FEC codewords (e.g., page 53, line 36), 'Hamming code words' (e.g., page 52, line 53), and just 'code word' (page 53, line 32) seem to be used interchangeably to describe the 128-bit code word that is passed across the 8 lane PMA service interface to the PMA sublayer as 16 groups of 8.

Suggested Remedy

Suggest that the term 'SD-FEC codeword' be used consistently in subclause 155.3.3 to describe the 128-bit code word passed across the PMA service interface.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.

Doesn't the symbol interleaving operate on groups of sixteen DP-16QAM symbols, mapped from the 128-bit SD-FEC codewords passed across the PMA service interface, as described in subclause 155.3.3.1.

Suggested Remedy

Suggest that the text 'The symbol interleaver performs an 8-way interleaving of symbols from Hamming code words ...' be changed to read 'The symbol interleaver performs an 8-way interleaving of groups of sixteen symbols mapped from SD-FEC codewords ...'.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155 SC 155.3.3.2 P 52 L 54 # 239
Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

On page 52, line 54, the symbol number is in normal font whereas it is in subscript font in the remainder of subclause 155.3.3.2.

SuggestedRemedy
Suggest that, based on page 52, line 54, the symbol number should be in normal rather than subscript font in the rest of the subclause to make it clear the two numbers following 'S' separated by a comma are the code word number followed by the symbol number in the code word. Alternatively, perhaps it should be stated that two numbers following 'S' separated by a comma are the code word number followed by the symbol number in the code word.

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.2 P 53 L 34 # 215
Huber, Thomas Nokia

Comment Type TR Comment Status A rewrite bucket

According to 155.3.3.1 Gray mapping and polarization distribution the 'S' code word is an array of DP-16QAM symbols (page 52, line 35). As a result, aren't 'Symbols from eight code words [S0, ...,S7] ...' (page 52, line 54) a total of 128 DP-16QAM symbols? This seems to be confirmed by Figure 155-11 'Eight-way Hamming code interleaver' which shows symbols S0,0 through S7,15 which is 128 symbols.

SuggestedRemedy
Suggest the text 'When the 64-symbol buffer is full ...' be changed to read 'When the 128-symbol buffer is full ...'.

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.2 P 54 L 11 # 216
Huber, Thomas Nokia

There is a horizontal line missing between the second and third sets of symbols in Figure 155-11

SuggestedRemedy
Add the missing line.

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.3 P 54 L 27 # 241
Law, David Hewlett Packard Enterprise

There is no specification of how the output from PAM symbol interleaving function is mapped into the payload fields of the sub-frame of a super-frame.

SuggestedRemedy
Add a subclause to describe how the output of the PAM symbol interleaving function is mapped into the payload fields of the sub-frame of a super-frame.

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
Subclause 155.3.3 'Insert FAW, TS and PS symbols' however says 'A super-frame is defined as a set of 181 888 symbols in each of the X and Y polarizations including ...'. Since a separate super-frame for each of the X and Y polarizations, the 'symbols' seem to be 16QAM symbols rather than DP-16QAM symbols.

Suggested Remedy

Suggest that the text 'A super-frame is defined as a set of 181 888 symbols in each of the X and Y polarizations including 175 616 payload symbols and 6272 additional symbols.' be changed to read 'A super-frame is defined as a set of 181 888 16QAM symbols for each of the X and Y polarizations including 175 616 payload 16QAM symbols and 6272 additional 16QAM symbols.'.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.

The second paragraph of subclause 155.3.3 'Insert FAW, TS and PS symbols' says 'The first sub-frame of a super-frame includes ... 76 reserved symbols (rsvd<0:75>). ...', however, there is no specification of what 16QAM symbol should be transmitted for these reserved symbols.

Suggested Remedy

Define the 16QAM symbol to be transmitted for these 76 reserved symbols.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.

The sentence states "Each super-frame is made up of 49 sub-frames.". This is unusual terminology as a super-frame (or multi-frame) is usually made of n frames (and not sub-frames). This also begs the question as to why "super-frame" is used instead of the more usual "multi-frame"

Suggested Remedy

Propose changing "super-frame" to "multi-frame" and "sub-frame" to "frame" throughout this section. An alternative would be to use "frame" and "sub-frame".

Response

ACCEPT IN PRINCIPAL.

See response to comment #346.

The contents of the sub-frame 0 between P4 and P115, and sub-frame 1 and 48 between P2 and P115, are not defined in Figure 155-12.

For sub-frame 0, the number of symbols shown in Figure 155-12 after P0, P1, P2, P3 and P115 is 31. A sub-frame is 3712 symbols long, and there are 116 PS symbols, and since 3712/32 = 116 it seems reasonable to assume that there are 31 symbols after each PS symbol for sub-frame 0, but this needs to be specified.

For sub-frame 1, the number of symbols shown in Figure 155-12 after P0 is 31, after P1 is 31, however, after P115 it is 32. Similarly, for sub-frame 48, the number of symbols shown in Figure 155-12 after P0 is 42, after P1 is 31, and after P115 it is 32. It is therefore difficult to make an assumption about the number of symbols after each PS between P2 and P115, so this needs to be specified.

Suggested Remedy

Specify the contents of the sub-frame 0 between P4 and P115, and sub-frame 1 and 48 between P2 and P115.

Response

ACCEPT IN PRINCIPAL.

See response to comment #346.
The third paragraph of subclause 155.3.3.3 'Insert FAW, TS and PS symbols' says that 'The next 48 sub-frames of the super-frame have an 11-symbol TS (ts<0:10>), 116 PS symbols [P0, P115], and 3586 payload symbols.' which seems to imply that sub-frames 1 through 48 are all the same formats. Figure 155-12, however, shows 31 symbols after P0 for sub-frame 1, yet 42 symbols after P0 for sub-frame 48. Similarly, Figure 155-12 shows 31 symbols after P1 for sub-frame 1, yet 32 symbols after P1 for sub-frame 48. And if sub-frame 1 and sub-frame 48 are different formats, what are the formats for sub-frames 2 through 47.

The 31 symbols after P0 shown for sub-frame 1 in Figure 155-12 are ts<0:10>, but P0 overlaps ts<0>, so this is 10 bits, followed by m<3488:3508> which is 21 bits resulting in a total of 31 bits. The 42 symbols after P0 shown for sub-frame 48 in Figure 155-12 are ts<0:10>, but P0 overlaps ts<0>, so this is 10 bits, followed by m<172 030:172 061> which is 32 bits, resulting in a total of 42 bits. The 31 symbols after P1 shown for sub-frame 1 in Figure 155-12 are m<3509:3539>, the 32 symbols after P1 shown for sub-frame 48 in Figure 155-12 are m<172 062:172 093>.

Suggested Remedy
If sub-frames 1 through 48 are not the same format, specify which sub-frames are in what format. If they are in the same format, correct the figure to show the correct number of bits.

Response
ACCEPT IN PRINCIPLE.

Suggested Remedy
While sub-frames 1 and 48 are annotated with 3 and 0 in P0, sub-frames 0 doesn't have this annotation. In addition, it isn't clear what the 3 to 0 signifies, perhaps that each DP-16QAM symbol has four components, but subclause 155.3.3.3 (page 54, line 29) says 'For each polarization, the stream of Gray mapped, interleaved symbols are assembled into a frame format suitable for transmission over ...' which seems to imply a separate frame for each polarization.

Suggested Remedy
Either remove the 3 to 0 annotation for sub-frames 1 and 48 or add to sub-frames 0 and define the meaning.

Response
ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

**Cl 155 SC 155.3.3.3.3 P 55 L 40 # 485**

Dawe, Piers  
Nvidia

**Comment Type E**  
**Comment Status A**  
rewrite bucket

**Suggested Remedy**

```
split table (not properly indicated). Also Table 155-6-PS
```

**Response**

```
ACCEPT IN PRINCIPLE.
```

See response to comment #346.

**Cl 155 SC 155.3.3.3.3 P 57 L 8 # 272**

Law, David  
Hewlett Packard Enterprise

**Comment Type T**  
**Comment Status A**  
rewrite bucket

**Suggested Remedy**

```
Subclause 155.3.3.3.3 'Pilot sequence (PS)' says that "The seed is reset at the start of every sub-frame ...". Isn't it the generator that is reset at the start of every sub-frame using the seed value?
```

**Response**

```
Rewrite to clarify.
```

See response to comment #346.

**Cl 155 SC 155.3.3.3.3 P 57 L 3 # 82**

Ran, Adee  
Cisco

**Comment Type T**  
**Comment Status A**  
rewrite bucket

```
"The PS is a fixed PRBS10 sequence mapped to 16QAM symbols with different seed values for X and Y polarizations. The generator for the pilot sequence is shown in Figure 155-13"

Is it two separate PRBS sequences with different seeds?

Also it is unclear how bits are mapped to the I and Q values in Table 155-6.
```

**Suggested Remedy**

```
Rewrite to clarify.
```

**Response**

```
ACCEPT IN PRINCIPLE.
```

See response to comment #346.
There is no specification of how the PRBS10 sequence is mapped to 16QAM symbols. From review of Table 155-6 it appears that the generator in Figure 155-13 is used to produce 232 bits. The even bits are mapped to the in-phase component of the 16QAM symbol, odd bits mapped to the quadrature-phase component of the 16QAM symbol, with a 0 mapped to a `-3' and a 1 mapped to a `3'.

**Suggested Remedy**

Suggest that the second paragraph of subclause 155.3.3.3 be changed to read:

The seed is reset at the start of every sub-frame, so that the same 116 symbols, [P0, ...,P115] are inserted into every sub-frame of the same polarization. For each polarization X and Y, the generator produces 232 bits PRBS[231:0] that are mapped to 116 16QAM symbols, [P0, ...,P115]

where for i = 0 to 115,

- PSBR[2i] maps to the in-phase (I) component of the 16QAM symbol [Pi] for the respective polarization
- PSBR[2i+1] maps to the quadrature-phase (Q) component of the 16QAM symbol [Pi] for the respective polarization

and where,

- 0 maps to -3 for the respective 16QAM symbol component
- 1 maps to +3 for the respective 16QAM symbol component

The generator polynomial and seed values are listed in Table 155-6 and the complete PS sequence is shown in Table 155-6.

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 155 SC 155.3.3.3 P 57 L 32 # 487
Dawe, Piers Nvidia
Comment Type E Comment Status A rewrite bucket
Table 155-6-PS
SuggestedRemedy
Use whole words. Pilot sequence
Response Response Status C
ACCEP IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.3.3.3 P 57 L 33 # 276
Law, David Hewlett Packard Enterprise
Comment Type E Comment Status A rewrite bucket
There appear to be two separate tables number 155-6, the first labelled 'Table 155-5-PS generator polynomial and seed values', the second labelled 'Table 155-6-PS'.
SuggestedRemedy
[1] Suggest that the second Table 155-6 'PS' be renumbered to be 155-7, with subsequent tables renumbered, and its title should be
[2] Suggest that the title of the second Table 155-6 should be changed from 'PS' to read 'Pilot sequence'.
Response Response Status C
ACCEP IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.3.3.4 P 58 L 32 # 138
Nicholl, Gary Cisco Systems
Comment Type TR Comment Status A rewrite bucket
The first sentence states "On each polarization, the stream of symbols is converted to four analog signals per symbol: IX, QX, IY, and QY,......". This makes it sound like that they are four analog signals per symbol per polarization (making 8 in total).
I thought IX and QX formed one 16QAM symbol on one polarization (the X polarization) and IY and QY formed one 16QAM symbol for the other polarization (the Y polarization).
SuggestedRemedy
Rewrite the text to make it clear that there are not four analog signals (IX, QX, IY, QY) for each polarization (which would mean 8 analog signals in total), but instead there are two analog signals (IX, QX) per symbol for the X polarization and two analog signals (IY, QY) per symbol for the Y polarization.
Response Response Status C
ACCEP IN PRINCIPLE.
See response to comment #346.

Cl 155 SC 155.3.3.4.1 P 58 L 38 # 83
Ran, Adee Cisco
Comment Type T Comment Status A rewrite bucket
The title says "Symbol mapping to physical lanes", but in the text it is "coherent signal to physical lane mappings".
The conversion of symbols to signals is done in the PMD.
SuggestedRemedy
Change "All of the coherent signal to physical lane mappings" to "All options for symbol mapping to physical lanes". Change Table 155-7 title accordingly.
Response Response Status C
ACCEP IN PRINCIPLE.
See response to comment #346.
D’Ambrosia, John
Futurewei, US Subsidiary of Huawei

This sentence appears to include unnecessary information -
Note that interleaving of signals by polarization is not allowed since this would add a non-
essential level of complexity to the Rx digital processing.

Suggested Remedy
modify sentence to
Note that interleaving of signals by polarization is not allowed.

Response
ACCEPT IN PRINCIPLE.

See response to comment #346.

Nicholl, Gary
Cisco Systems

The last sentence states ", which correspond to the inter-sublayer signals
PMD:IS_UNITDATA_0.request ..". I presume in this case we are talking about the inter-
sublayer signals below the PMA (PMD service interface) and not the inter-sublayer signals
above the PMA. (PMA service interface).

Suggested Remedy
Update the text to make it clear that the "inter-sublayer signals" being referred to are below
the PMA, or alternatively just refer to the PMD service interface directly.

Response
ACCEPT IN PRINCIPLE.

See response to comment #346.

Zimmerman, George
CME Consulting/APL Group, Cisco, Commscope, Ma

"The signals are sampled by an ADC on each lane at a sampling rate." "The details of the
ADC , are implementation specific". This is a description of an implementation, not
appropriate for an interoperability specification. If someone could do the signal processing
optically, analog, or by magic, it would still comply with the standard. The fact that an ADC
is used, isn't a part of the interoperability standard, or even any of the characteristics of the
ADC. Hence the mention is inappropriate and should be deleted. The sentence works just
fine anyways and describes the processing without the "by an ADC".

Suggested Remedy
Change header of 155.3.5 to Receive signal sampling.
On line 50, Delete "by an ADC"
Change line 54 to "The details of the sampling, including any quantization and the chosen
sampling rate are implementation specific."
Replace "ADC" with "Sampler" in figure 155-10.

Response
ACCEPT IN PRINCIPLE.

See response to comment #346.
### Comment #84

**Comment Type:** T  **Comment Status:** A  **rewrite bucket**
- The signals IX/QX/IY/QX are just signals (per 155.3.3.4 and 156.1), and are not "coherent" by themselves. The coherency is part of the PMD.

**Suggested Remedy:**
- Change "Four coherent signals" to "Four continuous signals".
  - In 155.3.3.4.1 and in Table 155-7 change "coherent signal" to "symbol".

**Response**  
**Response Status:** C  **ACCEPT IN PRINCIPLE.**
- See response to comment #346.

### Comment #85

**Comment Type:** T  **Comment Status:** A
- The encoding of 16QAM symbols is based on Table 155-2
  - This table does not define any encoding of input symbols - it defines mapping of bits tuples to output symbols.
  - "but with a higher resolution than 4 bits"

**Resolution**
- Resolution is for the digital representation of each analog value. The resolution here should be more than two bits (per dimension). The resolution seems to be left open to implementation.
- This should be written more clearly. The suggested remedy is my attempt, but other text may be used.

**Suggested Remedy:**
- Change from "The encoding of 16QAM symbols is based on Table 155-2 but with a higher resolution than 4 bits to enable the SD-FEC decoder to detect and correct symbol errors"
- to "The 16QAM symbols should be sampled with more than two bits per dimension, in order to enable the SD-FEC decoder to correct errors and recover the bits from the symbols based on the mapping in Table 155-2".

