

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

CI 120A SC 120A.6 P 103 L 43 # 581  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 two 400GMII and 400GAUI-8 interfaces  
 SuggestedRemedy  
 Only one 400GAUI-8 interface  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #582.

CI 155 SC 155.1.1 P 32 L 3 # 126  
 Nicholl, Gary Cisco Systems  
 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 W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 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 W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.3 P 33 L 42 # 128  
 Nicholl, Gary Cisco Systems  
 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).  
 SuggestedRemedy  
 Add a definition for "SC-FEC" into section 1.4 (unless it was added by a previous project).  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.4 P 33 L 49 # 129  
 Nicholl, Gary Cisco Systems  
 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 ?  
 SuggestedRemedy  
 Add a description of the PMA inter-sublayer interfaces to this section.  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.4 P 33 L 52 # 182  
 D'Ambrosia, John Fuuturewei, US Subsidiary of Huawei  
 Comment Type E Comment Status A rewrite bucket  
 When using an Extender, the PCS is connecting to the 400GMII in theory. This sentence does not express this - Optionally the upper interface may connect to a 400GMII Extender, defined in Clause 118, which then connects to the Reconciliation Sublayer.  
 SuggestedRemedy  
 Delete noted sentence.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 155 SC 155.1.4 P 34 L 2 # 424  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 8 x 59.84375 x (28/29) ...  
 SuggestedRemedy  
 use multiplication sign as elsewhere  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.4 P 34 L 2 # 42  
 Ran, Adeo Cisco  
 Comment Type T Comment Status A rewrite bucket  
 The "rate" 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.  
 SuggestedRemedy  
 Change to the per-lane rate (59.84375 ? 28/29 Gb/s on each of 8 PCS lanes).  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.4 P 34 L 2 # 425  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 Giving an encoded rate in "Gb/s" is confusing because that's how we express MAC rates.  
 SuggestedRemedy  
 Something like:  
 The 400GBASE-ZR PCS has a nominal transfer rate rate at the 8-wide PMA service interface of 59.84375 x (28/29) Gtransfers/s +/- 20 ppm for a total of ~462.2414 Gtransfers/s.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.4.2 P 34 L 16 # 185  
 D'Ambrosia, John Fuuturwei, US Subsidiary of Huawei  
 Comment Type ER Comment Status A rewrite bucket  
 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 W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.4.2 P 34 L 17 # 187  
 D'Ambrosia, John Fuuturwei, US Subsidiary of Huawei  
 Comment Type TR Comment Status A rewrite bucket  
 Stated sentence - The PMA service interface is defined in 155.3 The link for 155.3 does not go to a PMA service interface sub clause.  
 SuggestedRemedy  
 Pointer should be to 155.3.2.  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.1.5 P 35 L 3 # 10  
 Brown, Matt Huawei  
 Comment Type E Comment Status A rewrite bucket  
 "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.

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Cl 155 SC 155.1.5 P 35 L 3 # 130

Nicholl, Gary Cisco Systems

Comment Type TR Comment Status A rewrite bucket

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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.1.5 P 35 L 25 # 428

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

"SC-FEC adapt & encoding", "SC-FEC decoding & adapt" - it would help to know that there is interleaving here as well as below.

*SuggestedRemedy*

"SC-FEC adapt, encoding and interleaving", "SC-FEC de-interleaving, decoding & adapt" ?

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.1.5 P 35 L 43 # 429

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

"PMA:IS\_UNITDATA\_m-1.indication": the "m" in one direction only is not usual (so it looks like a leftover from Clause 119 where two widths are possible, but for a known and different reason), and not explained until much later in the document

*SuggestedRemedy*

Add an informative NOTE saying why it's m-1 not 7, and referring to the appropriate subclause.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.1.5 P 55 L 3 # 338

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

Comment Type E Comment Status A rewrite bucket

The sentence says 400GBASE-Z PCS sublayer, but the figure is labeled and used as the 400GBASE-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 "400GBASE-ZR PCS sublayer" to agree with the figure

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 6 # 43

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

The sentence "The PCS . can operate in nromal 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

CI 155 SC 155.2.1 P 36 L 7 # 44

Ran, Adeel 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.

SuggestedRemedy

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.1 P 36 L 12 # 188

D'Ambrosia, John Fuuturwei, 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

SuggestedRemedy

Reword  
Transmit data-units are sent to the PMA service interface via the PMA:IS\_UNITDATA\_i.request primitive. The PMA then encodes the data into two streams of 16QAM symbols.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.1 P 36 L 13 # 202

Huber, Thomas Nokia

Comment Type TR Comment Status A rewrite bucket

There is inconsistency wording between Figure 155-2 (which shows m lanes in the receive direction between the PMA and PCS), the text in 155.2.1 (which indicates two streams of m-bit symbols), and text in 155.2.5.1 and in 155.3.2 (both of which reference DP-16QAM symbols digitized to m-bit resolution).

SuggestedRemedy

Change  
"When communicating with the PMA in the receive direction, the 400GBASE-ZR PCS receives two streams of digitally encoded m-bit 16QAM symbols."  
to  
"When communicating with the PMA in the receive direction, the 400GBASE-ZR PCS receives digitally encoded m-bit DP-16QAM symbols."

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 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".

SuggestedRemedy

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.2.1 P 36 L 20 # 16

Gorshe, Steve

Microchip Technology

Comment Type ER Comment Status A rewrite bucket

The current text refers to "the +/- 100ppm 257-bit blocks" 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.

*SuggestedRemedy*

In this paragraph and any other occurances, references to the frequency or frequency offset of "blocks" should be changed to "block stream"

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 22 # 190

D'Ambrosia, John

Fuuturewei, US Subsidiary of Huawei

Comment Type TR Comment Status A rewrite bucket

This line has inner and outer FEC codes reversed -  
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.

*SuggestedRemedy*

Modify noted sentence -  
The transmit data is encoded with a concatenated forward error correction (CFEC) code consisting of an outer SC-FEC code and an inner Hamming code SD-FEC.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 22 # 20

Gustlin, Mark

Cisco

Comment Type TR Comment Status A 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 locaiton of the cods in the concatenation.

*SuggestedRemedy*

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

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 22 # 434

Dawe, Piers

Nvidia

Comment Type T Comment Status A 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.

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Cl 155 SC 155.2.1 P 36 L 22 # 433

Dawe, Piers

Nvidia

Comment Type T Comment Status A rewrite bucket

"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": this is intuitive but not the accepted (Forney's) use of inner and outer.

SuggestedRemedy

transmit data is encoded with a concatenated forward error correction (CFEC) code consisting of an outer SC-FEC code and an inner Hamming code SD-FEC

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 25 # 131

Nicholl, Gary

Cisco Systems

Comment Type ER Comment Status A 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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 29 # 46

Ran, Adeo

Cisco

Comment Type T Comment Status A 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.

Cl 155 SC 155.2.1 P 36 L 35 # 437

Dawe, Piers

Nvidia

Comment Type E Comment Status A rewrite bucket

PCS Receive process

SuggestedRemedy

PCS Receive function or PCS receive process

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.1 P 36 L 35 # 28

Marris, Arthur

Cadence Design Systems

Comment Type T Comment Status A rewrite bucket

Should this be "128 bit"?

SuggestedRemedy

Consider changing "128-symbol" to "128 bit symbol". Similar issue with "119-symbol" on line 37.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346."

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CI 155 SC 155.2.1 P 36 L 38 # 438  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 SC-FEC blocks of 510 x 512  
 SuggestedRemedy  
 whats? bits? bytes?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.1 P 36 L 38 # 439  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 SC-FEC blocks  
 SuggestedRemedy  
 SC-FEC codewords (as on line 39)  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.1 P 36 L 40 # 224  
 Law, David Hewlett Packard Enterprise  
 Comment Type E Comment Status A rewrite bucket  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.1 P 36 L 41 # 29  
 Marris, Arthur Cadence Design Systems  
 Comment Type T Comment Status A rewrite bucket  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.1 P 36 L 43 # 48  
 Ran, Adee Cisco  
 Comment Type E Comment Status A rewrite bucket  
 "257B blocks" is inconsistent with "257-bit blocks" used earlier. "B" is not used to denote bits elsewhere (except as abbreviations in coding scheme names).  
 Similarly "66b", "120b", and other instances in this draft.  
 SuggestedRemedy  
 Change "257B" to "257-bit" across the draft except where it is part of "256B/257B".  
 Similarly, change "66b" to "66-bit" in 155.2.2, "120b" to "120-bit" in 155.2.4.3, and similar instances as necessary.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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Cl 155 SC 155.2.4 P 37 L 8 # 225

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4 P 37 L 8 # 132

Nicholl, Gary Cisco Systems

Comment Type T Comment Status A rewrite bucket

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.1 P 37 L 12 # 203

Huber, Thomas Nokia

Comment Type T Comment Status A rewrite bucket

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\_coded<65:0>, which is passed to the 64B/66B to 256B/257B transcoder. tx\_coded<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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.2.4.3 P 37 L 29 # 226

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 37 L 29 # 440

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

257B

SuggestedRemedy

257-bit, many places. Compare base doc. "256B/257B" can stay.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 37 L 30 # 49

Ran, Adeo 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.

CI 155 SC 155.2.4.3 P 37 L 31 # 392

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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.2.4.3 P 38 L 2 # 204

Huber, Thomas

Nokia

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

Change "A 20 bit pad of all zeros is added after the OH blocks" to "A 20 bit pad of all zeros is added after the 1280 OH bits."

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 38 L 5 # 50

Ran, Adee

Cisco

Comment Type T Comment Status A rewrite bucket

"starting at column 5141 of row 0 and ending at column 10 280 of row 255, using GMP"

"column" has not been mentioned in preceding text. I assume a column is a bit, so there's no no need to use another term (and possibly create confusion, since in the related Clause 155 the columns denote octets).

The payload area ends simply at the end of the frame, so rows are not necessary either.

*SuggestedRemedy*

Change the quoted text to "from bit 5141 to the end of the frame, using GMP"

Change "column" to "bit" across this description.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 38 L 5 # 227

Law, David

Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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 ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 38 L 6 # 394

Slavick, Jeff

Broadcom

Comment Type TR Comment Status A rewrite bucket

in item 5 it refers to the PCS payload beginning at column 5141 which would be true for an indexing that begins at 1, but Table 155-1 appears to use column indexing that begins with 0

*SuggestedRemedy*

Change "column 5141 or row 0 and ending at column 10 280 of row 255" to "column 5140 of row 0 and ending at column 10 279 of row 255".

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 38 L 8 # 228

Law, David

Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.2.4.3 P 38 L 11 # 443  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 ITU-T G.709 Clause 9.4.3.2  
 SuggestedRemedy  
 ITU-T G.709 Clause 19.4.3.2 ?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.3 P 38 L 11 # 393  
 Slavick, Jeff Broadcom  
 Comment Type TR Comment Status A rewrite bucket  
 I could not find a Clause 9.4.3.2 in ITU-T G.709 but I did find a 19.4.3.2 that talks about GMP  
 SuggestedRemedy  
 Change 9.4.3.2 to 19.4.3.2  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.3 P 38 L 11 # 205  
 Huber, Thomas Nokia  
 Comment Type TR Comment Status A rewrite bucket  
 Clause 9.4.3.2 of ITU-T G.709 does not discuss GMP. Since the GMP OH being used aligns with 400ZR, maybe it is better to point to 155.2.4.5.3 (which then points to the OIF 400ZR IA). ITU-T G.709 and G.709.x don't specifically discuss the GMP encoding that is used in 400ZR and 400GBASE-ZR  
 SuggestedRemedy  
 Change  
 The principles of the GMP mapper are described in ITU-T G.709 (06/2020) Annex D, with details of the encoding of the GMP overhead in ITU-T G.709 Clause 9.4.3.2.  
 to:  
 The principles of the GMP mapper are described in ITU-T G.709 (06/2020) Annex D. Details of the overhead encoding for 400GBASE-ZR are in 155.2.4.5.3.  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.3 P 38 L 12 # 229  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.2.4.3 'GMP mapper' says 'The principles of the GMP mapper ... with details of the encoding of the GMP overhead in ITU-T G.709 Clause 9.4.3.2.'. On review of ITU-T G.709/Y.1331 (06/2020) <<https://www.itu.int/rec/recommendation.asp?lang=en&parent=T-REC-G.709-202006-l->>, there doesn't seem to be a subclause 9.4.3.2. Perhaps the reference should have been to subclause 19.4.3.2 'Generic mapping procedure (GMP)' in ITU-T G.709, although that only seems to address the justification overhead bytes.  
 SuggestedRemedy  
 Correct the reference to the GMP overhead in ITU-T G.709.  
 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

CI 155 SC 155.2.4.3 P 38 L 15 # 150

Lusted, Kent Intel Corporation

Comment Type TR Comment Status A rewrite bucket

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.

SuggestedRemedy

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 and stuff 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 Response Status W  
 ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 38 L 18 # 445

Dawe, Piers Nvidia

Comment Type T Comment Status A rewrite bucket

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

SuggestedRemedy

Deffine the GMP rate in the PCS section

Response Response Status C  
 ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.3 P 38 L 20 # 51

Ran, Adeo Cisco

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.

CI 155 SC 155.2.4.3 P 38 L 20 # 446

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

~10 214.684 -eh?

SuggestedRemedy

Wow, this is hard to read! Spaces inside indivisible things such as numbers or variable names are bad!

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 155.2.4.3 P 38 L 30 # 53

Ran, Adeo Cisco

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.

Cl 155 SC 155.2.4.3 P 38 L 30 # 52

Ran, Adeo Cisco

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.

Cl 155 SC 155.2.4.3 P 39 L 6 # 54

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

"10 970 bit row aligned" - the number is part of a compound noun so a hyphen should be used. The separator is not helpful in this case.

SuggestedRemedy

Change to "10970-bit row aligned".

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.3 P 39 L 7 # 55

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

"The AM field, containing am\_mapped<1919:0> is transmitted LSB first, i.e. am\_mapped<0> first, and am\_mapped<1919> last"

This phrasing is awkward (am\_mapped has already been defined in the first paragraph) and redundant.

SuggestedRemedy

Change to "The transmission order of am\_mapped is from am\_mapped<0> to am\_mapped<1919>".

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.4 P 38 L 46 # 206

Huber, Thomas Nokia

Comment Type T Comment Status A rewrite bucket

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.

SuggestedRemedy

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.2.4.4.1 P 38 L 50 # 387

Slavick, Jeff Broadcom

Comment Type E Comment Status A rewrite bucket

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

*SuggestedRemedy*

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.5 P 39 L 16 # 56

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

"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.

*SuggestedRemedy*

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.5 P 39 L 16 # 397

Slavick, Jeff Broadcom

Comment Type TR Comment Status A rewrite bucket

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.2.4.5.1 P 38 L 38 # 189  
 D'Ambrosia, John Fuuturwei, US Subsidiary of Huawei  
 Comment Type E Comment Status A rewrite bucket  
 MFAS is not listed in abbreviations  
 SuggestedRemedy  
 Add to 1.5  
 MFAS Multi-frame alignment signal  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.5.1 P 39 L 40 # 58  
 Ran, Adeo Cisco  
 Comment Type T Comment Status A rewrite bucket  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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  
 SuggestedRemedy  
 Remove GMP, define the 256-frame multi-frame sequence here, or add the reference  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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?  
 SuggestedRemedy  
 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 W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.5.2 P 39 L 48 # 449  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 "signal fail status was detected by the remote 400GBASE-ZR receive function in the upstream direction". 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.  
 SuggestedRemedy  
 Something like:  
 The RPF bit is used by a 400GBASE-ZR PHY to indicate to its link partner the signal fail status at its receive function  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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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.