**Response**  
**Response Status:** C  **ACCEPT IN PRINCIPLE.**
- See response to comment #346.
<table>
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<th>Cl</th>
<th>SC</th>
<th>155.4.2.1</th>
<th>P 60</th>
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<th># 280</th>
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<tr>
<td>Assuming this is a boolean variable, suggest this should be noted in the variable description, as with other boolean variables.</td>
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<tr>
<td>Suggest that ‘A variable set by the …’ should read ‘A boolean variable set by the …’.</td>
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<tr>
<td>The subclause hierarchy below &quot;State variables&quot; is unnecessary, and includes subclauses that are not about state variables (155.4.2.2 through 155.4.2.4)</td>
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<tr>
<td>Delete 155.4.2 and move its subclauses upper in the hierarchy (to become 55.4.2 through 155.4.5).</td>
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<tr>
<td>Since Boolean is named after George Boole, I believe that it should always be Boolean (and not boolean).</td>
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<tr>
<td>Change all instances of 'boolean' to 'Boolean'.</td>
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</table>
Cl 155 SC 155.4.2.1 P 60 L 34 # 140
Nicholl, Gary Cisco Systems

Comment Type T Comment Status A rewrite bucket

**Definition of "pma_alignment_valid" variable.** Reading the previous text it is not clear exactly what constitutes a PMA lane, and how many PMA lanes there are, and how each PMA lane is assigned a unique lane number? The definition also refers to "PMA lanes are deskewed". I don't see any mention of PMA lane deskew in the functional block diagram in Figure 155-10.

**SuggestedRemedy**

Maybe this is all clearly defined earlier in the document. If so then the editors can reject this comment with a reference to the appropriate section of text. If not then the variable description needs to be updated to better reflect the functional descriptions earlier in this clause. This comment also applies to other variables defined in 155.4.2.1, that refer to "PMA lanes".

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.4.2.1 P 60 L 40 # 283
Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

The description of the 'reset' variable says that it is 'A boolean variable that controls the resetting of the PCS and PMA sublayers' and that 'It is true whenever a reset is necessary including when reset is initiated from the MDIO ... and when the MDIO has put the PCS and PMA sublayers into low-power mode.'.

The PMA and PCS are separate MMDs (see Table 45-1). The PMA/PMD reset bit is 1.0.15 and the low power bit is 1.0.11, both found in PMA/PMD control 1 register. The PCS reset bit is 3.0.15 and the low power bit is 3.0.11, both found in the PCS control 1 register. Since these registers are in separate MMDs, and since their state is not communicate across the PMA service interface, the PMA and PCS resets can operate independently.

**SuggestedRemedy**

[1] Rename the 'reset' variable used in Figure 155-14 'Frame alignment word (FAW) lock state diagram' to be 'pma_reset'.

[2] Rename the 'reset' variable used in Figure 155-15 'PMA deskew state diagram' to be 'pma_reset'.

[3] Rename the 'reset' variable used in Figure 155-16 'Alignment marker lock state diagram' to be 'pcs_reset'.

[4] Rename the 'reset' variable defined in subclause 155.4.2.1 'Variables' to be 'pma_reset' and change the description to read 'A Boolean variable that controls the resetting of the PMA sublayer. It is true whenever a reset is necessary including when reset is initiated from the MDIO, during power on, and when the MDIO has put the PMA sublayer into low-power mode.'.

[5] Add a definition of the 'pcs_reset' variable to subclause 155.4.2.1 'Variables' with the description 'A Boolean variable that controls the resetting of the PCS sublayer. It is true whenever a reset is necessary including when reset is initiated from the MDIO, during power on, and when the MDIO has put the PCS sublayer into low-power mode.'.

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.
Subclause 155.4.2.1 'Variables' says 'The PMA:IS_SIGNAL.indication primitive is generated through a signal indication logic (SIL) that reports signal health based on ... symbols being sent to the PCS on all of the output lanes.' The SIGNAL_OK parameter of the PMA:IS_SIGNAL.indication primitive is, however, used to derive the signal_ok variable (page 60, line 45) which is used as an 'open arrow' entry condition to the 'LOCK_INIT' state of the Figure 155-14 Frame alignment word (FAW) lock state diagram.

As a result, it appears that if the SIGNAL_OK parameter is ever set to FAIL, setting 'signal_ok' to FALSE, the figure 155-14 Frame alignment word (FAW) lock state diagram will enter the 'LOCK_INIT' state. I assume this will mean that symbols will not be sent to the PCS since the PMA will not have FAW alignment. This in turn will mean the condition 'symbols being sent to the PCS' for the SIL to set the SIGNAL_OK parameter to OK will not be met.

The PMA will then be locked in this condition permanently. The SIL cannot set the SIGNAL_OK parameter to OK until symbols are sent to the PCS. Yet symbols won't be sent to the PCS until the SIGNAL_OK parameter is set to OK.

**Suggested Remedy**

Please clarify the operation of the signal indication logic. Suggest, based on Figure 155-10, and the dotted line from the 'Carrier phase recovery block to the SIL,' that the 'signal_ok' variable used by the Frame alignment word (FAW) lock state diagram should be based on the status of the blocks below the 'Pilot removal' blocks while the SIGNAL_OK parameter sent to the PCS should also use the FAW alignment status.

Suggested Remedy: Please clarify the operation of the signal indication logic. Suggest, based on Figure 155-10, and the dotted line from the 'Carrier phase recovery block to the SIL,' that the 'signal_ok' variable used by the Frame alignment word (FAW) lock state diagram should be based on the status of the blocks below the 'Pilot removal' blocks while the SIGNAL_OK parameter sent to the PCS should also use the FAW alignment status.

Suggested Remedy: Please clarify the operation of the signal indication logic. Suggest, based on Figure 155-10, and the dotted line from the 'Carrier phase recovery block to the SIL,' that the 'signal_ok' variable used by the Frame alignment word (FAW) lock state diagram should be based on the status of the blocks below the 'Pilot removal' blocks while the SIGNAL_OK parameter sent to the PCS should also use the FAW alignment status.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.
Comment Type: TR/technical required  ER/editorial required  GR/general required  T/technical  E/editorial  G/general
COMMENT STATUS: D/dispatched  A/accepted  R/rejected  RESPONSE STATUS: O/open  W/written  C/closed  U/unsatisfied  Z/withdrawn
SORT ORDER: Clause, Subclause, page, line
The definition of the 'faw_valid' variable says '... set to true if the received 22-symbol block is a valid FAW.'. According to the super-frame format defined in subclause 155.3.3.3 the 22 FAW symbols are transmitted over a total of 23 symbols, as Pilot Sequence index P1 is inserted between the symbols faw<20> and faw<21> (see figure 155-12). As a result, a valid FAW will never be found in a received 22-symbol block, only in a received 23-symbol block after the 22nd symbol is deleted.

**Suggested Remedy**

If needed, clarify the definition of the 'faw_valid' variable to account for the P1 symbol inserted between the faw<20> and faw<21> symbols.

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

The reference to 155.3.3.3.1 is not hyperlinked in faw_valid

**Suggested Remedy**

make it a link

**Response**

ACCEPT.

---

Clause 155.3.3.3.1 defines FAW as a 22 symbols sequence, "bits" are not mentioned there

**Suggested Remedy**

For consistency replace: "The sequence is considered to be valid if at least 36 bits match the 44 known bits of the FAW pattern described in 155.3.3.3.1.," with: "The sequence is considered to be valid if at least 18 symbols match the 22 known symbols of the FAW pattern described in 155.3.3.3.1."

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.
The description of the variable 'current_pmal' says 'The PMA lane number is determined by the FAW payloads based on the mapping defined in 155.3.3.3.1.' and the description of the variable 'pma_lane' says 'The PMA lane number is determined by matching the received 22-symbol sequence to the values in one of the columns of Table 155-3...'. Subclause 155.3.3.3.1, nor Table 155-3, provide any lane numbers.

The PMA lane number is not referenced outside the state diagrams, other than in Table 155-3 where pma_lane_mapping<xx> is mapped to register 3.400 through 3.403, which doesn't seem correct as these are PCS lane registers, not PMA lane registers (see my other comment on this). As a result, rather than add PMA lane numbers to subclause 155.3.3.3.1 and/or Table 155-3, suggest references to 'PMA lane numbers' be changed to 'PMA lane identifiers' with the values 'Ix', 'Qx', 'Iy' and 'Qy'. The state diagram can compare PMA lane identifiers to see if they match and can test for a unique PMA lane identifier for each PMA lane as easily as it can for PMA lane numbers.

In addition, the description of the 'faw_valid' variable says 'The sequence is considered to be valid if at least 36 bits match the 44 known bits of the FAW pattern described in 155.3.3.3.1.' The description of the variable 'current_pmal' however says 'The PMA lane number is determined by the FAW payloads based on the mapping defined in 155.3.3.3.1.' Similarly, the description of the variable 'pma_lane' says 'The PMA lane number is determined by matching the received 22-symbol sequence to the values in one of the columns of Table 155-3...'. Neither mention the '36 out 44' approach used for the 'faw_valid' variable.

The 'current_pmal' description could imply a requirement for a full match to a column of Table 155-3, and the 'pma_lane' description requires a full match to a column of Table 155-3. Since the entry into states where 'current_pmal' is used is based on faw_valid = TRUE, doesn't this mean that the use of the '36 out 44' approach, which permits 8 16QAM symbols to not match, needs to be considered when determining 'current_pmal' and 'pma_lane'. As a worst-case example, couldn't a faw_valid = TRUE result from eight 16QAM symbols not matching due to errors on just one phase of just one of polarization. This would seem to imply that the compare for the values received on a lane with the columns of Table 155-3 also needs to permit eight values not matching.

In the case of 'current_pmal' and 'pma_lane', as there are only 22 values in a column of Table 155-3, it would seem a match would have to be valid if at least 14 values received on the lane match the 22 known values defined in a column to address the worst-case of all eight errors on one phase of one of polarization. It seems there may, however, be another approach to determine 'current_pmal' and 'pma_lane'. As a worst-case example, couldn't a faw_valid = TRUE result from eight 16QAM symbols not matching due to errors on just one phase of just one of polarization. This would seem to imply that the compare for the values received on a lane with the columns of Table 155-3 also needs to permit eight values not matching.

Finally, as this variable is used by a state diagram within the PMA, which sits above the PMD, the text '... is recognized on a given lane of the PMA service interface.' should read '... is recognized on a given lane of the PMD service interface.'

Suggested Remedy

[1] Change the description of the first_pmal variable to read as follows (note my other comment to change the coherent signal labels in Table 155-7 would impact this item if accepted):

A variable that holds the PMA lane identifier corresponding to the first FAW sequence that is recognized on a given lane of the PMD service interface. The corresponding PMA lane identifier is compared to the PMA lane identifier corresponding to the next FAW payload that is tested. The PMA lane identifier is the value for the given lane in the row of Table 155-7 that defines the PMD service interface lane mapping used to find the match for the current FAW sequence as described in the faw_valid variable.

Values:
Ix: Value for given lane from mapping used in Table 155-7 to find the current FAW sequence is XI.
Qx: Value for given lane from mapping used in Table 155-7 to find the current FAW sequence is XQ.
Iy: Value for given lane from mapping used in Table 155-7 to find the current FAW sequence is YI.
Qy: Value for given lane from mapping used in Table 155-7 to find the current FAW sequence is YQ.

[2] Change the description of the current_pmal variable to read as follows:

A variable that holds the PMA lane identifier corresponding to the current FAW sequence that is recognized on a given lane of the PMD service interface. It is compared to the variable first_pmal to confirm that the location of the FAW sequence has been detected. The PMA lane identifier is the value for the given lane in the row of Table 155-7 that defines the PMD service interface lane mapping used to find the match for the current FAW sequence as described in the faw_valid variable.

Values:
See first_pmal.

[3] Change the description of the pma_lane variable to read as follows:

pma_lane

A variable that holds the PMA lane identifier received on lane x of the PMA service interface when faws_lock<xx> = TRUE. The PMA lane identifier is determined by matching the received 22-symbol FAW sequence to the values in one of the columns of Table 155-3. The PMA lane identifier is the value for the given lane in the row of Table 155-7 that defines the PMD service interface lane mapping used to find the match for the current FAW sequence as described in the faw_valid variable.

Values:
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

See first_pmal.

[4] Change all instances of '... PMA lane number ...' to '... PMA lane identifier ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Cl 155 SC 155.4.2.1 P 61 L 28 # 143
Nicholl, Gary Cisco Systems

Comment Type TR Comment Status A rewrite bucket

Definition of variable "pma_lane". The definition states that there can be 4 PMA lane numbers on the PMA service interface. But if I look at Figure 155-10 there are 8 lanes on the PMA service interface. There are however 4 lanes on the PMD service interface. I suspect the editor meant "PMD service interface (i.e. the interface below the PMA sublayer) and not the PMA service interface (the interface above the PMA sublayer).

Also the reference to Table 155-3 is not an active cross reference.

SuggestedRemedy

Change "PMA service interface" to "PMD service interface".

Fix the cross-reference to Table 155-3.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Cl 155 SC 155.4.2.1 P 62 L 1 # 349
Maniloff, Eric Ciena

Comment Type T Comment Status A rewrite bucket

A bad CW can be detected either by detecting errors after FEC decoding or by CRC errors. This should be clarified in the counter definition.

SuggestedRemedy

Add the following to the definition of cw_bad: An uncorrected codeword is detected if either errors remain after FEC correction or if the CRC32 check fails.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Cl 155 SC 155.4.2.1 P 68 L 26 # 409
Slavick, Jeff Broadcom

Comment Type TR Comment Status A rewrite bucket

FEC high SER is not a feature of 400GBASE-ZR

SuggestedRemedy

Remove the FEC high SER row from Table 155-9

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Cl 155 SC 155.4.2.1 P 61 L 33 # 201
Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

There are nine instances of 'super-frame' and two instances of 'DSP super-frame'. Suggest that one term is used consistently.

SuggestedRemedy

Suggest that the two instances of '... DSP super-frame ...' (page 61, line 33 and page 63 and line 4) be changed to read '... super-frame ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.
The description of the ’FAW_COMPARE’ function in subclause 155.4.2.2 ’Functions’ says that ’if current_pmal and first_pmal both found a match and ... faw_match is set to true.’. Since faw_valid ’... is considered to be valid if at least 36 bits match the 44 known bits of the FAW pattern ’... I assume rather than a ’match’, this really should say something along the lines of ’if at least 36 symbols of the current receive 22-symbol block match the 44 known bits of the FAW pattern’.

It however seems simpler to just add faw_valid is TRUE as a condition to enter the COMP state, which would become ’faw_counter_done * faw_valid’, and have a path from the ’COUNT_2’ state to the ’INVALID_FAW’ state if ’faw_counter_done * faw_valid’ is FALSE. This would also mirror the similar use of the ’FAW_COMPARE’ function in the ’COMP_2ND’ state where the condition to transition to the state is ’faw_counter_done * faw_valid’ and ’faw_counter_done * !faw_valid’ results in a transition to the ”FAW_SLIP” state.

SuggestedRemedy:
[1] Change the text ’if current_pmal and first_pmal both found a match and indicate the same PMA lane number, faw_match is set to true’ in the description of the ’FAW_COMPARE’ function to read ’if current_pmal and first_pmal indicate the same PMA lane number, faw_match is set to true’.