**SuggestedRemedy**

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

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.5.2 P 39 L 49 # 231

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Isn't '... 400GBASE-ZR receive function in the upstream direction ...' 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'.

**SuggestedRemedy**

Suggest that '... 400GBASE-ZR receive function in the upstream direction and ...' should read '... 400GBASE-ZR receive function and ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.5.2 P 39 L 50 # 232

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

Subclause 155.2.4.5.2 'Link status monitoring and signaling' says 'RPF is set to "1" 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.

**SuggestedRemedy**

Please provide a definition of the conditions considered a 400GBASE-ZR PHY defect.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.5.2 P 39 L 51 # 389

Slavick, Jeff Broadcom

Comment Type TR Comment Status A rewrite bucket

Per Figure 155-4 the RPF field is in bit location 0 of the Status Octect. But the Text states it's bit location 1.

**SuggestedRemedy**

Change "in bit 1" to "the first bit"

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.5.2 P 40 L 1 # 60

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

What do "downstream", "host interface signal" and "MDI" signal" mean? Perhaps "downstream" should be "link partner"? For signals, are these the signals received by the 400GAUI C2M (which is optional) and the MDI?

**SuggestedRemedy**

Please rephrase to clarify.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 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.

CI 155 SC 155.2.4.5.2 P 40 L 10 # 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.

CI 155 SC 155.2.4.5.2 P 40 L 9 # 61  
 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.

CI 155 SC 155.2.4.5.3 P 40 L 17 # 62  
 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](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.

CI 155 SC 155.2.4.5.2 P 40 L 9 # 246  
 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.

SuggestedRemedy  
 Add a reference in 1.3 with either dated or undated version, preferably with a URL.  
 Delete the date from the subclause text, here and in 155.2.4.6 (if a dated version is used, place the full dated reference in a footnote).  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 155 SC 155.2.4.5.3 P 40 L 17 # 453

Dawe, Piers Nvidia

Comment Type TR Comment Status A rewrite bucket

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

SuggestedRemedy

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.5.3 P 40 L 24 # 57

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

C<sub>m</sub>(t) and C<sub>n</sub>D(t) are used but not defined. I assume they are defined in an external reference, but it is unclear. If all control bytes are defined externally then there is no need for this text.

SuggestedRemedy

Preferably add the detailed definitions from the referenced document. Otherwise, delete the entire last paragraph.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.5.3 P 40 L 24 # 17

Gorshe, Steve Microchip Technology

Comment Type E Comment Status A rewrite bucket

It seems worthwhile to provide some basic context regarding the meaning of C<sub>m</sub>(t) and S<sub>Cn</sub>(t). Although G.709 provides the details, it may be worthwhile expanding this statement somewhat.

SuggestedRemedy

I suggest adding the following sentences to the end of this paragraph: "Note that C<sub>m</sub>(t) indicates the number of 1028-bit GMP data words that will be transmitted during the next multi-frame, with S<sub>Cn</sub>D(t) nominally indicating the running remainder. Averaging the C<sub>m</sub>(t) plus S<sub>Cn</sub>D(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 Response Status C

ACCEPT IN PRINCIPLE.  
See response to comment #346.

CI 155 SC 155.2.4.5.3 P 40 L 25 # 207

Huber, Thomas Nokia

Comment Type E Comment Status A rewrite bucket

The 'nD' in C<sub>n</sub>D(t) should be subscripted

SuggestedRemedy

Change the nD to subscript.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.5.4 P 40 L 30 # 348

Maniloff, Eric Ciena

Comment Type E Comment Status A rewrite bucket

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

SuggestedRemedy

Add a figure showing the interleaved OH mapping

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.2.4.5.4 P 40 L 32 # 247  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 It appears that the 10-bit interleaver isn't specified.  
 SuggestedRemedy  
 Specify the 10-bit interleaver.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.6 P 40 L 37 # 248  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.2.4.6 'CRC32 and multi-block alignment signal (MBAS) insertion' says that 'Each SC-FEC block has 119 x 10 280 / 5 bits = 244 664 bits.', but isn't an input SC-FEC block 244 736 bits, formed of 244 664 information bits, 32 CRC bits, 6 MBAS bits, and 34 bits of padding (see figure 155-5). In addition, based on figure 155-5 and subclause 155.2.4.7, subclause 155.2.4.6 describes the input SC-FEC block.  
 SuggestedRemedy  
 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.

Cl 155 SC 155.2.4.6 P 40 L 39 # 63  
 Ran, Adeo Cisco  
 Comment Type E Comment Status A rewrite bucket  
 "mapped to 5 successive SC-FEC blocks"  
 isolated numbers less than 10 in general text should be spelled out.  
 SuggestedRemedy  
 Change "5" to "five".  
 Implement similar changes, and write numbers greater than 9 in digits, across the document as necessary.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.4.6 P 40 L 42 # 249  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.2.4.6 'CRC32 and multi-block alignment signal (MBAS) insertion' says 'The 32 bits of 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.  
 SuggestedRemedy  
 Suggest that:  
 [1] The text '... the CRC value are placed with ...' in the second paragraph of subclause 155.2.4.6 should be changed to read '... the CRC value are placed immediately after the information bits in the SC-FEC input block with ...'.  
 [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.

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Cl 155 SC 155.2.4.6 P 40 L 43 # 64

Ran, Adee Cisco

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.

Cl 155 SC 155.2.4.6 P 40 L 50 # 455

Dawe, Piers Nvidia

Comment Type T Comment Status A rewrite bucket

between source and sink

SuggestedRemedy

eh? Change to the usual terminology

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.6 P 40 L 50 # 454

Dawe, Piers Nvidia

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.

Cl 155 SC 155.2.4.7 P 41 L 1 # 251

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

Suggest that subclause 155.2.4.7 be retitled 'SC-FEC adapt and encoding' to match the equivalent block in Figure 155-2.

SuggestedRemedy

See comment.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.7 P 41 L 11 # 252

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Subclause 155.2.4.7 '400GBASE-ZR frame to SC-FEC adaptation' says '... which are added to the 400GBASE-ZR SC-FEC frame as ...'. This seems to be the only time the term '400GBASE-ZR SC-FEC frame' is used and the title of the referenced figure 155-6 is '400GBASE-ZR SC-FEC encoded frames'.

SuggestedRemedy

Subclause 155.2.4.7 '400GBASE-ZR frame to SC-FEC adaptation' says '... which are added to the 400GBASE-ZR SC-FEC frame as ...'. This seems to be the only time the term '400GBASE-ZR SC-FEC frame' is used and the title of the referenced figure 155-6 is '400GBASE-ZR SC-FEC encoded frames'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.2.4.7 P 42 L 5 # 253  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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

CI 155 SC 155.2.4.7 P 42 L 12 # 400  
 Slavick, Jeff Broadcom  
 Comment Type E Comment Status A rewrite bucket  
 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 it's Bj+3 box.  
 SuggestedRemedy  
 Thicken the right edge of the grey boxes that represne the CRC+MBAS.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.7 P 42 L 42 # 388  
 Slavick, Jeff Broadcom  
 Comment Type TR Comment Status A rewrite bucket  
 Figure 155-6 does not show the 6x119b pad  
 SuggestedRemedy  
 Add box at the end of the i+119 row to the right of the CRC+MBAS labeled 6x119b PAD  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 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?  
 SuggestedRemedy  
 Change "pad bits added" to "pad bits of all zeroes added"  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.9 P 43 L 9 # 65  
 Ran, Adeo Cisco  
 Comment Type T Comment Status A rewrite bucket  
 "a frame-synchronous scrambler of sequence 65 535"  
 Unclear; should it be "with sequence length of 65535"?  
 A 16-degree polynomial creates a periodic sequence length of 131071, so is it the first 65535 bits of that periodic sequence starting from the reset value?  
 SuggestedRemedy  
 Rewrite as appropriate.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 155 SC 155.2.4.9 P 43 L 10 # 460  
 Dawe, Piers Nvidia  
 Comment Type TR Comment Status A rewrite bucket  
 More information needed. Given the "generating polynomial", what has to be done? There are examples of scrambler definitions in the base document.  
 SuggestedRemedy  
 ?  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.9 P 43 L 12 # 458  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 x  
 SuggestedRemedy  
 define x  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.9 P 43 L 12 # 461  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 is row 1 the first or second row?  
 SuggestedRemedy  
 ?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.9 P 43 L 12 # 459  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 which end goes first?  
 SuggestedRemedy  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.9 P 43 L 14 # 31  
 Marris, Arthur Cadence Design Systems  
 Comment Type T Comment Status A rewrite bucket  
 Is resetting the scrambler a functional requirement?  
 SuggestedRemedy  
 Consider changing "resets" to "shall be reset"  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.4.9 P 43 L 14 # 66  
 Ran, Adeo Cisco  
 Comment Type T Comment Status A rewrite bucket  
 The definition of the scrambler is ambiguous; The choice of coefficient order, shift direction, and the point from which the output is taken can create different results.  
 Scrambler specifications typically include a block diagram of an LFSR and sometimes a portion of the sequence for clarity.  
 SuggestedRemedy  
 Add a diagram (similar to e.g. Figure 49-8) and some portion of the sequence following the initial 16 bits (0xFFFF).  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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Cl 155 SC 155.2.4.9 P 43 L 16 # 399

Slavick, Jeff Broadcom

Comment Type TR Comment Status A rewrite bucket

The scrambler stops advancing during the PAD bits? So the 714b of PAD will be either all 0's or all 1's?

SuggestedRemedy

Define the pad to be a random pattern or change "the scrambling state advances during each bit of the five SC-FEC blocks" to "the scrambling state advances for each transmitted bit"

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.10 P 43 L 20 # 255

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Suggest that '... SC-encoder ...' should read '... SC-FEC encoder ...'.

SuggestedRemedy

See comment.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.10 P 43 L 21 # 68

Ran, Adeo 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.

Cl 155 SC 155.2.4.10 P 43 L 21 # 67

Ran, Adeo 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.

Cl 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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 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.

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Cl 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 Fgiure 155-7.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.11 P 44 L 36 # 257

Law, David

Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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 ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.11 P 44 L 37 # 69

Ran, Adee

Cisco

Comment Type T Comment Status A rewrite bucket

"The generic operation of the Hamming SD-FEC scheme is specified in ITU-T G.709.3 Annex D"

The text in this subclause is insufficient to understand/implement the SD-FEC encoder function.

If it isn't fully defined (defined only in an external document) then there is no need for the details in the second paragraph.

*SuggestedRemedy*

Preferably add the detailed definitions from the referenced document. Otherwise, delete the second paragraph.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.4.11 P 44 L 40 # 258

Law, David

Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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'.

*SuggestedRemedy*

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.2.4.11 P 44 L 45 # 464

Dawe, Piers Nvidia

Comment Type T Comment Status A rewrite bucket

This says 8-bit symbols, 155.2.1 says two streams of 4-bit data.  
PMA:IS\_UNITDATA\_i.request is 7 wide.

*SuggestedRemedy*

The difference may matter when we are discussing Skew limits

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.2.4.12 P 45 L 50 # 259

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

[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 = [c0, c1, ...,c127], 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 = [c0, c1, ...,c127], is mapped ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.2.4.12 P 45 L 52 # 133  
 Nicholl, Gary Cisco Systems  
 Comment Type E Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 Update Figure 155-8 to use a constant font for all text.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.1 P 46 L 11 # 467  
 Dawe, Piers Nvidia  
 Comment Type TR Comment Status A rewrite bucket  
 "Logic described generically in ITU-T G.709.3 Annex D": generically - vague, and Annex D doesn't address FEC decoding at all, only check-block generation.  
 SuggestedRemedy  
 Write out what you need to say, here  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.1 P 46 L 11 # 466  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 "The Hamming SD-FEC decoder is a soft decision decoder"  
 SuggestedRemedy  
 What requires this? a sensitivity / OSNR tolerance spec? Please refer to wherever the reason is given.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.1 P 46 L 12 # 260  
 Law, David Hewlett Packard Enterprise  
 Comment Type E Comment Status A rewrite bucket  
 The vast majority of references to the in-phase and quadrature-phase X and Y polarization use the symbols I<sub>X</sub>, Q<sub>X</sub>, I<sub>Y</sub>, and Q<sub>Y</sub> (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.  
 SuggestedRemedy  
 On the assumption that they are referencing the same signals, please use I<sub>X</sub>, Q<sub>X</sub>, I<sub>Y</sub>, and Q<sub>Y</sub> 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.  
 See response to comment #346.

Cl 155 SC 155.2.5.3 P 46 L 26 # 384  
 Wienckowski, Natalie General Motors  
 Comment Type E Comment Status A rewrite bucket  
 You should refer to the equation.  
 SuggestedRemedy  
 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.

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Cl 155 SC 155.2.5.5 P 46 L 36 # 70

Ran, Adeo Cisco

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.

SuggestedRemedy

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.

Cl 155 SC 155.2.5.5 P 46 L 36 # 469

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

incoming block 10 ...

SuggestedRemedy

incoming block of 10 ...?

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.5 P 46 L 46 # 71

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

The third paragraph "The 400GBASE-ZR PCS provides detection and signaling of link degrade for use by network equipment..."  
 is repeated verbatim in 155.2.5.7.2. No need to write it twice.

SuggestedRemedy

Delete the third paragraph.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.2.5.5 P 46 L 46 # 401

Slavick, Jeff Broadcom

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

SuggestedRemedy

Add references to the MDIO registers to control and observe link degrade

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.2.5.5 P 46 L 48 # 408

Slavick, Jeff Broadcom

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.

SuggestedRemedy

Replace the last paragraph of 155.2.5.5 with the following:

The 400GBASE-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 FEC\_degraded\_SER\_ability\_variable (see 155.4.2.1). When the option is provided it is enabled by the assertion of the FEC\_degraded\_SER\_enable variable (see 155.4.2.1).

When 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 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 FEC\_degraded\_SER\_activate\_threshold (see 155.5.1), the 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 FEC\_degraded\_SER\_deactivate\_threshold, the FEC\_degraded\_SER bit is cleared. If either FEC\_degraded\_SER\_ability or FEC\_degraded\_SER\_enable is de-asserted then the 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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 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.

CI 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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 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.