[2] Change the condition on the transition from the ’COUNT_2’ state to the ’COMP’ state in Figure 155-14 ’Frame alignment word (FAW) lock state diagram’ to read ’faw_counter_done * faw_valid’.

[3] Add a transition from the ’COUNT_2’ state to the ”INVALID_FAW” state in Figure 155-14 ’Frame alignment word (FAW) lock state diagram’ that reads ’faw_counter_done * !faw_valid’.

Response:
ACCEPT IN PRINCIPLE.

See response to comment #346.

The description of the ’cw_bad_count’ counter, however this counter is not reference anywhere else in the draft.

SuggestedRemedy:
Delete the ’cw_bad_count’ counter definition.

Response:
ACCEPT IN PRINCIPLE.

See response to comment #346.

The description of the ’restart_lock’ variable says ’A boolean variable that is set by the frame alignment word (FAW) lock process to reset the synchronization process on all PMA lanes. It is set to TRUE when 15 FAWs in a row fail to match (15_BAD state).’ While the restart_lock variable is used in the frame alignment word (FAW) lock process described in Figure 155-14, it is also used in the Alignment marker lock process described in Figure 155-16.

SuggestedRemedy:
[1] Rename all instances of the ’restart_lock’ variable used in Figure 155-14 ’Frame alignment word (FAW) lock state diagram’ to be ’pma_restart_lock’.

[2] Rename all instances of the ’restart_lock’ variable used in Figure 155-16 ’Alignment marker lock state diagram’ to be ’pcs_restart_lock’.

[3] Rename ’restart_lock’ variable in subclause 155.4.2.1 ’Variables’ to be ’pma_restart_lock’.

[4] Add a definition of the ’pcs_restart_lock’ variable to subclause 155.4.2.1 ’Variables’.

Response:
ACCEPT IN PRINCIPLE.

See response to comment #346.
Comment Type: T
Comment Status: A
rewrite bucket

Text on FAW synchronization seems to imply that there is a FAW synchronization process for each lane, for a total of 4 independent FAW synchronization processes. Actually there are 2 FAW synchronization processes, one per polarization (see figure 115.10 and clause 155.3.3.7)

Suggested Remedy
Replace: "The synchronization process operates independently on each lane" with: "The synchronization process operates independently on each polarization"

Response
ACCEPT IN PRINCIPLE.

See response to comment #346.

Comment Type: E
Comment Status: A
rewrite bucket

As the PMA is 'above' the PMD, the PMA would detect alignment in the symbols for a given lane of the PMD service interface.

Suggested Remedy
Change the text ‘... the PMA service interface.’ to read ‘... the PMD service interface.’

Response
ACCEPT IN PRINCIPLE.

See response to comment #346.
Based on the description of the 'faw_valid' variable, and slide 4 of the contribution 'faw_valid analysis' from Mike Sluyski [https://www.ieee802.org/3/cw/public/22_0523/sluyski_3cw_01a_220523.pdf#page=4] referencing a 'QPSK FAW' value of 44, it seems a valid FAW sequence can only be detected across all four lanes. As a result, it will only be possible to achieve FAW lock on all lanes, or no lanes. There is no case where some lanes can be FAW locked and others are not. Therefore, seems no need to have four instances of the Frame alignment word lock state diagram (page 63, line 3). If there were, they wouldn't operate independently on each lane (page 63, line 5), and instead would operate in lock step.

It therefore seems that the four Frame alignment word lock state diagram can be collapsed in to one if the first_pmal and current_pmal variables hold the mapping number found in table 155-7 to achieve faw_valid rather than the lane number. The PMA deskew state diagram can then be removed.

SuggestedRemedy

[1] Delete the variables 'pma_alignment_valid', 'all_locked', and PMA_lane_mapping from subclause 155.4.2.1 'Variables' and Figure 155-14.

[2] Change the description of the 'faws_lock' variable (page 61, line 1) to read:

faws_lock
A Boolean variable that is set to true when the receiver has detected the location of the FAW.

[3] Change the description of the faw_valid as suggested in my comment about faw_valid.

[4] Change the description of the first_pmal to read (this overrides my other comment about first_pmal):

A variable that holds the PMA lane mapping number found in the first column of Table 155-7 corresponding to the PMD service interface lane mapping used to find the match for the first FAW sequence. It is compared to the PMA lane mapping number corresponding to the next FAW payload that is found.

[5] Change the description of the current_pmal to read (this overrides my other comment about current_pmal):

A variable that holds the PMA lane mapping number found in the first column of Table 155-7 corresponding to the PMD service interface lane mapping used to find the match for the current FAW sequence. It is compared to the variable first_pmal to confirm that the location of the FAW sequence has been detected.

[6] Change all instances of ‘... PMA lane number ...’ to ‘... PMA lane mapping number ...’.

[7] Change the text ‘... of the next FAW on a PMA lane.’ to read ‘... of the FAW.’ in the 'faw_counter' description.

[8] Change the first paragraph of subclause 155.4.2.4 'State diagrams' to read 'The PMA shall also implement the deskew process as shown in Figure 155-14.'

[9] Delete the second paragraph of subclause 155.4.2.4.

[10] Add the assignment 'pma_align_status <= FALSE' to the 'LOCK_INIT' state of Figure 155-14.

[11] Add the assignment 'pma_align_status <= TRUE' to the '2_GOOD' state of Figure 155-14.

[12] Delete Figure 155-15.

[13] Change the 'Value/Comment' filed of PICS item SM1 in subclause 155.7.4.4 'State diagrams' to read 'Meets the requirements of Figure 155-14'.

[14] Delete the SM2 row from subclause 155.7.4.4 and renumber following items.

Response

Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Huber, Thomas Nokia

Comment Type TR
Comment Status A
rewrite bucket

In the GET_BLOCK state, the variable slip_done should be faw_slip_done

SuggestedRemedy

Change slip_done to faw_slip_done

Response

Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Law, David  Hewlett Packard Enterprise

Comment Type  T  Comment Status  A  rewrite bucket

The 'slip_done' variable assigned to FALSE in the GET_BLOCK state of the Frame alignment word (FAW) lock state diagram is not defined. Suspect it should read 'faw_slip_done' so that it is set to FALSE before the FAW_SLIP function, which sets it TRUE, is called in the FAW_SLIP state.

SuggestedRemedy
Change the text 'slip_done <= FALSE' in the GET_BLOCK state in Figure 155-14 to read 'faw_slip_done <= FALSE'.

Response  Response Status  C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Law, David  Hewlett Packard Enterprise

Comment Type  T  Comment Status  A  rewrite bucket

The description of the 'first_pmal' variable says it '... the PMA lane number that corresponds to the first FAW payload ...' however, it is updated by the assignment 'first_pmal <= current_pmal' every cycle through the '2_GOOD' and 'GOOD_FAW' states. With that said, the assignment 'first_pmal <= current_pmal' in the '2_GOOD' and 'GOOD_FAW' states appear to be redundant since the only way to enter these states is if 'faw_match' is TRUE and for 'faw_match' to be TRUE the first_pmal and current_pmal variables have to be equal (see FAW_COMPARE function, page 62, line 28).

SuggestedRemedy
Consider removing the assignment 'first_pmal <= current_pmal' from the '2_GOOD' and 'GOOD_FAW' states.

Response  Response Status  C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Law, David  Hewlett Packard Enterprise

Comment Type  TR  Comment Status  A  rewrite bucket

Subclause 155.4.2.3 'Counters' defines the 'faws_bad_count' whereas the Figure 155-14 'Frame alignment word (FAW) lock state diagram' uses 'faw_bad_count' ('faw' vs 'faws').

SuggestedRemedy
Suggest that:

[1] The transition from the 'INVALID_FAW' state to the '15_BAD' state be changed to read 'faws_bad_count = 15'.
[2] The transition from the 'INVALID_FAW' state to the 'COUNT_2' state be changed to read 'faws_bad_count < 15'.

Response  Response Status  C
ACCEPT IN PRINCIPLE.

See response to comment #346.

TYPE: TR/technical required  ER/editorial required  GR/general required  T/Technical  E/editorial  G/general
COMMENT STATUS: D/dispatched  A/accepted  R/rejected  RESPONSE STATUS: O/open  W/written  C/closed  U/unsatisfied  Z/withdrawn
SORT ORDER: Clause, Subclause, page, line
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<td>155.4.2.4</td>
<td>P 64</td>
<td>L 24</td>
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<td>The 'restart_lock' variable is set to TRUE on entry to the '15_BAD' state. This will cause the state diagram to transition to the 'LOCK_INIT' state because 'restart_lock' is one of the OR conditions in the 'open arrow' entry to that state. The actions in the 'LOCK_INIT' state will be executed, but since 'restart_lock' remains set to TRUE, and 'open arrow' transitions are evaluated continuously whenever any state is evaluating its exit conditions (see 21.5.3), on exit the state diagram will loop back to the 'LOCK_INIT' state. The state diagram will then be locked in this loop permanently.</td>
<td>SuggestedRemedy: Suggest that either the action 'restart_lock &lt;= FALSE' be added to the 'LOCK_INIT' state or the 'restart_lock' be deleted and a 'UCT' be added from the '15_BAD' state to the 'LOCK_INIT' state.</td>
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IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Comment Type: T  Comment Status: A  rewrite bucket

There are two instances of `amps_lock` and one of `amps_lock<x>` in figure 155-16 Alignment marker lock state diagram. Since subclause 155.2.4.3 'GMP mapper' says '... 400GBASE-ZR frames are not mapped to 16 PCS lanes ...', and since subclause 155.4.2.1 'Variables' defines `amps_lock` without an index, it seems that `amps_lock<x>` should read `amps_lock`.

**SuggestedRemedy**
Change 'amps_lock<x> <= FALSE' in the LOCK_INIT state to read 'amps_lock <= FALSE'.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Comment Type: T  Comment Status: A  rewrite bucket

The figure 155-16 PCS alignment marker lock state diagram uses the variable `pma_align_status`, however that variable is generated by the figure 155-14 PMA frame alignment word (FAW) lock state diagram, and it is not passed across the PMA service interface from the PMA to the PCS. As a result, it is not available to be used in the figure 155-16 PCS alignment marker lock state diagram.

Suggest that `pma_align_status` being 'TRUE' be used as a condition to set the SIGNAL_OK parameter of the PMA:IS SIGNAL.indication primitive to OK and therefore communicate it across the PMA service interface. Since 'signal_ok', derived from the SIGNAL_OK parameter, is already used as an 'open arrow' entry to the 'LOCK_INIT' state of the figure 155-16 PCS alignment marker lock state diagram, `pma_align_status` can be deleted as an exit condition from that state.

**SuggestedRemedy**
[1] Add `pma_align_status` being 'TRUE' as a condition to set the SIGNAL_OK parameter of the PMA:IS SIGNAL.indication primitive to OK in subclause 155.3.2 '400GBASE-ZR PMA service interface'.
[2] Delete that exit condition `pma_align_status` from the LOCK_INIT state in figure 155-16.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Comment Type: E  Comment Status: A  rewrite bucket

Typo, `amps_...` should be `amp_...` based on counter definition, see page 62, line 37.

**SuggestedRemedy**
Change the action 'amps_bad_count <= 0' to read 'amp_bad_count <= 0' in the 'GOOD_AM' state of the Figure 155-16 'Alignment marker lock state diagram'.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Comment Type: T  Comment Status: A  rewrite bucket

The 'restart_lock' variable is set to TRUE on entry to the '5_BAD' state. This will cause the state diagram to transition to the 'LOCK_INIT' state because 'restart_lock' is one of the OR conditions in the 'open arrow' entry to that state. The actions in the 'LOCK_INIT' state will be executed, but since 'restart_lock' remains set to TRUE, and 'open arrow' transitions are evaluated continuously whenever any state is evaluating its exit conditions (see 21.5.3), on exit the state diagram will loop back to the 'LOCK_INIT' state. The state diagram will then be locked in this loop permanently.

**SuggestedRemedy**
Suggest that either the action 'restart_lock <= FALSE' be added to the 'LOCK_INIT' state or the 'restart_lock' be deleted and a 'UCT' be added from the '5_BAD' state to the 'LOCK_INIT' state.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Comment Type: E  Comment Status: A  rewrite bucket

Complete the line under '2_GOOD'.

**SuggestedRemedy**
See comment.

**Response**
ACCEPT.
See response to comment #346.

---

Comment Type: T  Comment Status: A  rewrite bucket

The 'restart_lock' variable is set to TRUE on entry to the '5_BAD' state. This will cause the state diagram to transition to the 'LOCK_INIT' state because 'restart_lock' is one of the OR conditions in the 'open arrow' entry to that state. The actions in the 'LOCK_INIT' state will be executed, but since 'restart_lock' remains set to TRUE, and 'open arrow' transitions are evaluated continuously whenever any state is evaluating its exit conditions (see 21.5.3), on exit the state diagram will loop back to the 'LOCK_INIT' state. The state diagram will then be locked in this loop permanently.

**SuggestedRemedy**
Suggest that either the action 'restart_lock <= FALSE' be added to the 'LOCK_INIT' state or the 'restart_lock' be deleted and a 'UCT' be added from the '5_BAD' state to the 'LOCK_INIT' state.

**Response**
ACCEPT IN PRINCIPLE.
See response to comment #346.

---

Comment Type: E  Comment Status: A  rewrite bucket

Complete the line under '2_GOOD'.

**SuggestedRemedy**
See comment.

**Response**
ACCEPT.
See response to comment #346.

---

Comment Type: E  Comment Status: A  rewrite bucket

Complete the line under '2_GOOD'.

**SuggestedRemedy**
See comment.

**Response**
ACCEPT.
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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  U/unsatisfied  Z/withdrawn

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

Page 88 of 128

10/24/2022 11:39:34 A
In Table 155-8 there are several MDIO control variables associated with "FEC degraded SER" processing, but I can find no description of FEC degraded SER processing in the draft. For 400GBASE-R the FEC degrade SER processing is associated with the RS544 FEC and based on monitoring for RS symbol errors within a given time interval (as described in section 119.2.5.3).

If we want to do something similar for 400GBASE-ZR then the "FEC degrade" monitoring should be based on monitoring a combination of the SD-FEC and SC-FEC.

This appears to be completely missing from the current draft.

Suggested Remedy: Define a FEC degrade monitoring scheme for 400GBASE-ZR (similar to what was done in section 119.2.5.3 for 400GBASE-R).

Response: See response to comment #346.

---

Table 155-9 provides FEC corrected and uncorrected codeword counts for the SC-FEC. Should there be similar monitoring for the SD-FEC? This is missing in the current draft.

Suggested Remedy: Define FEC monitoring for the SD-FEC.

Response: ACCEPT IN PRINCIPLE.

See response to comment #346.

---

This is simply a question for clarification. Depending on the answer changes may or may not be required in the draft.

Suggested Remedy: Delete the four FEC degraded SER rows

Response: ACCEPT IN PRINCIPLE.

See response to comment #346.
The MDIO references for corrected and uncorrected codeword counters only point to the Clause 45 register, which then points you back to Clause 153 for the definition of the counter. In Clause 153 it refers to "fec_align_status" which does not exist in Clause 155.

**SuggestedRemedy**

Add sub-clauses for corrected and uncorrected codeword counters:

155.5.1.x FEC_corrected_cw_counter

A corrected FEC codeword is a codeword that contained errors and was corrected. The FEC_corrected_cw_counter is a 32-bit counter that counts once for each corrected FEC codeword processed when pma_alignment_valid is TRUE. This variable is mapped to the registers defined in 45.2.1.227 (1.2276, 1.2277).

155.5.1.y FEC_uncorrected_cw_counter

An uncorrected FEC codeword is a codeword that contains errors that were not corrected, including FEC codewords that may have been mis-corrected or not completely corrected. The FEC_uncorrected_cw_counter is a 32-bit counter that counts once for each uncorrected FEC codeword processed when pma_alignment_valid is TRUE. This variable is mapped to the registers defined in 45.2.1.228 (1.2278, 1.2279).

Bring in 45.2.1.227 and 45.2.1.228 and references to the newly added sub-clauses in Clause 155.

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

The corrected bit and total bit MDIO registers refer to Clause 153 only but are being used in Clause 155 now.

**SuggestedRemedy**

Add the following sub-clauses:

155.5.1.x FEC_total_bits_counter

See 153.2.5.3 for the definition of this counter.

155.5.1.y FEC_corrected_bits_counter

See 153.2.5.4 for the definition of this counter.

Bring in 45.2.1.229 and 45.2.1.230 and add appropriate references to these new sub-clauses

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.

---

Widen the right column width until they fit

**Response**

ACCEPT IN PRINCIPLE.

See response to comment #346.
Comment Type: TR

Table 155-9 mentions the MDIO status variable "FEC degraded SER", but as pointed out in an earlier comment the draft provides no description as to how the "FEC degraded SER" status variable is set.

Suggested Remedy:
The description for "FEC degraded SER" is missing from the draft. The drafters should define a FEC degrade monitoring scheme for 400GBASE-ZR (similar to what was done in section 119.2.5.3 for 400GBASE-R).

Response Status: A

Response:
See response to comment #346.

Comment Type: TR

Register bits 3.52.3.0:0 (IEEE Std 802.3-2022 subclause 45.2.3.25) are PCS lane alignment lock status registers, yet they are mapped to PMA lane alignment lock variables (faw_lock<3:0>). Similarly, register bit 3.50.12 is the PCS alignment status, yet it is mapped to the PMA alignment status variable (pma_align_status).

If there was a 400GBASE-ZR framing issue on a link where the PMA framing was operating correctly, the faws_lock<3:0> bits and the pma_align_status would all be true based on the respective frame alignment word (FAW) lock state diagrams, while the PMA would not be aligned based on the alignment marker lock state diagram. In that case, the current register mapping would indicate that all the PCS lanes were aligned, and the overall PCS was aligned, when in fact this is not the case. This would seem to be misleading information to provide in the management registers in such a case.

Further, register 3.400 (IEEE Std 802.3-2022 subclause 45.2.3.49) through 3.419 are the PCS lane mapping registers, lanes 0 through 19 and these registers report the PCS lane number provide by the alignment marker for the respective PMA service interface lane. Table 155-9, however, maps these PCS lane mapping registers to the PAM lane mapping variable 'pma_lane_mapping<3x>' output by Figure 155-14, the 'Frame alignment word (FAW) lock state diagram'.

Subclause 155.2.4.3 'GMP mapper' says 'The first 1920 bits of the frame contain alignment markers (AM)' and that 'These are identical to the 16 x 120b markers defined for 400GBASE-R in 119.2.4.4.2.' Since the 16 different 400GBASE-R PCS lane alignment markers are all placed in a single 400GBASE-ZR alignment mark (see 155.2.4.4.1) it seems that 400GBASE-ZR frames are not mapped to 16 PCS lanes. This seems to be confirmed in subclause 155.2.4.3 'GMP mapper' which says '...400GBASE-ZR frames are not mapped to 16 PCS lanes ...'. As a result, there are no PCS lanes across the PMA service interface, therefore there is no PCS lane alignment lock status nor PCS Lane mapping.

Finally, register bits 3.52.3:0, 3.50.12, and 3.400 through 3.403, which are all PCS register bits defined for MMD 3 (see IEEE Std 802.3-2022 Table 45-1), are mapped to variables found in the PMA. As illustrated in Figure 120A-9 (page 103), MMD 3 does not have access to the PMA (or PMD) as they are in MMD 1.

Based on the above, suggest that two new subclauses are added to say that registers 3.52, 3.53 and 3.400 through 3.403 are not used by the 400GBASE-ZR PCS because the 400GBASE-ZR PCS does not use PCS lanes across the PMA service interface. Require all PCS lane alignment bits to be set to zero. The content of the PCS lane mapping registers does not need to be defined because their content is only valid when the respective PCS lane alignment bit set to one. In addition, suggest that the PCS lane alignment status bit be mapped from the 'amps_lock' variable generated by the Figure 155-16, the PCS alignment marker lock state diagram.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Suggested changes:

[1] Delete the antepenultimate row of Table 155-9.

[2] Add a new subclause 155.5.1 as follows:

155.5.1 PCS lane alignment registers

The PCS lane alignment registers (registers 3.52 and 3.53) are not used as the 400GBASE-ZR PCS does not use PCS lanes across the PMA service interface (see 155.2.4.3). A 400GBASE-ZR PCS shall return a zero for all bits in these registers.

[3] Change the variable 'pma_align_status' in the 'ZR-PCS/PMA variable' column of the penultimate row of Table 155-9 to 'amps_lock'.


[5] Add a new subclause 155.5.2 as follows:

155.5.2 PCS lane mapping registers

The PCS lane mapping registers (registers 3.400 through 3.419) are not used as the 400GBASE-ZR PCS does not use PCS lanes across the PMA service interface.

Response

ACCEPT IN PRINCIPLE.

See response to comment #346.

Zimmerman, George
CME Consulting/APL Group, Cisco, Commscope, Ma

Comment Type TR  Comment Status A  rewrite bucket

This is a general comment on the requirements. I am attaching it to these PICS because this is where it became apparent. The style of IEEE SA standards (and IEEE Std 802.3) is that requirements use the term "shall". Each PICS item should have an associated "shall" and each "shall" should have a PICS. However, 155.7.4.1 is a list of the subclauses for the most part. Further, looking at the subclauses, they are largely without "shall"s. Most of the items in clause 155 are descriptive of an implementation, and do not use the term shall. They use "is" or other descriptive language. The PICS are a list of the functional blocks described, but most of those functional blocks are lacking actual requirements.

Instead they often describe an implementation or, worse yet, sometimes try to require a particular implementation ("an implementation shall"). What needs to happen is that the clause needs to be rewritten carefully considering what requirements are needed for interoperability, and deleting the unnecessary implementation description. This is a big job, and, in my opinion, means the draft is not technically complete, and should not have begun initial working group ballot. I truly regret having to make a comment like this, but I believe this is a great example of why we have working group ballots in 802.

SuggestedRemedy

Unfortunately, the draft is so far from complete that I cannot propose a specific remedy for the systematic problem. I can suggest that the TF look at each subblock, determine what the observed behavior is, determine which parts matter to interoperability, and write "shall" statements in the subclauses. Then those shall statements can be made as PICS. Additionally, this will highlight where there is implementation description that can be deleted. When this is done, restart working group ballot.

Response

ACCEPT IN PRINCIPLE.

With editorial license, restructure and clarify Clause 155 and 156 as appropriate:

- to identify interoperability requirements using "SHALL" statements, as needed.
- to address issues noted in https://www.ieee802.org/3/cw/public/22_10/dambrosia_3cw_01b_221018.pdf

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

D'Ambrosia, John Fuaturewei, US Subsidiary of Huawei

Comment Type TR

associated clauses include the 400GBASE-R PCS, 400GBASE-4 PMA, and all AUI's. These clauses are referenced via the extender sublayer, so they should not be noted here.

SuggestedRemedy

Delete table entries Clause 119, 120, and all AUI related clauses.

Response

ACCEPT IN PRINCIPLE.


With editorial license

Dawe, Piers Nvidia

Comment Type E

Clause 116 and the purpose

SuggestedRemedy

"The bit error ratio (BER) when processed by the 400GBASE-ZR PMA (Clause 155) shall be less than 1.25 × 10^-2..."
The output of the PMA is not bits but samples that are fed into the SD-FEC in the PCS. A BER cannot be defined at this interface before SD-FEC decoding, so this normative requirement is meaningless.

Maybe the intent was after the SD-FEC decoder (which is in the PCS)?

Perhaps the PMD/PMA BER should not be specified for this PHY.

SuggestedRemedy

Consider removing this requirement and defining only the PCS output frame loss ratio.

Otherwise, rewrite to create a well-defined requirement.

Response

ACCEPT IN PRINCIPLE.

Change the title of 156.1.1 to "Frame loss ratio"

Change the 1st paragraph of 156.1.1 to:

"The frame loss ratio (FLR), (see 1.4.275) after processing by the PMA and PCS shall be less than 1.7 × 10^-12 for 64-octet frames with a minimum interpacket gap."

Delete the 2nd paragraph.

In clause 155 add additional language to clarify the degrade function and SER target.

With editorial license.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.1.1 P 74 L 39 # 493
Dawe, Piers Nvidia
Comment Type E Comment Status A
PMA (Clause 155)
SuggestedRemedy
PMA (155.3)
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 91.

Cl 156 SC 156.1.1 P 74 L 41 # 313
Law, David Hewlett Packard Enterprise
Comment Type T Comment Status A
Subclause '156.1.1 Bit error ratio' says '... for 64-octet frames with minimum interpacket gap when additionally processed by the CFEC (Clause 155).'. The text '... the CFEC (Clause 155)' seems to imply a function but isn't CFEC. '... a concatenated forward error correction (CFEC) code consisting of an inner SC-FEC code and an outer Hamming code SD-FEC' to quote subclause 155.2.1.
SuggestedRemedy
Suggest that the text '... for 64-octet frames with minimum interpacket gap when additionally processed by the CFEC (Clause 155).' should be changed to read '... for 64-octet frames with a minimum interpacket gap after CFEC error correction (see 155.2.1).'.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 91.

Cl 156 SC 156.1.1 P 74 L 41 # 314
Law, David Hewlett Packard Enterprise
Comment Type E Comment Status A
Suggest that '... frames with minimum interpacket ...' should read '... frames with a minimum interpacket ...'.
SuggestedRemedy
See comment.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 91.

Cl 156 SC 156.2 P 74 L 52 # 315
Law, David Hewlett Packard Enterprise
Comment Type E Comment Status A rewrite bucket
Suggest that '... PMA entity that resides just above the PMD, and the PMD entity.' should read '... PMA sublayer that resides just above the PMD, and the PMD sublayer.'.
SuggestedRemedy
See comment.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 156 SC 156.2 P 75 L 3 # 92
Ran, Adee Cisco
Comment Type T Comment Status A rewrite bucket
The service interface of this PMD is not consistent with 116.3 because as it's written, the inputs and outputs are analog signals, not streams of discrete symbols.
SuggestedRemedy
Rewrite the text without referring to 116.3 (or make it "similar to 116.3 but...")
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment #346.

Cl 156 SC 156.2 P 75 L 11 # 93
Ran, Adee Cisco
Comment Type E Comment Status A rewrite bucket
"The 400GBASE-ZR PMD has four analog streams, in which case i = 0 to 3." why "in which case"?
SuggestedRemedy
change "in which case" to "hence".
Response Response Status C
ACCEPT IN PRINCIPLE.
Update in conjunction with clause 155 rewrite, see response to #346.
With editorial license.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.2 P 75 L 13 # 94
Ran, Adee Cisco

Comment Type T Comment Status A rewrite bucket
As described here the PMA sends digital symbols (discrete and sampled) from a set of 4 levels), not "analog streams" (which is an undefined term).

Also applies to 156.5.2 which contains very similar text.

SuggestedRemedy
Change "In the transmit direction, the PMA continuously sends four analog streams to the PMD" to
"In the transmit direction, the PMA continuously sends four streams of quaternary symbols to the PMD".

Change "The PMD then converts these four analog streams" to
"The PMD then converts these streams of symbols".

Apply in 156.5.2, if it is retained.

Response Response Status C ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 156 SC 156.2 P 75 L 14 # 316
Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket
Subclause '155.3.3 Functions within the PMA' says that 'The purpose of the PMA is to adapt between the PCS layer digital symbols to and from the four analog signals ...' and subclause 155.3.3.4 '16QAM encode and signal drivers' says that "... stream of symbols is converted to four analog signals ..." and that 'The analog signals are sent to the 400GBASE-ZR PMD sublayer over the PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request sublayer signals'. It, therefore, appears that the PMD service interface is a set of analogue signals. Finally, Figure 155-10 shows a DEC block above the PMD service interface.

Subclause 156.2 'Physical Medium Dependent (PMD) service interface', however, says 'In the transmit direction, the PMA continuously sends four analog streams to the PMD ... with binary values of 3, 1, -1, and -3 using the PMD:IS_UNITDATA_i.request primitive'. Is it correct to say '... with binary values ...'.

SuggestedRemedy
[1] Suggest that in subclause 156.2 (page 75, line 14) the text '"... X and Y polarizations with binary values of 3, 1, -1, and -3 using the ...' should be changed to read '"... X and Y polarizations with the values of 3, 1, -1, and -3 using the ...'.'

[2] Suggest that in subclause 156.5.2 (page 77, line 39) the text '"... X and Y polarizations with binary values of 3, 1, -1, and -3.' should be changed to read '"... X and Y polarizations with the values of 3, 1, -1, and -3.'.

Response Response Status C ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 156 SC 156.2 P 75 L 14 # 95
Ran, Adee Cisco

Comment Type T Comment Status A
The values listed are not binary.

Also applies in 156.5.2

SuggestedRemedy
Delete "binary".

Response Response Status C ACCEPT.

See response to comment #346.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156  SC 156.2  P 75  L 14  # 494
Dawe, Piers  Nvidia
Comment Type  E  Comment Status  A
3, 1, -1, and -3
SuggestedRemedy
Please count forwards in the usual way: -3, -1, 1, and 3, and in next paragraph and 156.5.2 and 156.5.3
Response  Response Status  C
ACCEPT IN PRINCIPLE.

Implement suggested remedy with editorial license.

Cl 156  SC 156.2  P 75  L 18  # 96
Ran, Adee  Cisco
Comment Type  T  Comment Status  A
rewrite bucket
As described here the PMD sends analog signals (continuous, to be sampled and digitized in the PMA).
"Analog streams" is an undefined term and is not used in other clauses (previous instances of this term have been removed by 802.3dc and earlier revision projects).
Also applies to 156.5.3 which contains very similar text.

SuggestedRemedy
Change "the PMD continuously sends four analog streams to the PMA, corresponding to the signals received from the MDI" to "the PMD continuously sends four analog signals to the PMA, corresponding to the optical signal received from the MDI".
Response  Response Status  C
ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 156  SC 156.2  P 75  L 22  # 495
Dawe, Piers  Nvidia
Comment Type  E  Comment Status  R
"the variable SIGNAL_DETECT parameter": 156.5.4 says it's a parameter, this and that say not variable
SuggestedRemedy
Delete variable
Response  Response Status  C
REJECT.

There was no consensus in the CRG to make a change at this time.

Cl 156  SC 156.2  P 75  L 26  # 97
Ran, Adee  Cisco
Comment Type  T  Comment Status  R
The NOTE about signal detect is out of place since the value is always OK. "sufficient light" and "meeting the BER" are irrelevant for this PMD, since signal detect is not a function of light intensity and the PMD does not detect bits.
SuggestedRemedy
Delete the NOTE.
Response  Response Status  C
REJECT.