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Cl 155 SC 155.2.5.7 P 47 L 9 # 72  
 Ran, Adeo 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 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 14 # 73  
 Ran, Adeo 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.  
 SuggestedRemedy  
 Change 155.4 to Figure 155-16  
 Response Response Status W  
 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.  
 SuggestedRemedy  
 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.  
 SuggestedRemedy  
 Remove figure 155-9. Add a sentence to the end of clause 155.2.5.7 indicating that the overhead bytes over the four-frame multiframe are shown in Figure 155-4.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 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  
 SuggestedRemedy  
 Remove it, refer to 155-4 instead  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 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  
 SuggestedRemedy  
 Delete Figure 155-9. Add "(see Figure 155-4)" to the end of last paragraph  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 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  
 SuggestedRemedy  
 Reference it or remove it. See another comment.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.5.7.2 P 48 L 5 # 474  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 upstream, downstream  
 SuggestedRemedy  
 Rx, Tx. Compare base doc.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.5.7.2 P 48 L 9 # 475  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 detailed in 155.2.5.7.2 - but this is 155.2.5.7.2  
 SuggestedRemedy  
 ?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.2.5.7.2 P 48 L 21 # 212  
 Huber, Thomas Nokia  
 Comment Type E Comment Status A rewrite bucket  
 It looks like there is an 'of' that should be 'or' - I think the intent is that if the receiver can't frame to the DSP frame, or the 400ZR frame or multiframe, it inserts LF  
 SuggestedRemedy  
 Change "In the case of a DSP framing of 400GBASE-ZR frame or multi-frame loss." to "In the case of a DSP framing loss or 400GBASE-ZR frame or multi-frame loss."  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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Cl 155 SC 155.2.5.7.2 P 48 L 22 # 476  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 framing of frame or multi-frame loss - eh?  
 SuggestedRemedy  
 In the case of a loss of 400GBASE-ZR frame sync or multi-frame sync?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.7.2 P 48 L 23 # 74  
 Ran, Adeo Cisco  
 Comment Type T Comment Status A rewrite bucket  
 "LF ordered sets" are not defined in this draft.  
 I assume it is the "Local Fault" RS ordered set.  
 SuggestedRemedy  
 Change to "Local Fault ordered sets (see 81.3.4)".  
 (or another ordered set if so intended)  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.8 P 48 L 36 # 18  
 Gorshe, Steve Microchip Technology  
 Comment Type ER Comment Status A rewrite bucket  
 The sentence incorrectly confuses the location and coverage of the GMP CRC fields.  
 Specifically, it says that the CRC8 is found in JC1-3 and the CRC4 is found in JC4-6. The  
 CRC8 is located in JC3 and the CRC4 is located in JC6.  
 SuggestedRemedy  
 Change the last sentence of the paragraph to read: "The CRC8 value in JC3 provides error  
 detection coverage for the information in JC1-JC3 and the CRC4 value in JC4 provides  
 error detection coverage for the associated information fields in JC4-6."  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.8 P 48 L 36 # 19  
 Gorshe, Steve Microchip Technology  
 Comment Type E Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 In conjunction with the change proposed in the previous comment, add the following  
 sentence to the end of the paragraph: "The JC1-2 field information is also protected by  
 limits on how the JC1-2 fields can change in successive multi-frames and the coding  
 technique for indicating these changes, which combine with the CRC8 in JC3 to provide  
 error correction capability for bit and burst errors impacting JC1-3."  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.2.5.10 P 48 L 53 # 477  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 The PCS receives decode blocks  
 SuggestedRemedy  
 The PCS receive function decodes blocks ?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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Cl 155 SC 155.3.1 P 49 L 3 # 135

Nicholl, Gary Cisco Systems

Comment Type ER Comment Status A rewrite bucket

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.

SuggestedRemedy

I would propose to delete section 155.1., and put all of the corresponding overview information into either the PCS section (155.2) or the PMA section (155.3) respectively.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.1.1 P 49 L 9 # 262

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Since [1] the subclause of 156.5 'PMD functional specifications' lists more than just a transmit and receive function, and [2] to parallel the text 'The PMA allows the 400GBASE-ZR PCS (specified in 155.2) ...', suggest that '... media-independent way to a coherent transmitter and receiver specified in Clause 156.' should be changed to read '... media-independent way to the 400GBASE-ZR PMD (specified in 156).'

SuggestedRemedy

See comment.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.1.1 P 49 L 11 # 478

Dawe, Piers Nvidia

Comment Type T Comment Status A rewrite bucket

The interfaces for the inputs of

SuggestedRemedy

The interfaces of ?

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.1.2 P 49 L 16 # 481

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

relationship with

SuggestedRemedy

relationship to Also 156.1

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.1.3 P 49 L 23 # 75

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

The term "symbol" 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).

This is confusing.

SuggestedRemedy

Define a clear terminology (e.g. bits, quaternary symbols, DP-16QAM symbols) and apply it across 155.3.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.1.3 P 49 L 51 # 344

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

Comment Type E Comment Status A rewrite bucket

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)

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.1.3 P 51 L 3 # 479  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 "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.

CI 155 SC 155.3.1.3 P 51 L 13 # 480  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 Align CFEC and FAW/TS symbols (X) remove  
 SuggestedRemedy  
 Align CFEC and remove FAW/TS symbols (X) ?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.1.3 P 51 L 26 # 345  
 Zimmerman, George CME Consulting/APL Group, Cisco, Commscope, Ma  
 Comment Type TR Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 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 Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.2 P 50 L 1 # 263  
 Law, David Hewlett Packard Enterprise  
 Comment Type TR Comment Status A rewrite bucket  
 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 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 dependant.

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.

SuggestedRemedy

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\_i.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

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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

155.3.3.1.

#### 155.3.2.1.2 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.

#### 155.3.2.1.3 Effect of receipt

The PMA 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-bit 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  $n = 16 \times m$ .

##### 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.

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

See response to comment #346.

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*Cl* **155**      *SC* **155.3.2**                      *P* **50**                      *L* **3**                      # **264**

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*    *Response Status*    **C**

ACCEPT IN PRINCIPLE.

See response to comment #346.

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*Cl* **155**      *SC* **155.3.2**                      *P* **50**                      *L* **11**                      # **76**

Ran, Adeel    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*    *Response Status*    **C**

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.2 P 50 L 16 # 482  
 Dawe, Piers Nvidia  
 Comment Type TR Comment Status A rewrite bucket  
 \* ~50.212875 Gb/s: ~ too vague, signaling rate should be in GBd  
 SuggestedRemedy  
 Specify the rate without approximation  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.2 P 50 L 16 # 136  
 Nicholl, Gary Cisco Systems  
 Comment Type T Comment Status A rewrite bucket  
 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 ?20 ppm" . Isn't the nominal signalling rate known exactly ? I don't remember seeing the "approximate" sign used in other IEEE standards when referring to the nominal signaling rate?  
 SuggestedRemedy  
 This is more of a question of clarification ?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.2 P 50 L 16 # 265  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.3.2 says '... sends eight parallel bit streams to the PMA, each at a nominal signaling rate of ...'. Since this is a signalling rate, the unit of measurement should be in Bd rather than Hz (see the following paragraph).  
 SuggestedRemedy  
 Suggest that '... ~50.212875 Gb/s +/-20 ppm (~57.78 Gb/s).' should read '... ~50.212875 GBd +/-20 ppm (~57.78 GBd).' (where +/- is a plus-minus symbol).  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.2 P 51 L 18 # 266  
 Law, David Hewlett Packard Enterprise  
 Comment Type E Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 Either label the rectangle or delete it.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.2 P 51 L 19 # 15  
 Bruckman, Leon Huawei  
 Comment Type E Comment Status A rewrite bucket  
 Empty box without any fuction  
 SuggestedRemedy  
 Remove empty fbox from figure 155-10  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 155 SC 155.3.2 P 51 L 28 # 267

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.2 P 51 L 31 # 385

Wienckowski, Natalie General Motors

Comment Type E Comment Status A rewrite bucket

It's hard to see the text with the line through it.

SuggestedRemedy

Add a box around "400GBASE-ZR PMA sublayer" so the line is "behind" it.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.2 P 51 L 31 # 12

Lewis, Jon Dell Technologies

Comment Type E Comment Status A rewrite bucket

Text and arrow intersect.

SuggestedRemedy

Remove intersection of text and arrow to make the figure more legible.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.2 P 51 L 48 # 268

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Suggest that '... through a signal indication logic (SIL) that reports ...' should read '... through a signal indication logic (SIL) function that reports ...'.

SuggestedRemedy

See comment.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.2 P 51 L 49 # 269

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

Subclause 155.3.2 '400GBASE-ZR PMA service interface' says that 'The PMA: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 PMA: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.

SuggestedRemedy

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.2 P 51 L 49 # 77

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

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.

SuggestedRemedy

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.2 P 51 L 53 # 233

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

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.

CI 155 SC 155.3.3 P 52 L 3 # 213

Huber, Thomas Nokia

Comment Type E Comment Status A rewrite bucket

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 signals to and from the four analog signals."

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.3 P 52 L 5 # 483  
 Dawe, Piers Nvidia  
 Comment Type T Comment Status A rewrite bucket  
 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.

CI 155 SC 155.3.3 P 52 L 5 # 234  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.3.3 'Functions within the PMA' says 'The purpose of the PMA is to ... and optionally to provide test signals and loop-back.'  
 There, however, doesn't appear to be any subclauses under subclause 155.3 'Physical Medium Attachment (PMA) sublayer, type 400GBASE-ZR' that define test signals or loop-back.  
 SuggestedRemedy  
 Either add definitions defining test signals and loop back within the PMA or remove this text from subclause 155.3.3.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3 P 52 L 9 # 235  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.3.3 'Functions within the PMA' says '... elements of a symbol, namely IX, QX, IY, or QY, ...', referencing IX, QX, IY, and QY as 'elements' of a DP-16QAM symbol. Subclause 155.3.3.1 'Gray mapping and polarization distribution' says '- (c8i, c8i+1) maps to the in-phase (I) component of the X-polarization of si' referencing IX, QX, IY, and QY as 'components' of a DP-16QAM symbol.  
 SuggestedRemedy  
 Suggest that either 'element' or 'component' be used consistently to describe IX, QX, IY, and QY used to form a DP-16QAM symbol.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.1 P 52 L 15 # 78  
 Ran, Adeo Cisco  
 Comment Type T Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.1 P 52 L 21 # 484  
 Dawe, Piers Nvidia  
 Comment Type TR Comment Status A rewrite bucket  
 This says the PMA does Gray de-mapping then it says it doesn't the PCS does it.  
 SuggestedRemedy  
 Remove lines 20-25, add appropriate material to PCS section.  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 155 SC 155.3.3.1 P 52 L 27 # 80

Ran, Adee Cisco

Comment Type T Comment Status A rewrite bucket

"Note that the receive process mapping of Gray-coded signals is applicable only after the SD-FEC decoder process in the 400GBASE-ZR PCS"

This means that the Gray de-mapping function is not part of the PMA but part of the PCS; indeed, the service interface of the PMA is based on ADC samples, not bits, and the Gray de-mapping does not appear in Figure 155-10, because it cannot be performed until SD-FEC decoding (in the PCS) is completed.

Similarly, the Gray mapping in the Tx direction logically belongs in the PCS, because its output is Gray-coded symbols.

*SuggestedRemedy*

Possibly, move the content of the Gray mapping function to the PCS (retaining the polarization distribution in the PMA).

Or find another way to cleanly separate these functions.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.1 P 52 L 28 # 342

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

Comment Type TR Comment Status A rewrite bucket

"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.

*SuggestedRemedy*

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.1 P 52 L 32 # 237

Law, David Hewlett Packard Enterprise

Comment Type ER Comment Status A rewrite bucket

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

*SuggestedRemedy*

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.1 P 52 L 32 # 236

Law, David Hewlett Packard Enterprise

Comment Type ER Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.3.1 P 52 L 32 # 81

Ran, Adee Cisco

Comment Type T Comment Status A rewrite bucket

"Each 128-bit code word from the SD-FEC encoder  $c = [c_0, c_1, \dots, c_{127}]$ , is mapped to sixteen DP-16QAM symbols (S)"

Does the PMA have to be aligned with the SD-FEC encoder codewords?

If so, the alignment function is not defined; it may be more appropriate to define the service interface in the Tx direction in terms of 128-bit codewords instead of bits on 8 lanes, such that the alignment is inherent.

If not, please clarify that the 128-bit blocks start point within the SD-FEC codeword is arbitrary.

A similar question holds for the Rx direction (based on the text in 155.3.3.8) - is the alignment of SD-FEC defined as a PMA function or a PCS function?

*SuggestedRemedy*

From 155.3.3.2 it seems that alignment is necessary, so the service interface should be defined with 128-element vectors (instead of lanes), and perhaps use tx\_word instead of tx\_symbol and rx\_word instead of rx\_symbol.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.2 P 52 L 53 # 238

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 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.

CI 155 SC 155.3.3.2 P 53 L 33 # 240

Law, David Hewlett Packard Enterprise

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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.3.2 P 53 L 34 # 215  
 Huber, Thomas Nokia  
 Comment Type TR Comment Status A rewrite bucket  
 The intended interleaving is that first symbol of each of 16 codewords is transmitted, then the second symbol, etc. The example is not consistent with that - S(1,1) should follow S(0,1) rather than S(0,2) (as seen in figure 155-11).  
 SuggestedRemedy  
 Change S0,2 to S1,1  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.2 P 54 L 11 # 216  
 Huber, Thomas Nokia  
 Comment Type T Comment Status A rewrite bucket  
 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.

CI 155 SC 155.3.3.3 P 54 L 27 # 241  
 Law, David Hewlett Packard Enterprise  
 Comment Type TR Comment Status A rewrite bucket  
 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 W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.3 P 54 L 31 # 242  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 Subclause 155.3.3.3 '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.  
 SuggestedRemedy  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.3 P 54 L 32 # 137  
 Nicholl, Gary Cisco Systems  
 Comment Type E Comment Status A rewrite bucket  
 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"  
 SuggestedRemedy  
 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 Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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Cl 155 SC 155.3.3.3 P 54 L 37 # 243

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

The second paragraph of subclause 155.3.3.3 '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.

*SuggestedRemedy*

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

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.3 P 55 L 4 # 244

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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 every 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.

*SuggestedRemedy*

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

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.3 P 55 L 10 # 245

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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>.

*SuggestedRemedy*

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.3.3.3 P 55 L 11 # 270

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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 sperate frame for each polarization.

SuggestedRemedy

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.3 P 55 L 25 # 271

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

Subclause 155.3.3.3 'Insert FAW, TS and PS symbols' says 'The super-frame and sub-frame formats are shown in Figure 155-12.', however the title of Figure 155-12 'Transmission frame and sub-frame organization and bit ordering' and there doesn't seem to be any illustration of a super-frame.

SuggestedRemedy

- [1] Suggest the title of Figure 155-12 be changed to read 'Super-frame and sub-frame organization and bit ordering'.
- [2] Suggest that the transmission order of the sub-frame and sub-frames to from a super-frame be added to the figure.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.3.1 P 55 L 40 # 485

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

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

SuggestedRemedy

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.3.3.3.3 P 57 L 3 # 82

Ran, Adeo 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.

SuggestedRemedy

Rewrite to clarify.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 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

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?

*SuggestedRemedy*

Suggest that the text 'The seed is reset at the start of every sub-frame, so that the same ...' be changed to read 'The generator is initialized using the seed at the start of every sub-frame, so that the same ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.3.3 P 57 L 8 # 273

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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'.

*SuggestedRemedy*

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.3.3.3 P 57 L 10 # 274  
 Law, David Hewlett Packard Enterprise  
 Comment Type E Comment Status A rewrite bucket  
 Since the abbreviation 'PS' is 'pilot sequence' the text '... PS sequence ...' expands to '... pilot sequence sequence ...'.  
 SuggestedRemedy  
 Suggest the text '... the complete PS sequence is ...' be changed to read '... the complete PS is ...'.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.3.3 P 57 L 12 # 275  
 Law, David Hewlett Packard Enterprise  
 Comment Type E Comment Status A rewrite bucket  
 Add an arrow head to the line from P8, P4 and P3 where they connect to the XOR logic operator symbol.  
 SuggestedRemedy  
 See comment.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.3.3 P 57 L 14 # 486  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 Missing arrowheads on 3 vertical paths  
 SuggestedRemedy  
 Add them  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.3.3 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  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.3.3 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  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

CI 155 SC 155.3.3.4 P 58 L 30 # 277  
 Law, David Hewlett Packard Enterprise  
 Comment Type T Comment Status A rewrite bucket  
 The title of subclause 155.3.3.4 is '16QAM encode and signal drivers' however I don't think IEEE P802.3cw specifies a physical instantiation of the PMD service interface, and I don't see any text related to signal drivers in subclause 155.3.3.4. Perhaps it would be better to reference the DAC (see Figure 155-10) to parallel the title of subclause 155.3.3.5 below.  
 SuggestedRemedy  
 Suggest that the title of subclause 155.3.3.4 is changed to read '16QAM encode and DAC'.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

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CI 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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.4.1 P 58 L 38 # 83

Ran, Adeo 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

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.4.1 P 58 L 39 # 191

D'Ambrosia, John Fuuturwei, US Subsidiary of Huawei

Comment Type E Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.4.1 P 58 L 42 # 139

Nicholl, Gary Cisco Systems

Comment Type ER Comment Status A rewrite bucket

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).