There was no consensus in the CRG to make a change at this time.

Cl 156  SC 156.2  P 75  L 26  # 496
Dawe, Piers  Nvidia
Comment Type  T  Comment Status  R
"poor quality link to provide sufficient light for a SIGNAL_DETECT = OK": this note isn't relevant if the parameter is fixed
SuggestedRemedy
Change the note to explain the situation
Response  Response Status  C
REJECT.

There was no consensus in the CRG to make a change at this time.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

**Comment CI 156 SC 156.3.1 P 75 L 35 # 497**

Dawe, Piers
Nvidia

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

2048 bit times

**Suggested Remedy**
8192 bit times

**Response**  
**Response Status C**

ACCEPT IN PRINCIPLE.

| Change "no more than 2048 bit times (4 pause_quanta or 20.48 ns)" to "no more than 8192 bit times (16 pause_quanta or 20.48 ns)" |

**Comment CI 156 SC 156.3.2 P 75 L 41 # 98**

Ran, Adee
Cisco

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

**Suggested Remedy**
Add a statement that there is no skew variation at TP2.

| I suspect that skew variation cannot exist at SP2 (PMD service interface), because the PCS and PMA are defined as operating in one clock domain, not as multiple lanes with separate logic. This may be worth mentioning (as done in other cases where skew variation can’t exist, e.g. 140.3.2).  

Is skew variation (as opposed to static skew) relevant on a single-lane, but coherent, PMD output?  
If there is no skew variation between SP2 and SP3 then skew variation need not be specified at all. |

| According to the latest comment, change "at the points SP0 to SP7 shown in Figure 80-8" to "at the points SP1 to SP6 shown in Figure 116–5". |

**Response**  
**Response Status C**

ACCEPT IN PRINCIPLE.

See response to comment #346.

**Comment CI 156 SC 156.3.2 P 75 L 44 # 193**

D’Ambrosia, John
Futurewei, US Subsidiary of Huawei

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

rewrite bucket

It is unclear if the skew constraints need to be revisited in light that the part is not part of 400GBASE-R family, but current pointer is to 80-8, which is for 100G

**Suggested Remedy**
Revisit skew constraints as needed.
The diagram reference should be 116-4.

**Response**  
**Response Status C**

ACCEPT IN PRINCIPLE.

See response to comment #346.

**Comment CI 156 SC 156.3.2 P 75 L 44 # 99**

Ran, Adee
Cisco

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

**Suggested Remedy**
Change "at the points SP0 to SP7 shown in Figure 80-8" to "at the points SP1 to SP6 shown in Figure 116–5".

**Response**  
**Response Status C**

ACCEPT IN PRINCIPLE.

See response to comment #346.
Cl 156 SC 156.3.2 P 75 L 46 # 517
Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

Subclause 156.3.2 'Skew constraints' says that 'The Skew (relative delay) between the lanes is kept within limits so that the information on the FEC lanes can be reassembled by the FEC.' On review of Clause 155, 400GBASE-ZR doesn't seem to mention FEC lanes anywhere else. Further, subclause 155.2.4.3 'GMP mapper' says '... 400GBASE-ZR frames are not mapped to 16 PCS lanes ...'. As far as I can see, the 8-bit PMA service interface carries an 8-bit word that describes an DP-16QAM symbols based on the mapping defined in Table 155-2. As a result, the only lanes seem to be the PMD service interface which has four lanes which carry four analogue streams representing the in-phase and quadrature-phase component of the two polarizations (page 75, line 13).

Table 156-6 specifies a maximum polarization skew of 5 ps (page 82, line 45) and a maximum quadrature skew is 0.75 ps (page 83, line 6). Subclause 156.3.2, however, says The Skew at SP3 (the transmitter MDI) shall be less than 54 ns and the Skew Variation at SP3 is limited to 600 ps'. I suspect that the former values are correct. And based on this, assuming no retiming in the PMD, the other values in subclause 156.3.2 don't seem correct either.

SuggestedRemedy
Since 400GBASE-ZR doesn't seem to support FEC lanes, and says it doesn't support PCS lanes, suggest that subclause 156.3.2 is deleted.

Response Response Status C

See response to comment #346.

Cl 156 SC 156.4 P 76 L 38 # 518
Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

There is no description of how the PMD_global_signal_detect variable, defined in subclause 156.4, should be driven. Subclause 156.5.4 'PMD global signal detect function' says that SIGNAL_DETECT is set to a fixed OK value, hence there is in effect no signal detect to report in the PMD.

SuggestedRemedy
Suggest that:

[1] The PMD_global_signal_detect row in Table 156-3 (page 76, line 38) should be deleted.
[2] A change to subclause 45.2.1.9.7 'Global PMD receive signal detect (1.10.0)' be added to the draft that adds 'This bit is not supported by the 400GBASE-ZR PMDs.' to subclause 45.2.1.9.7.

Response Response Status C
REJECT.

There was no consensus in the CRG to make a change at this time.

Cl 156 SC 156.2 P 75 L 52 # 498
Dawe, Piers Nvidia

Comment Type TR Comment Status A rewrite bucket

Are these Skew and SV limits plausible? What does the PMA need? This is a hybrid of "parallel" and "serial", needs new numbers.

SuggestedRemedy
Revise to limits that are appropriate to DP-16PAM technology and the channel.

Response Response Status C

See response to comment #346.
There are no references to describe the use of the variables Tx_index_ability_0 to Tx_index_ability_63 and Rx_index_ability_0 to Rx_index_ability_63 defined in Table 156–3 in the draft. What happens if a value is selected in Tx optical channel index or Rx optical channel index register (page 76, line 25) corresponding to an index value in the Tx index ability 0 to Tx index ability 63 or Rx index ability 0 to Rx index ability 63 registers, respectively, that is false. Is the write to the Tx optical channel index or Rx optical channel index register ignored and operation continues on the existing value? Or is the value accepted, but then transmission of reception ceases, as the index value is not supported?

**Suggested Remedy**

Suggest that the last paragraph of 164.5, that already discusses Tx_optical_channel_index and the Rx_optical_channel_index be update the describe how Tx_optical_channel_index and the Rx_optical_channel_index interacts with the Tx_index_ability_0 to Tx_index_ability_63 and Rx_index_ability_0 to Rx_index_ability_63 variables.

**Response**

ACCEPT IN PRINCIPLE.

At new sentence at the end of 45.2.1.150.1 and 45.2.1.154.2

"The supported channel indices of the PMA/PMD are advertised in the PMA/PMD channel ability registers. A PMA/PMD may ignore writes to the PMA/PMD channel index bits that select a channel it has not advertised in the PMA/PMD channel ability registers."

With editorial license.

The two references to the variable 'Tx_optical_frequency_index' in this subclause should be to 'Tx_optical_channel_index', see page 76, line 22.

**Suggested Remedy**

See comment.

**Response**

ACCEPT IN PRINCIPLE.

Implement suggested remedies with editorial license.

Since subclause 156.5.4 'PMD global signal detect function' says that 'The PMD global signal detect function shall set the state of the SIGNAL_DETECT parameter to a fixed OK value,' it doesn't seem correct to show the SIGNAL_DETECT emanating from the 'Optical receiver' block in Figure 156-2 'Block diagram for 400GBASE-ZR transmit/receive paths'.

**Suggested Remedy**

Suggest that SIGNAL_DETECT be removed from Figure 156-2.

**Response**

REJECT.

There was no consensus to make a change at this time.
**IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments**

<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Page</th>
<th>Line</th>
<th>Comment</th>
<th>Response Status</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>156</td>
<td>156.5.1</td>
<td>E</td>
<td>A</td>
<td>P 77</td>
<td>30</td>
<td>Remove any blank lines with editorial license</td>
<td>C</td>
<td>Remove</td>
</tr>
<tr>
<td>156</td>
<td>156.5.2</td>
<td>E</td>
<td>A</td>
<td>P 77</td>
<td>35</td>
<td>The text in this subclause practically repeats a paragraph in 156.2.</td>
<td>C</td>
<td>Accept in principle</td>
</tr>
<tr>
<td>156</td>
<td>156.5.2</td>
<td>E</td>
<td>A</td>
<td>P 77</td>
<td>35</td>
<td>The text 'The analog signals are sent to the 400GBASE-ZR PMD sublayer over the PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request sublayer signals.' in subclause 155.3.3.4 (page 58, line 33) is changed to read 'The four analog signals are passed across the PMD service interface to the PMA in the tx_symbol parameters of the PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request primitives.'</td>
<td>C</td>
<td>Accept in principle</td>
</tr>
<tr>
<td>156</td>
<td>156.5.2</td>
<td>E</td>
<td>A</td>
<td>P 77</td>
<td>35</td>
<td>The text 'Four coherent signals IX, QX, IY, and QY are supplied by the receive function of the 400GBASE-ZR PMD and input to the 400GBASE-ZR PMA over the PMD:IS_UNITDATA_0.indication to PMD:IS_UNITDATA_3.indication.' in subclause 155.3.3.5 (page 58, line 47) is changed to read 'Four coherent signals IX, QX, IY, and QY received by the PMD are passed across the PMD service interface to the PMA in the rx_symbol parameters of the PMD:IS_UNITDATA_0.indication to PMD:IS_UNITDATA_3.indication primitives.'</td>
<td>C</td>
<td>Accept in principle</td>
</tr>
</tbody>
</table>

**Suggested Remedy:**

- Suggest: [1] The text 'The PMD Transmit function shall convert the four analog streams requested by the PMD service interface messages PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request into ...' (page 77, line 35) should be changed to read 'The PMD Transmit function shall convert the four analog streams from the PMA passed across the PMD service interface in the tx_symbol parameters of the PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request primitives into ...'.
- Suggest: [2] The text 'The PMD Receive function shall convert the composite optical signal received from the MDI into four analog streams for delivery to the PMD service interface using the messages PMD:IS_UNITDATA_0.indication to PMD:IS_UNITDATA_3.indication, all according ...' (page 77, line 45) should be changed to read 'The PMD Receive function shall convert the composite optical signal received from the MDI into four analog streams passed across the PMD service interface to the PMA in the rx_symbol parameters of the PMD:IS_UNITDATA_0.indication to PMD:IS_UNITDATA_3.indication primitives, all according ...'.
- Suggest: [3] The text 'The analog signals are sent to the 400GBASE-ZR PMD sublayer over the PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request sublayer signals.' in subclause 155.3.3.4 is changed to read 'The four analog signals are passed across the PMD service interface to the PMA in the tx_symbol parameters of the PMD:IS_UNITDATA_0.request to PMD:IS_UNITDATA_3.request primitives.'
- Suggest: [4] The text 'Four coherent signals IX, QX, IY, and QY are supplied by the receive function of the 400GBASE-ZR PMD and input to the 400GBASE-ZR PMA over the PMD:IS_UNITDATA_0.indication to PMD:IS_UNITDATA_3.indication.' is changed to read 'Four coherent signals IX, QX, IY, and QY received by the PMD are passed across the PMD service interface to the PMA in the rx_symbol parameters of the PMD:IS_UNITDATA_0.indication to PMD:IS_UNITDATA_3.indication primitives.'

**Response Status:**

- C: Closed
- U: Unsatisfied
- Z: Withdrawn

**Comment Status:**

- D: Dispatched
- A: Accepted
- R: Rejected

**Response Status:**

- W: Written
- O: Open

**Type:** TR/Technical required, ER/Editorial required, GR/General required, T/Technical, E/Editorial, G/General
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Huber, Thomas Nokia

Comment Type: T
Comment Status: A

"Binary values 3, 1, -1, -3" doesn't seem to be correct since there are four values listed.

Suggested Remedy

Change "binary values" to "symbol values".

Response

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment #96.

Huber, Thomas Nokia

Comment Type: T
Comment Status: A

Table 155-2 is mapping the value of a pair of FEC-encoded bits to the symbol values.

Suggested Remedy

Change the last sentence of the paragraph to read "The mapping of FEC bits to symbol amplitudes is listed in Table 155-2."

Response

Response Status: C

ACCEPT.

Huber, Thomas Nokia

Comment Type: T
Comment Status: A

The mapping of the analog values to the symbol amplitudes is listed in Table 155-2.

Suggested Remedy

ACCEPT IN PRINCIPLE.

See response to comment #96.

Dawe, Piers Nvidia

Comment Type: E
Comment Status: R

No SD!

Suggested Remedy

REJECT.

There was no consensus in the CRG to make a change at this time.

Response

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment 219

Law, David Hewlett Packard Enterprise

Comment Type: T
Comment Status: A

Subclause 156.5.2 'PMD transmit function' says 'The mapping of the analog values to the symbol amplitudes is listed in Table 155–2.' Is this correct, Table 155–2 seems to provide the mapping between the 128-bit digital code word from the SD-FEC encoder to the in-phase (I) and quadrature-phase (Q) components of the 16QAM symbols.

Suggested Remedy

Change reference if required.

Response

Response Status: C

ACCEPT IN PRINCIPLE.

See response to comment 219
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.6 P 78 L 49 # 323
Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A
Subclause 156.6 ‘The DWDM channel over a DWDM black link’ says ‘... the medium associated with the 400GBASE-ZR PMD, over which the PHY operates at a single optical frequency ...’. Doesn’t the PHY operate over two different optical frequencies when the Tx Rx different optical channel ability is true?

Suggested Remedy
Suggest that the text ‘... over which the PHY operates at a single optical frequency ...’ in subclause 156.6 be changed to read ‘... over which the PHY transmits at a single optical frequency ...’.

Response Response Status C
ACCEPT IN PRINCIPLE.

Change to "over which the PHY operates at a single optical frequency (often also referred to by its associated wavelength) on a defined frequency grid in each direction."

Cl 156 SC 156.6 P 79 L 10 # 328
Ghiasi, Ali Ghiasi Quantum/Marvell

Comment Type ER Comment Status R
It would be helpful on figure 156-3 to also add TP2_0, TP2_n, TP3_0, and TP3_n

Suggested Remedy
add TP2_0, TP2_n, TP3_0, and TP3_n

Response Response Status C
REJECT.

The 0 and n-1 PMDs connecting to TP2 and TP3 are included in the diagram. Figure matches same 100ZR figure in IEEE Std 802.3-2022 154.6

Cl 156 SC 156.6 P 79 L 18 # 502
Dawe, Piers Nvidia

Comment Type E Comment Status A
misuse of TP2

Suggested Remedy

Response Response Status C
REJECT.

Comment unclear and no suggested remedy provided

Cl 156 SC 156.6 P 79 L 38 # 503
Dawe, Piers Nvidia

Comment Type E Comment Status A
blank line

Suggested Remedy

Response Response Status C
ACCEPT IN PRINCIPLE.

Remove any blank lines with editorial license

Cl 156 SC 156.6 P 79 L 48 # 101
Ran, Adee Cisco

Comment Type E Comment Status A
bucket
"Tx" and "Rx" should not be used as abbreviations of the terms "transmitter" and "receiver" (except in variable and register names, in diagram labels, or as qualifiers).

Suggested Remedy
Change to "transmitter" and "receiver" here and in other places as appropriate.

Response Response Status C
ACCEPT IN PRINCIPLE.

Change "Tx" to "transmitter" and change "Rx" to "receiver" through the document. With editorial license.