*SuggestedRemedy*

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.3.3.5 P 58 L 45 # 341

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

Comment Type TR Comment Status A rewrite bucket

"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".

SuggestedRemedy

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.5 P 58 L 45 # 343

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

Comment Type TR Comment Status A rewrite bucket

"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".

SuggestedRemedy

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.3.3.5 P 58 L 47 # 84

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

The signals IX/QX/IY/QY are just signals (per 155.3.3.4 and 156.1), and are not "coherent" by themselves. The coherency is part of the PMD.

SuggestedRemedy

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.

CI 155 SC 155.3.3.6 P 59 L 22 # 85

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

"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 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.

SuggestedRemedy

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.

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CI 155 SC 155.3.3.8 P 60 L 4 # 87

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

"comprising sixteen symbols encoded as shown in Table 155-2 but at a higher resolution than 8 bits"

SD-FEC codewords are by definition 128 bits; and table 155-2 shows mapping of bit tuples into output symbols.

Also, according to the next paragraph, the output of the process is a single stream of samples, not codewords.

This text seems to specify that the input to the decoder should be four streams of samples (combinations of X/Y and I/Q) with more than two bits per sample.

SuggestedRemedy

Rewrite to clarify.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2 P 60 L 22 # 88

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

The subclause hierarchy below "State variables" is unnecessary, and includes subclauses that are not about state variables (155.4.2.2 through 155.4.2.4)

SuggestedRemedy

Delete 155.4.2 and move its subclauses upper in the hierarchy (to become 55.4.2 through 155.4.5).

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 60 L 26 # 280

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

Assuming this is a boolean variable, suggest this should be noted in the variable description, as with other boolean variables.

SuggestedRemedy

Suggest that 'A variable set by the ...' should read 'A boolean variable set by the ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 60 L 29 # 281

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

The description of the 'pma\_enable\_deskew' variable says 'A boolean variable that enables and disables the PMA deskew process.'. Is this correct as 'pma\_enable\_deskew' is an output of the Figure 155 15 'PMA deskew state diagram' that doesn't appear to be used anywhere else.

SuggestedRemedy

Suggest the description of the 'pma\_enable\_deskew' variable should be changed to read 'A Boolean variable that set to true when deskew is enabled and set to false when deskew is disabled. Received symbols may be discarded whenever deskew is enabled.'.

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

CI 155 SC 155.4.2.1 P 60 L 34 # 140

Nicholl, Gary Cisco Systems

Comment Type T Comment Status A rewrite bucket

Definiton of "pma\_alignment\_valid" variable. Reading the previous text it is not clear exactly what consititues 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 refelct thefunctional descriptions earlier in this clause. This comment also applies to other variables defined in 155.4.2.1, that refer to "PMA lanes".

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.4.2.1 P 60 L 44 # 285

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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.

See also my other comment suggest separate 'pma\_signal\_ok' and 'pcs\_signal\_ok' variables.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 60 L 44 # 284

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

The description of the 'signal\_ok' variable says 'A boolean variable that is set based on the most recently received value of PMA:IS\_SIGNAL.indication(SIGNAL\_OK).' however that is generated by the PMA, see last paragraph of subclause 155.3.2 400GBASE-ZR 'PMA service interface'.

*SuggestedRemedy*

[1] Rename the 'signal\_ok' variable used in Figure 155-14 'Frame alignment word (FAW) lock state diagram' to be 'pma\_signal\_ok'.

[2] Rename the 'signal\_ok' variable used in Figure 155-16 'Alignment marker lock state diagram' to be 'pcs\_signal\_ok'.

[3] Rename the 'signal\_ok' variable defined in subclause 155.4.2.1 'Variables' to be 'pcs\_signal\_ok' and change the description to read 'A Boolean variable that is set based on the most recently received SIGNAL\_OK parameter of the PMA:IS\_SIGNAL.indication primitive. It is true if the value was OK and false if the value was FAIL'.

[4] Add a new variable 'pma\_signal\_ok' with the description 'A Boolean variable that is set by the signal indication logic (see 155.3.2). It is true when symbols received from the PMD are being processed successfully by the signal processing, false otherwise.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 60 L 51 # 405

Slavick, Jeff Broadcom

Comment Type T Comment Status A rewrite bucket

Definition of restart\_lock begins by talking about how it affects all lanes, then states it activates when 15 FAWs fail to match, but doesn't clearly define that's 15 failures in a row on a single PMA lane.

*SuggestedRemedy*

Change "fail to match" to "fail to match on a given PMA lane"

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.4.2.1 P 61 L 3 # 141

Nicholl, Gary Cisco Systems

Comment Type TR Comment Status A rewrite bucket

Definition of variable "faws\_lock<x>". A number of issues here. Firstly the text states that "...receiver has detected the location of the FAW for a given lane on the PMA service interface.". There is no "FAW" on the "PMA service interface" (i.e. the interface above the PMA sublayer) as the FAW is inserted/removed by the PMA sublayer itself. I think what is meant here is the "PMD service interface" and not the "PMA service interface"? Secondly the description states "...where x=0:3". This suggests that there are four separate FAWs being locked to, whereas according to section 155.3.3.3 and Figure 155-10 there is only a single FAWs inserted per polarization, so one FAW for X polarization and one FAW for Y polarization.

*SuggestedRemedy*

Correct the reference to the PMD service interface (if the assumption in the comment is correct) and explain why there are 4 "faws\_lock<x>" boolean variables when according to section 155.3.3.3 there are only two FAWs (one for X polarization and one for Y polarization)

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.4.2.1 P 61 L 11 # 142

Nicholl, Gary Cisco Systems

Comment Type ER Comment Status A rewrite bucket

Definiton of "faw\_valid". The references to "Table 155-3" and section "155.3.3.3.1" are not active cross-references.

*SuggestedRemedy*

Correct cross-references.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.4.2.1 P 61 L 11 # 287

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

The description of the 'faw\_valid' variable says 'The FAW consists of one of the sequences listed in Table 155-3.' but then '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 sequence listed in Table 155-3, and the candidate sequences received over the PMD service interface, are both 22 DP-16QAM symbols, not 44 bits. Based on 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](https://www.ieee802.org/3/cw/public/22_0523/sluyski_3cw_01a_220523.pdf#page=4)> referencing a 'QPSK FAW' value of 44 in the spreadsheet, I assume the reference to 36 bits matching the 44 known bits should be to 36 16QAM symbols matching the 44 16QAM symbols (which form the 22 DP-16QAM symbol FAW sequence), defined in Table 155-3.

Additionally, isn't it the case that the four components of the DP-16QAM symbols of the candidate 22 symbol block received over the four-lane PMD service interface can be mapped to the four lanes in any of eight ways defined in Table 155-7? If that is the case, suggest that this is also addressed in the description of the 'faw\_valid' variable.

*SuggestedRemedy*

Suggest that the 'faw\_valid' variable description should be changed to read:

A Boolean variable that is set to true if the candidate 22 DP-16QAM symbol block received over the four-lane PMD service interface is a valid FAW sequence. The candidate 22 DP-16QAM symbol block is compared to the FAW sequence defined in Table 155-3, considering all permitted PMD service interface lanes mappings defined in Table 155-7. The candidate 22 DP-16QAM symbol block is considered to be a valid FAW sequence if at least 36 of its component 16QAM symbols match, in value, sequence position, and the 44 known 16QAM symbols of the FAW sequence defined in Table 155-3.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.4.2.1 P 61 L 11 # 288

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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.