Cl 156 SC 156.6 P 79 L 52 # 504
Dawe, Piers Nvidia

Comment Type E Comment Status A
bucket
Rx_optical_frequency_index Tx_optical_frequency_index Tx_Rx_diff_opt_freq_ability

Suggested Remedy

Tables 156-2, 3 and a later sentence have Tx_optical_channel_index Rx_optical_channel_index Tx_Rx_diff_opt_chan_ability

Response Response Status C
ACCEPT IN PRINCIPLE.

See responses to comments 324, 325 and 326

Type: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
Comment Status: D/dispatched A/accepted R/rejected Response Status: O/open W/written C/closed U/unsatisfied Z/withdrawn
Sort Order: Clause, Subclause, page, line

Cl 156 SC 156.6 Page 102 of 128
10/24/2022 11:39:35 A
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.6 P 80 L 1 # 505
Dawe, Piers Nvidia

Comment Type E Comment Status A
blank lines 1 to 3

SuggestedRemedy

Response Response Status C
ACCEPT IN PRINCIPLE.
Remove any blank lines with editorial license

Cl 156 SC 156.6 P 80 L 7 # 506
Dawe, Piers Nvidia

Comment Type E Comment Status R
fi not defined

SuggestedRemedy

Response Response Status C
REJECT.

fi is defined on page 79, line 31 as "all channel frequencies fi:"
and is consistent with figure 154-3 in IEEE Std 802.3-2022

A straw poll was taken:
I support rejection of comment #506 as proposed

Yes: 16
No: 2

Cl 156 SC 156.6 P 80 L 28 # 507
Dawe, Piers Nvidia

Comment Type E Comment Status R
square or round brackets

SuggestedRemedy

Response Response Status C
REJECT.

Use of [ ] brackets consistent with Table 154-5 in IEEE Std 802.3-2022

Cl 156 SC 156.7 P 84 L 22 # 334
Ghiasi, Ali Ghiasi Quantum/Marvell

Comment Type TR Comment Status R
The receiver must tolerate 26 dB OSNR and meet the required error rate, it is not clear
what receive OSNR (min) of 29 dB provides

SuggestedRemedy

Response Response Status U
REJECT.

Receiver OSNR tolerance is measured without line impairments, see 156.9.24, which is
different than Receiver OSNR which includes line impairments, see 156.9.23

Cl 156 SC 156.7 P 84 L 24 # 333
Ghiasi, Ali Ghiasi Quantum/Marvell

Comment Type TR Comment Status R
Receive OSNR tolerance is not defined at point till one reads section 156.9.24

SuggestedRemedy

Response Response Status C
REJECT.

All specifications in Tables 156-7, -8 and -9 including Receive OSNR tolerance are defined
in 156.9 which is after the tables but consistent with multiple clauses in IEEE Std 802.3-
2022.

Cl 156 SC 156.7.1 P 82 L 23 # 102
Ran, Adee Cisco

Comment Type E Comment Status A
"+/– 20 ppm"
Also in Table 156–7

SuggestedRemedy

Response Response Status C
ACCEPT IN PRINCIPLE.

Change to "±20 ppm" (symbol and space)

With editorial license.
<table>
<thead>
<tr>
<th>CI</th>
<th>SC</th>
<th>Page</th>
<th>Line</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Comment</th>
<th>Suggested Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>156</td>
<td>156.7.1</td>
<td>82</td>
<td>23</td>
<td>E</td>
<td>R</td>
<td>Why +/-20 ppm?</td>
<td>REJECT.</td>
</tr>
<tr>
<td>156</td>
<td>156.7.1</td>
<td>82</td>
<td>23</td>
<td>E</td>
<td>R</td>
<td>Why 59.84375?</td>
<td>REJECT.</td>
</tr>
<tr>
<td>156</td>
<td>156.7.1</td>
<td>82</td>
<td>23</td>
<td>E</td>
<td>R</td>
<td>Average channel output power</td>
<td>REJECT.</td>
</tr>
</tbody>
</table>

Response: REJECT.

This is a value per adopted baseline from page 6 of https://www.ieee802.org/3/cn/public/19_01/lyubomirsky_3cn_01b_0119.pdf. There was no proposed remedy or justification for a change.

Comment Detail:
- **Comment Type**: E
- **Comment Status**: R
- **Response Status**: C

Response: REJECT.

This is an exact value per adopted baseline from page 24 of https://www.ieee802.org/3/cn/public/19_01/lyubomirsky_3cn_01b_0119.pdf

Comment Detail:
- **Comment Type**: E
- **Comment Status**: R
- **Response Status**: C

Response: REJECT.

This is a value per adopted baseline from page 6 of https://www.ieee802.org/3/cn/public/19_01/lyubomirsky_3cn_01b_0119.pdf. There was no proposed remedy or justification for a change.

Response: REJECT.

This is an exact value per adopted baseline from page 24 of https://www.ieee802.org/3/cn/public/19_01/lyubomirsky_3cn_01b_0119.pdf

Comment Detail:
- **Comment Type**: E
- **Comment Status**: R
- **Response Status**: C

Response: REJECT.

This is a value per adopted baseline from page 6 of https://www.ieee802.org/3/cn/public/19_01/lyubomirsky_3cn_01b_0119.pdf. There was no proposed remedy or justification for a change.

Response: REJECT.

This is an exact value per adopted baseline from page 24 of https://www.ieee802.org/3/cn/public/19_01/lyubomirsky_3cn_01b_0119.pdf

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

Limiting adjacent channel crosstalk penalty requires a reduction in the power deltas between channels. To ensure this, adjustable power must be specified.

**Suggested Remedy**
Add an entry "Adjustable Range of Tx Output Power" with Min limited to -13 to -9 dBm

Response: ACCEPT IN PRINCIPLE.

In table 156-6 change
Average channel output power (min) to -16.0 dBm

In table 156-6 add new parameter "Adjustable range of Tx output power" with a value of -13 to -9 dBm. Add note "The transmitter shall be provisionable within this power range. Provisioning outside this range is allowed provided the max and min limits are met."

In table 156-6 add new parameter "Minimum average channel power at maximum adjustable power setting" with a value of -10 dBm

Add related PICS to 156.13.4.4 Optical measurement methods

In 156.9 add new subclause "Adjustable range of Tx output power" with a definition of

"This field specifies the minimum range over which the Tx output power can be provisioned. The Tx power shall be provisionable up to the higher value of the adjustable range or greater, and down to the lower value of the adjustable range or lower."

When set to the highest provisionable power, the average Tx output power must be within the range defined by the min and max values of average channel output power as specified in Table 156-6."

In 156.9 add new subclause "Minimum average channel power at maximum adjustable power setting" with editorial for the definition.

With editorial license.

**Comment Type**: TR/technical required
**Comment Status**: A

**Response Status**: C

**SORT ORDER**: Clause, Subclause, page, line
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.7.1 P 82 L 30 # 354
Maniloff, Eric Ciena

Comment Type TR Comment Status A
When adding the Tx output power tuning, its accuracy should be defined as well

SuggestedRemedy
Add an entry "Transmit output power control absolute accuracy" with Min = -1.0 dB and Max = 1.0 dB

Response Response Status C
ACCEPT IN PRINCIPLE.

In table 156-6 add a new parameter "Transmit output power control absolute accuracy" with a value of +/-1 dB.

In 156.9 add new subclause "Transmit output power control absolute accuracy" with editorial for the definition.

With editorial license.

Cl 156 SC 156.7.1 P 82 L 35 # 511
Dawe, Piers Nvidia

Comment Type E Comment Status A
RRC Roll-Off

SuggestedRemedy
?

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment 103

Cl 156 SC 156.7.1 P 82 L 35 # 329
Ghiasi, Ali Ghiasi Quantum/Marvell

Comment Type TR Comment Status A
RRC is introduced for 1st time in table 156-6 with not reference

SuggestedRemedy
Add reference to 156.9.4

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment 103

Cl 156 SC 156.7.1 P 82 L 35 # 103
Ran, Adee Cisco

Comment Type T Comment Status A
"RRC Roll-Off" is not a unit. It is unclear what it means in this context.

Similarly for the (min) row.

The spectral mask is specified in 156.9.4 - reading this subclause it becomes clear that the "Value" in the table are the beta parameter values for the two masks.

Instead of listing numbers that are meaningless without reading the subclause text, simply point to the subclause.

SuggestedRemedy
Change "Value" to "See 156.9.4" and use em-dash for "Unit" in both rows.

Response Response Status C
ACCEPT.

Cl 156 SC 156.7.1 P 82 L 48 # 337
Ghiasi, Ali Ghiasi Quantum/Marvell

Comment Type TR Comment Status R
For full interoperability using EVM may need additional constrains based on the data in rahn_3cw_01a_220223 and way_3cw_01a_220523

SuggestedRemedy
Need more data to prove that EVM will provide the IEEE level of interoperability

Response Response Status U
REJECT.

No suggested remedy provided

Cl 156 SC 156.7.1 P 82 L 49 # 512
Dawe, Piers Nvidia

Comment Type E Comment Status A
I-Q (max instantaneous), I-Q (mean)

SuggestedRemedy
?

Response Response Status C
ACCEPT IN PRINCIPLE.

See responses to comment 350 and 351

TYPE: TR/technical required  ER/editorial required  GR/general required  T/technical  E/editorial  G/general
COMMENT STATUS: D/dispatched  A/accepted  R/rejected  RESPONSE STATUS: O/open  W/written  C/closed  U/unsatisfied  Z/withdrawn
SORT ORDER: Clause, Subclause, page, line
CI 156 SC 156.7.1 Page 105 of 128
10/24/2022 11:39:35 AM
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.7.1 P 82 L 49 # 350
Maniloff, Eric Ciena

Comment Type T Comment Status A
I-Q is an insufficient name for this spec

SuggestedRemedy
Change spec name to "I-Q Offset per Polarization (Max Instantaneous)"

Response Response Status C
ACCEPT IN PRINCIPLE.

In Tables 156-6 and table 156-11 change "I-Q (max instantaneous)" to "Instantaneous I-Q offset per polarization (max)"

With editorial license

Cl 156 SC 156.7.1 P 82 L 50 # 351
Maniloff, Eric Ciena

Comment Type T Comment Status A
I-Q is an insufficient name for this spec

SuggestedRemedy
Change spec name to "I-Q Offset per Polarization (Mean)"

Response Response Status C
ACCEPT IN PRINCIPLE.

In Table 156-6 and Table 156-11 change "I-Q (mean)" to "Mean I-Q offset per polarization (max)"

With editorial license

Cl 156 SC 156.7.1 P 82 L 53 # 513
Dawe, Piers Nvidia

Comment Type E Comment Status A
Several things with max and min, others without. Definition of 156.9.14 in I-Q phase error doesn't define its sign

SuggestedRemedy

Response Response Status C
ACCEPT IN PRINCIPLE.

In Table 156-6 delete "I-Q phase error (min)", change "I-Q phase error (max)" to "I-Q phase error magnitude (max)" with a value of 5.

With editorial license

Cl 156 SC 156.7.1 P 82 L 54 # 514
Dawe, Piers Nvidia

Comment Type E Comment Status A
bottom line of table

bucket

SuggestedRemedy

Response Response Status C
ACCEPT IN PRINCIPLE.

Remove any blank lines with editorial license

Cl 156 SC 156.7.1 P 83 L 8 # 104
Ran, Adee Cisco

Comment Type T Comment Status A
dB(12.5 GHz) is not a unit.
Also in Table 156–7.

SuggestedRemedy
Change to dB and move the 12.5 GHz to the description or add a footnote to explain if necessary.

Response Response Status C
ACCEPT IN PRINCIPLE.

Add a space between change "dB(12.5 GHz)" to "dB (12.5 GHz)"

Same unit in IEEE Std 802.3-2022 clause 154 table 154.7
<table>
<thead>
<tr>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Suggested Remedy</th>
<th>Response</th>
<th>Response Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>A</td>
<td>In-band should not be capitalized</td>
<td>Accept</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>A</td>
<td>Change In to in</td>
<td>Accept</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>A</td>
<td>Transmitter In-band OSNR</td>
<td>Accept</td>
<td></td>
</tr>
<tr>
<td>TR</td>
<td>A</td>
<td>Transmit output power stability can't be negative</td>
<td>Remove the negative line</td>
<td>Accept</td>
</tr>
<tr>
<td>TR</td>
<td>R</td>
<td>Transmit output power absolute accuracy has to be in dBm.</td>
<td>Need discussions on the intent</td>
<td>Reject</td>
</tr>
<tr>
<td>T</td>
<td>A</td>
<td>RIN average and RIN peak are not designated as maximum.</td>
<td>Add &quot;(max)&quot; in both descriptions</td>
<td>Accept</td>
</tr>
</tbody>
</table>

Ghiasi, Ali | Ghiasi Quantum/Marvell

Cl 156 SC 156.7.1 P 83 L 8 # 352
Maniloff, Eric | Ciena

Cl 156 SC 156.7.1 P 83 L 16 # 331
Dawe, Piers | Nvidia

Cl 156 SC 156.7.1 P 83 L 18 # 332
Ghiasi, Ali | Ghiasi Quantum/Marvell

Cl 156 SC 156.7.1 P 83 L 20 # 106
Ran, Adee | Cisco

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general
COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn
SORT ORDER: Clause, Subclause, page, line
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

**Comment**

"Average receive power (max)" does not depend on the receiver, but on the channel output. So it can't be a receiver specification (as the text above the table states).

**Suggested Remedy**

- Change parameter names and/or add explanations in footnotes.
- Consider moving parameters to the black link characteristics in Table 156-8 or deleting duplicates.

**Response**

REJECT.

"Average receive power (max)" is a receive characteristic in multiple IEEE Std 802.3-2022 subclauses including Table 151-8, Table 154-8 and 802.3db D3.2 Table 167.8.

---

**Comment**

Are these specs for "black link" or for "DWDM channel"?

**Suggested Remedy**

- Suggest that the text 'Some clarification of the requirements in Table 156–8 is provided in informative Annex 156A, as well as examples of compliant DWDM black links.' in subclause 156.8 be changed to read 'Some examples of compliant DWDM black links are provided in Annex 156A.'

**Response**

ACCEPT.

---

**Comment**

Some clarification of the requirements in Table 156-8 is provided in informative Annex 156A, as well as examples of compliant DWDM black links.

**Suggested Remedy**

- Leftover from 100GBASE-ZR (154.8). Delete? refer to 154A?

**Response**

ACCEPT IN PRINCIPLE.

---

**Comment**

Table needs a footnote. Example of current wording from 140: Receiver sensitivity (OMAouter) (max) for 100GBASE-DR is optional and is defined for a transmitter with a value of SECQ up to 3.4 dB. 140.7.12.1 Receiver sensitivity for 100GBASE-DR The receiver sensitivity for 100GBASE-DR is optional and is defined for a transmitter with a value of SECQ up to 3.4 dB. Receiver sensitivity for 100GBASE-DR should meet Equation (140–1), which is illustrated in Figure 140-9. The normative requirement for the 100GBASE-DR receiver is stressed receiver sensitivity.

**Suggested Remedy**

- Add note in Table 156-7 for Receiver OSNR tolerance stating "OSNR tolerance is optional and compliance is not required."

**Response**

ACCEPT IN PRINCIPLE.

---

**Comment**

"Average receive power tolerance (min)" which may be a tolerance requirement. Similarly for Receiver OSNR (also defined in Table 156-8 for the channel, with the same value).

**Suggested Remedy**

- Change parameter names and/or add explanations in footnotes.
- Consider moving parameters to the black link characteristics in Table 156-8 or deleting duplicates.

**Response**

REJECT.

"Average receive power (max)" is a receive characteristic in multiple IEEE Std 802.3-2022 subclauses including Table 151-8, Table 154-8 and 802.3db D3.2 Table 167.8.
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>P</th>
<th>L</th>
<th>#</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>SuggestedRemedy</th>
<th>Proposed Response</th>
<th>Response Status</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>156</td>
<td>156.8</td>
<td>85</td>
<td>5</td>
<td>519</td>
<td>E</td>
<td>D</td>
<td>Average output power at TP3</td>
<td>REJECT.</td>
<td></td>
<td>Dawe, Piers (Nvidia)</td>
</tr>
<tr>
<td>156</td>
<td>156.8</td>
<td>85</td>
<td>8</td>
<td>355</td>
<td>E</td>
<td>A</td>
<td>Text for OSNR... should not be present</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>In Table 156-8 change &quot;Average output power at TP3 (min): for OSNR at TP3 (12.5 GHz)&quot; to &quot;Average output power at TP3 (min)&quot;</td>
<td>Dawe, Piers (Nvidia)</td>
</tr>
<tr>
<td>156</td>
<td>156.8</td>
<td>85</td>
<td>13</td>
<td>356</td>
<td>E</td>
<td>A</td>
<td>Text for OSNR... should not be present</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>In Table 156-8 change &quot;Optical path OSNR penalty (max), for OSNR at TP3 (12.5 GHz)&quot; to &quot;Optical path OSNR penalty (max)&quot;</td>
<td>Dawe, Piers (Nvidia)</td>
</tr>
</tbody>
</table>

Comment was WITHDRAWN by the commenter.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.8 P 85 L 35 # 523
Dawe, Piers Nvidia

Comment Type E Comment Status A
Only relevant
SuggestedRemedy

Response Response Status C
ACCEPT IN PRINCIPLE.

In footnote d change:
"Only relevant with implementations of a DWDM black link with one or more optical add-drop multiplexers present."

to

"Applicable to implementations of a DWDM black link with one or more optical add-drop multiplexers present."

Cl 156 SC 156.8 P 85 L 44 # 524
Dawe, Piers Nvidia

Comment Type E Comment Status D
why is the table like this, high? isolation at 0 and +/-75?
SuggestedRemedy

Proposed Response Response Status Z
REJECT.

This comment was WITHDRAWN by the commenter.

Cl 156 SC 156.8 P 85 L 45 # 107
Ran, Adee Cisco

Comment Type E Comment Status A
"+/-" bucket
SuggestedRemedy
Change to "±" (symbol) across the table
Response Response Status C
ACCEPT IN PRINCIPLE.

Change symbol as suggested throughout the document. With editorial license

Cl 156 SC 156.9.1 P 86 L 35 # 525
Dawe, Piers Nvidia

Comment Type E Comment Status R
Scrambled idle encoded by CFEC and not SD-FEC?
SuggestedRemedy

Response Response Status C
REJECT.

Use of CFEC is correct as per 155.2.1 "The transmit data is encoded with a concatenated forward error correction (CFEC) code consisting of an inner SC-FEC code and an outer Hamming code SD-FEC"

Cl 156 SC 156.9.1 P 86 L 35 # 108
Ran, Adee Cisco

Comment Type T Comment Status A
82.2.11 defines a 100GBASE-R test pattern, which is irrelevant. The 400GBASE-ZR PCS has a test pattern mode specified in 155.2.1.
SuggestedRemedy
Change "82.2.11, Clause 155" to "155.2.1".
Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment #346.
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC 156.9.1</th>
<th>P 86</th>
<th>L 42</th>
<th># 526</th>
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<td>valid 400GBASE-R</td>
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<tr>
<td>In table 156-11 change &quot;400GBASE-R&quot; to &quot;400GBASE-ZR&quot;. With editorial license.</td>
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<td>I-Q is an insufficient name for this spec</td>
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</table>
| SuggestedRemedy | Change spec name to "I-Q Offset per Polarization (Max Instantaneous)"
| Response | Response Status | C |
| ACCEPT IN PRINCIPLE. |
| See response to comment 350 |

<table>
<thead>
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</table>
| SuggestedRemedy | Change spec name to "I-Q Offset per Polarization (Mean)"
| Response | Response Status | C |
| ACCEPT IN PRINCIPLE. |
| See response to comment 351 |

<table>
<thead>
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<th>L 13</th>
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<td>I-Q phase error (max), I-Q phase error (min)</td>
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<td>Combine, as for Average receive power</td>
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<td>See response to comment 513</td>
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</table>
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.9.4 P 88 L 1 # 110
Ran, Adee Cisco

Comment Type E Comment Status A
The damping factor is denoted by the German "Eszett" symbol ß, it should be the Greek "beta" β.

Suggested Remedy
Replace to the β character (Greek beta) here and elsewhere as necessary.

Response Response Status C
ACCEPT IN PRINCIPLE.

See response to comment 359

Cl 156 SC 156.9.4 P 88 L 8 # 531
Dawe, Piers Nvidia

Comment Type E Comment Status A
As this mask is a normative spec

Suggested Remedy
Write out the frequency-domain equations for a RRC response with a damping factor of 0.4

Response Response Status C
ACCEPT IN PRINCIPLE.

Change "is set at –9 dB up to the –9 dB of an RRC with ß of 0.05." to "is set at -9 dB up to 30.8 GHz offset and follows a RRC β of 0.05 for higher frequencies."

Cl 156 SC 156.9.4 P 88 L 52 # 529
Dawe, Piers Nvidia

Comment Type E Comment Status A
Compliant transmitters ... are required to ... by applying minimum and maximum masks to the spectrum acquired using an optical spectrum analyzer.

Suggested Remedy
Not

Response Response Status C
ACCEPT IN PRINCIPLE.

Change 156.9.4 to:

"The transmit spectrum shall be within the limits of this subclause if measured per IEC 61280-1-3. Upper and lower limits are defined by truncated root-raised-cosine (RRC) responses around the signal's center frequency.

The upper and lower masks are illustrated in Figure 156–4.

The upper limit follows a RRC response with a roll-off factor β of 0.4 from 0 dB at zero frequency offset up to 40.4 GHz offset; it is –20 dB at higher frequencies. The lower limit is set at -9 dB up to 30.8 GHz offset and follows a RRC β of 0.05 for higher frequencies."

Cl 156 SC 156.9.1 P 87 L 25 # 528
Dawe, Piers Nvidia

Comment Type E Comment Status D
Is Average receive power a kind of sensitivity/overload? If not, why not any 400GBASE-ZW signal? Same for Ripple? which is a channel (black link) property

Suggested Remedy
REJECT.

This comment was WITHDRAWN by the commenter.

Cl 156 SC 156.9.4 P 87 L 25 # 528
Dawe, Piers Nvidia

Comment Type E Comment Status D
Is Average receive power a kind of sensitivity/overload? If not, why not any 400GBASE-ZW signal? Same for Ripple? which is a channel (black link) property

Suggested Remedy
REJECT.

This comment was WITHDRAWN by the commenter.
<table>
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<td><strong>Comment Status</strong></td>
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<tr>
<td>This clause defines the transmit mask as following a RRC. The RRC definition should be included.</td>
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<tr>
<td><strong>Suggested Remedy</strong></td>
<td>Add an equation to 156.9.4 defining the RRC function and Beta used to define the mask, or a reference to a definition elsewhere in 802.3</td>
<td></td>
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<tr>
<td>No suggested remedy provided</td>
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</table>
"The laser frequency noise mask is the laser frequency noise measured at a resolution between $10^{-1}$ and $10^{-6}$ times the frequency of interest."

The mask is not the measured noise; it is the specified maximum.

The paragraph is not phrased in typical standard language and can be improved. The text in the suggested remedy may be used (or corrected if it contains any error).

**SuggestedRemedy**

Change the first paragraph from

"The laser frequency noise mask is the laser frequency noise measured at a resolution between $10^{-1}$ and $10^{-6}$ times the frequency of interest. The frequency sweep relative to the laser center frequency shall be from less than 100 Hz to $f_{baud}/2$. With the exception of spurs, the measured frequency noise at any frequency shall be below the mask formed by interpolating between the points listed in Table 156–12 and illustrated in Figure 156–5." to

"The laser frequency noise mask is the maximum allowed laser frequency noise and is formed by interpolating between the points listed in Table 156–12 and illustrated in Figure 156–5. The mask frequencies are relative to the laser center frequency from less than 100 Hz to $f_{baud}/2$. Measurement resolution should be between $10^{-1}$ and $10^{-6}$ times the frequency of interest. With the exception of spurs, the measured frequency noise at any frequency shall be below the mask."

**Response**

ACCEPT IN PRINCIPLE.

Change as suggested but in the second sentence change "than 100 Hz to $f_{baud}/2$" to "than 100 Hz to half the signaling rate". See response to comment 112.

---

"fbaud" is not defined in this clause.

**SuggestedRemedy**

Either define it (with a numerical value) or use the numerical value here.

**Response**

ACCEPT IN PRINCIPLE.

See response to comment 112.

---

1-sided noise power spectral density [Hz^2/Hz]

**SuggestedRemedy**

but noise power should be in watts, or dBc. Figure title has "spectral power density"

**Response**

ACCEPT IN PRINCIPLE.

See response to comment 168.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Table 156-12 and figure 156-6. Table 93-8 for example has units of V^2 / Hz and just want to check that the power density here really has units of Hz^2 / Hz. I think this is the first time a one-side spectral power density with these units shows up in 802.3 standard, but this is not my area and I’m just trying to help. Thank you!

Suggested Remedy
Check that correct units are Hz^2 / Hz and maybe consider explaining the units if indeed this is the first time such units appear in 802.3 standard.

Response
ACCEPT IN PRINCIPLE.

The power spectral density of frequency noise has units of Hz^2 / Hz

Ensure correct use of "power spectral density".

Change "noise power spectral density" to "frequency noise power spectral density"

With editorial license.

Figure 156-5 is cluttered.

This figure does not add any information beyond Table 156-12 (which is normative, whereas the figure is an illustration).

Suggested Remedy
Remove the marker labels (e.g. "X: 1 x 10^4, Y: 1 x 10^9") and change "Hz2" to "Hz^2" in the y axis label.

Alternatively, delete the figure.

Response
ACCEPT IN PRINCIPLE.

Retain figure 156-5 and change "Hz2" to "Hz^2" in the y axis label.

IN TABLE 156-12 Everywhere else in the 802.3 standard "1-sided" is spelled out as "one-sided". For example table 93.8, table 110-11, table 136-18, table 137-6, table 83D-6, table 93A-1, section 93A.1.6, table 120D-8.

Suggested Remedy
Spell out "1-sided" as "one-sided" in FIGURE 156-6.

Response
ACCEPT.
The abbreviation EVM should be introduced before it is used.

Suggested Remedy
Insert "(EVM)" after the first instance of "error vector magnitude" (which may be in a different paragraph, based on another comment).

Response
ACCEPT IN PRINCIPLE.

Add "EVM: error vector magnitude" to 1.5. In all other usages in the document replace "error vector magnitude" with "EVM". With editorial license.

The last paragraph defines EVMmax, but the specified value in Table 156-6 is for EVM (max). It does not seem to be the same thing.

Suggested Remedy
Move the first paragraph (containing the "shall") after the last one (which defines EVMmax), and hinge the specifications to be EVMmax instead of EVM.

Response
ACCEPT IN PRINCIPLE.

Change 156.9.10 to:

"EVM is a metric to define the quality of a 400 Gb/s DP-16QAM transmitter. The EVM calculation is defined in 156.10.1.2.7.

EVMmax is the RMS addition of the EVM values of the sampled symbols for each polarization divided by the maximum amplitude of the theoretical constellation.

EVMmax 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.

The components of the conformance test setup to verify EVM are described in 156.10".

In table 156-6 change "error vector magnitude (max)" to "EVMmax (max)"

With editorial license.

Add a definition for I-Q Offset Measurement

Suggested Remedy
Add the following Specification:

\[IQ_{offset}(Max) = 10\log_{10} \left( \frac{I_{mean}^2 + Q_{mean}^2}{P_{signal}} \right)\]

with a measurement interval of 1 us

Response
ACCEPT IN PRINCIPLE.

Change 156.9.11 to "The instantaneous I-Q offset per polarization is calculated as IQoffset = 10log10[(Imean^2 + Qmean^2)/Psignal] with a measurement interval of 1 us. The instantaneous I-Q offset per polarization is the maximum value per polarization and shall be within the limits given in Table 156–6."

With editorial license.
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

C| 156 | SC 156.9.11 | P 90 | L 26 | # 116
---|---|---|---|---|---
Ran, Adee | Cisco |
Comment | E | Comment Status | A |
Comment Type | Font size is inconsistent in the text, also in 156.9.12.

Suggested Remedy
Make it consistent.

Response | C | Response Status |
Response | ACCEPT IN PRINCIPLE.

Ensure consistent font in 156.9.11 and 156.9.12. With editorial license

C| 156 | SC 156.9.11 | P 90 | L 26 | # 117
---|---|---|---|---|---
Ran, Adee | Cisco |
Comment | T | Comment Status | A |
The definition of I-Q (max instantaneous) is unclear. "peak value" of what per polarization? is it peak power?

Assuming it is not the difference between I and Q, the current name is confusing. Should it be "Max instantaneous power per polarization"?

Also, having the definition and the "shall" in the same sentence create poor language.

Suggested Remedy
Consider renaming this parameter.
Rewrite the definition to make it clear, even if the name is not changed.
Make the "shall" statement separate from the definition.

Response | C | Response Status |
Response | ACCEPT IN PRINCIPLE.

See response to comments 361

C| 156 | SC 156.9.12 | P 90 | L 28 | # 362
---|---|---|---|---|---
Maniloff, Eric | Ciena |
Comment | E | Comment Status | A |
I-Q is an insufficient name for this spec

Suggested Remedy
Change spec name to "I-Q Offset per Polarization (Mean)"

Response | C | Response Status |
Response | ACCEPT IN PRINCIPLE.

"Mean I-Q offset per polarization"

C| 156 | SC 156.9.12 | P 90 | L 28 | # 363
---|---|---|---|---|---
Maniloff, Eric | Ciena |
Comment | T | Comment Status | A |
Add a definition for I-Q Offset Measurement

Suggested Remedy
Add the following Specification:

\[ IQ_{offset(Mean)} = 10\log_{10}\left( \frac{I_{mean}^2 + Q_{mean}^2}{P_{signal}} \right) \]

Response | C | Response Status |
Response | ACCEPT IN PRINCIPLE.

See response to comment #362. Change 156.9.12 to "The mean I-Q offset is calculated as \[ Iq_{offset(mean)} = 10\log_{10}\left( \frac{(I_{mean}^2 + Q_{mean}^2)}{P_{signal}} \right) \]. The mean I-Q offset per polarization is the mean value per polarization and shall be within the limits given in Table 156–6. "

With editorial license.

C| 156 | SC 156.9.12 | P 90 | L 30 | # 364
---|---|---|---|---|---
Maniloff, Eric | Ciena |
Comment | T | Comment Status | A |
\[ \leq 1\mu s \] measurement interval applies to Max, not mean

Suggested Remedy
Remove reference to \[ \leq 1\mu s \] from 156.9.12

Response | C | Response Status |
Response | ACCEPT IN PRINCIPLE.

See response to comment 363
Comment Type: T  Comment Status: A
The definition of I-Q (mean) is unclear. "mean value" of what per polarization? is it mean power?

Assuming it is not the difference between I and Q, the current name is confusing. Should it be "mean power per polarization"?

What does "averaged over <=1 us" mean? Is averaging over only 1 ps acceptable? Should it perhaps be measured over at least 1 us?

In clause 154 there is a parameter with a different name, "I-Q offset (max)", and its definition refers to ITU-T G.698.2. This may create further confusion.

Also, having the definition and the "shall" in the same sentence create poor language.

Suggested Remedy
Consider renaming this parameter.
Rewrite the definition to make it clear, even if the name is not changed.
Make the "shall" statement separate from the definition.

Response  Response Status: C
ACCEPT IN PRINCIPLE.

See responses to comments 362 and 363

Comment Status: A
Response Status: C

---

Comment Type: E  Comment Status: A
I-Q (mean)

Suggested Remedy

Response  Response Status: C
ACCEPT IN PRINCIPLE.
See responses to comments 351 and 363

---

Comment Type: E  Comment Status: R
I-Q amplitude imbalance (mean)

Suggested Remedy
proportional amplitude difference?

Response  Response Status: C
REJECT.

Comment unclear and no suggested remedy provided

---

Comment Type: E  Comment Status: A
"proportional" phase difference

Suggested Remedy

Response  Response Status: C
ACCEPT IN PRINCIPLE.

Delete "proportional".
<table>
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<th>SC</th>
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<th>L</th>
<th>#</th>
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<td>C</td>
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<td>C</td>
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<td>156.9.17</td>
<td>91</td>
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<td>maximum spectral excursion</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>C</td>
<td>A</td>
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</table>

Comment unclear and no suggested remedy provided

Comment unclear and no suggested remedy provided

This comment was WITHDRAWN by the commenter.

Add "Optical signal-to-noise ratio (OSNR)" to 156.13.4.4. With editorial license

Comment is unclear and no suggested remedy provided

In 156.9.17 change the end of the second sentence from "plus and minus the maximum spectral excursion" to "plus and minus the maximum spectral excursion as defined in ITU-T G.698.2."
<table>
<thead>
<tr>
<th>Cl 156</th>
<th>SC 156.9.18</th>
<th>P 91</th>
<th>L 15</th>
<th># 547</th>
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<td>Define in-band</td>
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<td>Update definition of in-band OSNR to define relative noise with editorial license.</td>
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<tr>
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<th>SC 156.9.21</th>
<th>P 91</th>
<th>L 36</th>
<th># 548</th>
</tr>
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<tbody>
<tr>
<td>Dawe, Piers</td>
<td>Nvidia</td>
<td><strong>Comment Type</strong></td>
<td>E</td>
<td><strong>Comment Status</strong></td>
</tr>
<tr>
<td><strong>SuggestedRemedy</strong></td>
<td>No verb</td>
<td><strong>Response</strong></td>
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<td><strong>Response Status</strong></td>
</tr>
<tr>
<td><strong>Response</strong></td>
<td><strong>Response Status</strong></td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start the sentence with &quot;Transmit output power absolute accuracy is the&quot;</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Cl 156</th>
<th>SC 156.9.22</th>
<th>P 91</th>
<th>L 41</th>
<th># 549</th>
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<td>E</td>
<td><strong>Comment Status</strong></td>
</tr>
<tr>
<td><strong>SuggestedRemedy</strong></td>
<td>The average receive power shall be within the limits given in Table 156-7.</td>
<td><strong>Response</strong></td>
<td></td>
<td><strong>Response Status</strong></td>
</tr>
<tr>
<td><strong>Response</strong></td>
<td><strong>Response Status</strong></td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change 156.9.22 to &quot;The average receive power defines the range of average receiver input power over which the BER requirement in 156.1.1 has to be met at the values of minimum OSNR defined in Table 156–7. This power may be measured per IEC 61280-1-3&quot;.</td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Cl 156</th>
<th>SC 156.9.24</th>
<th>P 92</th>
<th>L 4</th>
<th># 552</th>
</tr>
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<tbody>
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<td>Dawe, Piers</td>
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<td><strong>Comment Type</strong></td>
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<td><strong>Comment Status</strong></td>
</tr>
<tr>
<td><strong>SuggestedRemedy</strong></td>
<td>pre-FEC BER level lower than the CFEC threshold</td>
<td><strong>Response</strong></td>
<td></td>
<td><strong>Response Status</strong></td>
</tr>
<tr>
<td><strong>Response</strong></td>
<td><strong>Response Status</strong></td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change &quot;while maintaining a pre-FEC BER level lower than the CFEC threshold&quot; to &quot;while maintaining a frame loss ratio within the limit specified in 156.1.1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only applies to CFEC, see response to comment #525.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With editorial license.</td>
<td></td>
<td></td>
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</tr>
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</table>

<table>
<thead>
<tr>
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<th>SC 156.9.24</th>
<th>P 92</th>
<th>L 5</th>
<th># 551</th>
</tr>
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<tbody>
<tr>
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<td><strong>Comment Type</strong></td>
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<td><strong>Comment Status</strong></td>
</tr>
<tr>
<td><strong>SuggestedRemedy</strong></td>
<td>has to be met with a worst-case compliant transmitter, but it does not have to be met</td>
<td><strong>Proposed Response</strong></td>
<td></td>
<td><strong>Response Status</strong></td>
</tr>
<tr>
<td><strong>Proposed Response</strong></td>
<td><strong>Response Status</strong></td>
<td>Z</td>
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<tr>
<td>REJECT.</td>
<td></td>
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<tr>
<td>This comment was WITHDRAWN by the commenter.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comment Type: E  Comment Status: A
see earlier for table footnote and "optional"

Suggested Remedy

Response

ACCEPT IN PRINCIPLE.

Change the last sentence in 156.9.24 to
"OSNR tolerance is optional and compliance is not required. The normative receiver requirement is receiver OSNR, see 156.9.23."

Comment Type: T  Comment Status: A

"OSNR tolerance is informative and compliance is not required."

Informative text should not appear in normative clauses. 802.3dc did the work of removing "informative specifications" or turning them into recommendations.

This parameter seems to be loosely defined and unmeasurable in a deployed system (pre-FEC BER counters and test patterns are not specified). So maybe it should not even be a recommendation.

Also, the "Receiver OSNR" parameter have names that does not suggest their meaning. If this parameter is retained, the name should be changed, maybe to "Receiver OSNR tolerance without channel impairments"

Suggested Remedy

Preferably delete this parameter (subclause text and table).

Otherwise change the "informative" paragraph to make it a recommendation, and change the parameter name to be more meaningful.

Response

ACCEPT IN PRINCIPLE.

In 156.9.24 change
"OSNR tolerance is informative and compliance is not required."
to
"OSNR tolerance is optional and compliance is not required."

In table 156-7, for parameter Receiver OSNR tolerance add a footnote "Receiver OSNR tolerance is optional"
<table>
<thead>
<tr>
<th>Cl</th>
<th>SC</th>
<th>Subclause</th>
<th>Page</th>
<th>Line</th>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Comment</th>
<th>Suggested Remedy</th>
<th>Proposed Response</th>
<th>Response Status</th>
<th>Response</th>
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<tbody>
<tr>
<td>156</td>
<td>156.9.25</td>
<td>P 92</td>
<td>L 13</td>
<td>#553</td>
<td>E</td>
<td>D</td>
<td>insertion loss</td>
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<td>This comment was WITHDRAWN by the commenter.</td>
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<tr>
<td>156</td>
<td>156.9.26</td>
<td>P 92</td>
<td>L 18</td>
<td>#554</td>
<td>E</td>
<td>D</td>
<td>Optical path OSNR penalty, defined in Recommendation ITU-T G.698.2, qv</td>
<td>REJECT.</td>
<td>This comment was WITHDRAWN by the commenter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>156</td>
<td>156.9.29</td>
<td>P 92</td>
<td>L 33</td>
<td>#555</td>
<td>E</td>
<td>A</td>
<td>Adjacent channel isolation, defined in Recommendation ITU-T G.671, qv</td>
<td>ACCEPT IN PRINCIPLE.</td>
<td>In 156.9.29 change subclause name to &quot;Adjacent channel spectral isolation&quot; and the definition to &quot;The adjacent channel isolation, as defined in TBD, shall be within the limits given in Table 156-9.&quot; With editorial license.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **TYPE**: TR/technical required, ER/editorial required, GR/general required, T/technical, E/editorial, G/general
- **COMMENT STATUS**: D/dispatched, A/accepted, R/rejected, O/open, W/written, C/closed, U/unsatisfied, Z/withdrawn
- **SORT ORDER**: Clause, Subclause, page, line
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

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<th>Cl</th>
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<th>P</th>
<th>L</th>
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<td>93</td>
<td>8</td>
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<tr>
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<td>A to D and analysis? 156.10.1.2 says it's Offline</td>
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<tr>
<td><strong>SuggestedRemedy</strong></td>
<td>add patch cord and MDI point to figure 156-6 similar to figure 156-2, with editorial license</td>
<td></td>
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<td><strong>Response</strong></td>
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<td>Nvidia</td>
<td><strong>Response Status</strong></td>
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<td><strong>Change &quot;TX&quot; to &quot;Tx&quot;</strong></td>
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<td>93</td>
<td>9</td>
<td>559</td>
</tr>
<tr>
<td>Dawe, Piers</td>
<td>Nvidia</td>
<td>It would be helpful to show the patch cord, between Tx and TP2</td>
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<td>Nvidia</td>
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<td>Nvidia</td>
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<td><strong>Remove any blank lines with editorial license</strong></td>
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<td>94</td>
<td>36</td>
<td>564</td>
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<tr>
<td>Dawe, Piers</td>
<td>Nvidia</td>
<td>Need a bigger block size for at least one of these, to go with the jitter corner frequency</td>
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<td><strong>Comment Status</strong></td>
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<tr>
<td><strong>Response</strong></td>
<td>Dawe, Piers</td>
<td>Nvidia</td>
<td><strong>Response Status</strong></td>
<td>U</td>
</tr>
<tr>
<td><strong>Response</strong></td>
<td>REJECT.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The CRG had no consensus to make a change at this, more study on a suitable solution is required.</strong></td>
<td></td>
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</tbody>
</table>
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

**Comment Type:** T  **Comment Status:** A
"3rd-order super Gaussian filter with RRC = 0.2"

This is an uncommon way to specify a filter, and it is unclear.

RRC seems to stand for root raised cosine (0.2 may be the roll-off parameter beta), but this filter is not "super Gaussian" and it's unclear what "3rd-order" means for a raised cosine. Or is it a different filter?

Also, the cutoff frequency is not specified.

**Suggested Remedy:**
Rewrite to clarify.

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

**Response**
Change "3rd-order super Gaussian filter with RRC = 0.2" to "RRC filter with beta = 0.2"

---

**Comment Type:** E  **Comment Status:** A
3rd-order super Gaussian filter with RRC = 0.2

**Suggested Remedy**
ACCEPT IN PRINCIPLE.

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

See response to comment 121

---

**Comment Type:** E  **Comment Status:** A
IQ Offset

**Suggested Remedy**
IQ offset (twice)

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

See response to comment 121

---
IEEE P802.3cw D2.0 400 Gb/s over DWDM systems Initial Working Group ballot comments

Cl 156 SC 156.10.1.2.6 P 94 L 3 # 569
Dawe, Piers Nvidia
Comment Type E Comment Status A
FIR filter with 15 real taps
SuggestedRemedy Where is the cursor?
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 335.

Cl 156 SC 156.10.1.2.6 P 94 L 4 # 570
Dawe, Piers Nvidia
Comment Type E Comment Status R
using the signal with additive white Gaussian noise considering the Receiver OSNR(min)
SuggestedRemedy do what?
Response Response Status C
REJECT.
No consensus to make a change.

Cl 156 SC 156.10.1.2.6 P 95 L 3 # 335
Ghiasi, Ali Ghiasi Quantum/Marvell
Comment Type TR Comment Status A
Improve definition of the FIR
SuggestedRemedy The signal is equalized using an FIR filter with 15 T spaced equalizer with real taps. The sum of all taps is equal to 1, and the main tap is allowed to vary from tap 1 to tap 8.
Response Response Status C
ACCEPT IN PRINCIPLE.
Change the first sentence of 156.10.1.2.6 to "The signal is equalized using a 15-tap, T-spaced, feed-forward equalizer with real taps. The sum of all taps is equal to 1 and the main tap is allowed to vary from tap 1 to tap 8."

Cl 156 SC 156.10.1.2.6 P 95 L 9 # 122
Ran, Adee Cisco
Comment Type E Comment Status A
bucket
I don't see any TBDs.
SuggestedRemedy Delete the editor's note.
Response Response Status C
ACCEPT.

Cl 156 SC 156.10.1.2.6 P 95 L 9 # 220
Huber, Thomas Nokia
Comment Type E Comment Status A
bucket
The editor's note about TBDs is no longer relevant
SuggestedRemedy Remove the editor's note.
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 122

Cl 156 SC 156.10.1.2.6 P 95 L 9 # 366
Maniloff, Eric Ciena
Comment Type E Comment Status A
bucket
Editor's Note should be removed
SuggestedRemedy Remove Note
Response Response Status C
ACCEPT IN PRINCIPLE.
See response to comment 122
<table>
<thead>
<tr>
<th>Comment Type</th>
<th>Comment Status</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>E</td>
<td>A</td>
<td>The equation label format seems unusual (hyphen instead of en dash, spaces). Also, the equation labels are not on the same line as the equation. <strong>Suggested Remedy</strong> Use the standard equation style. <strong>Response</strong> <strong>Response Status</strong> C <strong>ACCEPT IN PRINCIPLE.</strong> Update equation style to match style guide. With editorial license</td>
</tr>
<tr>
<td>E</td>
<td>R</td>
<td>It would be better to count from 1 to K in the usual way <strong>Suggested Remedy</strong> <strong>Response</strong> <strong>Response Status</strong> C <strong>REJECT.</strong> No suggested remedy provided. Further contributions for defining noted parameters are welcome. See response to comment 571.</td>
</tr>
<tr>
<td>E</td>
<td>R</td>
<td>I_delta and Q_delta not norm then norm <strong>Suggested Remedy</strong> <strong>Response</strong> <strong>Response Status</strong> C <strong>REJECT.</strong> No suggested remedy provided. Further contributions for defining noted parameters are welcome.</td>
</tr>
<tr>
<td>E</td>
<td>R</td>
<td>n and eta are the same thing? Why not k? <strong>Suggested Remedy</strong> <strong>Response</strong> <strong>Response Status</strong> C <strong>REJECT.</strong> No suggested remedy provided. Further contributions for defining noted parameters are welcome.</td>
</tr>
<tr>
<td>Cl</td>
<td>SC</td>
<td>Comment</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 U/unsatisfied Z/withdrawn

**SORT ORDER:** Clause, Subclause, page, line
Comment Type T  Comment Status A
Black Link examples should be expanded to include some specifications for Mux and Demux devices that would satisfy the black-link transfer function

Suggested Remedy
Add a table to 156.A.1 including Mux and Demux example specifications. For example see https://www.ieee802.org/3/cw/public/22_0523/maniloff_3cw_01_220523.pdf#page=5

Response Response Status C
ACCEPT IN PRINCIPLE.


Adding clarifying language that the filter characteristics in this presentation were derived for the case where adjacent channels were propagating in the same direction in one fiber.

With editorial license.