*SuggestedRemedy*

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 61 L 14 # 13

Bruckman, Leon Huawei

Comment Type T Comment Status A rewrite bucket

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

*SuggestedRemedy*

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 61 L 18 # 289

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

Subclause 155.3.3.3 'Insert FAW, TS and PS symbols' says that 'A super-frame is defined as .... including 175 616 payload symbols and 6272 additional symbols.' and that 'The first sub-frame of a super-frame includes ... a 22-symbol FAW (faw<0:21>) ... and 3488 payload symbols (m<0:3487>)'. Based on this it seems that the FAW is not considered part of the payload.

*SuggestedRemedy*

Since the title of subclause 155.3.3.3.1 'Frame alignment word (FAW) sequence', suggest that the four instances of '... FAW payload ...' (page 61, lines 16, 18, 20 and 23) be changed to read '... FAW sequence ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.1 P 61 L 19 # 290

Law, David

Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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 155-9 where pma\_lane\_mapping<x> 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', 'ly' 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'. Doesn't the PMD lane mapping row selected from Table 155-7 to achieve faw\_valid = TRUE inherently provide the 'current\_pmal' and 'pma\_lane' values (see my comment on faw\_valid)?

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.'

#### SuggestedRemedy

[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. It 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.

ly: 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<x> = 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:

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See first\_pmal.

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

Response Response Status **W**

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

Defintion of variable "pma\_lane". The defintion 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 sevice 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 interfece".

Fix the cross-reference to Table 155-3.

Response Response Status **W**

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.4.2.1 P 61 L 33 # 291

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.

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 fromo Table 155-9

Response Response Status **W**

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.4.2.2 P 62 L 28 # 292

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.3 P 62 L 40 # 293

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Subclause 155.4.2.3 'Counters' defines 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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 60 L 48 # 286

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.4.2.4 P 63 L 4 # 14

Bruckman, Leon Huawei

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)

*SuggestedRemedy*

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 63 L 7 # 294

Law, David Hewlett Packard Enterprise

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.

*SuggestedRemedy*

Change the text '... the PMA service interface.' to read '... the PMD service interface.'

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 63 L 12 # 295

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

Subclause 155.4.2.4 'State diagrams' says that 'The PCS shall implement the alignment marker lock process as shown in Figure 155-16 to identify the AM sequence at the start of each 400GBASE-ZR frame by observing data from the SC-FEC decoder output.', however Figure 155-2 (page 35, line 20) shows the 'AM/OH detect & removal' block after the 'CRC32 checking' block and subclause 155.2.5.7 'AM and OH detect and removal' says '.... after removal of CRC32, MBAS, and pad, ...'.

*SuggestedRemedy*

Suggest that the text '... by observing data from the SC-FEC decoder output.' be changed to read '... by observing data from the CRC32 check and error marking output.'

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 64 L 1 # 89

Ran, Adeo Cisco

Comment Type E Comment Status A rewrite bucket

The state diagram has several blocks in which text of assignment statements wraps to the next line. There is enough room to prevent that.

*SuggestedRemedy*

Resize blocks (changing layout if required) to prevent wrapping lines.

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 155.4.2.4 P 64 L 3 # 296

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

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](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. There, 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<x> from subclause 155.4.2.1 'Variables' and Figure 155-14.

[2] Change the description of the 'faws\_lock<x>' 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 next 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.

[14] Add the assignment 'pma\_align\_status <= TRUE' to the '2\_GOOD' state of Figure 155-14.

[15] Delete Figure 155-15.

[16] 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'.

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

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.4.2.4 P 64 L 15 # 217

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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.4.2.4 P 64 L 15 # 297

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.

CI 155 SC 155.4.2.4 P 64 L 19 # 299

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.

CI 155 SC 155.4.2.4 P 64 L 19 # 298

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

There is no definition of the 'prev\_pmal' variable used in the 'INVALID\_FAW' state of figure 155-14 'Frame alignment word (FAW) lock state diagram', and there is no use or reference to the 'prev\_pmal' variable elsewhere in the IEEE P802.3cw draft.

*SuggestedRemedy*

Delete the assignment 'prev\_pmal <= prev\_pmal + 4) mod 252' from the 'INVALID\_FAW' state.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 64 L 22 # 300

Law, David Hewlett Packard Enterprise

Comment Type T 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.

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CI 155 SC 155.4.2.4 P 64 L 24 # 301

Law, David Hewlett Packard Enterprise

Comment Type T Comment Status A rewrite bucket

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.

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 '15\_BAD' state to the 'LOCK\_INIT' state.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 64 L 42 # 303

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

The variable 'PMA\_lane\_mapping' in the 2\_GOOD state of the Frame alignment word (FAW) lock state diagram should read 'pma\_lane\_mapping' based on the definition in subclause 155.4.2.1 (page 61, line 34).

SuggestedRemedy

Change the text 'PMA\_lane\_mapping<x> <= current\_pma1' in the 2\_GOOD state in Figure 155-14 to read 'pma\_lane\_mapping<x> <= current\_pma1'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 64 L 48 # 304

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Since the title of Figure 155-15 is 'PMA deskew state diagram' suggest that PMA should be added to the title of Figure 155-14 and PCS to the title of Figure 155-16.

SuggestedRemedy

Suggest that:

[1] The title of Figure 155-14 should be changed to read 'PMA Frame alignment word (FAW) lock state diagram'.

[2] The title of Figure 155-16 should be changed to read 'PCS Alignment marker lock state diagram'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 66 L 8 # 305

Law, David Hewlett Packard Enterprise

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 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

CI 155 SC 155.4.2.4 P 66 L 11 # 306

Law, David Hewlett Packard Enterprise

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 66 L 18 # 307

Law, David Hewlett Packard Enterprise

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.4.2.4 P 66 L 24 # 308

Law, David Hewlett Packard Enterprise

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 Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.5 P 67 L 3 # 310

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Strictly speaking, protocol agnostic management 'objects' are defined in Clause 30, with protocol specific 'objects' defined in IEEE Std 802.3.1 and IEEE Std 802.3.2.

SuggestedRemedy

Since the title of subclause 45.2 in IEEE Std 802.3-2022 is 'MDIO Interface registers', suggest that the text 'The following objects apply ...' in subclause 155.5 be changed to read 'The following registers apply ...'.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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Cl 155 SC 155.5 P 67 L 3 # 488  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 The following objects apply to: objects?  
 SuggestedRemedy  
 Reword  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.5.1 P 67 L 9 # 489  
 Dawe, Piers Nvidia  
 Comment Type E Comment Status A rewrite bucket  
 in 45  
 SuggestedRemedy  
 in Clause 45 and why green when line 4 has black?  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.5 P 67 L 10 # 311  
 Law, David Hewlett Packard Enterprise  
 Comment Type E Comment Status A rewrite bucket  
 Subclause 155.5 '400GBASE-ZR PCS and PMA management' uses the term 'provided' yet the following subclause 155.5.1 'PCS and PMA MDIO function mapping' uses 'implemented' about the MDIO interface.  
 SuggestedRemedy  
 Suggest that in subclause 155.5 '400GBASE-ZR PCS and PMA management' the text 'If an MDIO interface is provided ...' is changed to read 'If an MDIO interface is implemented ...'.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.5.1 P 67 L 15 # 144  
 Nicholl, Gary Cisco Systems  
 Comment Type TR Comment Status A rewrite bucket  
 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.  
 SuggestedRemedy  
 Define a FEC degrade monitoring scheme for 400GBASE-ZR (similar to what was done in section 119.2.5.3 for 400GBASE-R).  
 Response Response Status W  
 ACCEPT IN PRINCIPLE.  
 See response to comment #346.

Cl 155 SC 155.5.1 P 67 L 9 # 33  
 Marris, Arthur Cadence Design Systems  
 Comment Type E Comment Status A rewrite bucket  
 Insert correct cross reference  
 SuggestedRemedy  
 Replace 45 with a subclause number or a cross reference to Clause 45  
 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 155.5.1 P 67 L 28 # 490

Dawe, Piers Nvidia

Comment Type TR Comment Status A rewrite bucket

FEC degraded SER activate threshold register should be PCS FEC degraded SER activate threshold register, but it's for Clause 119 PCS RS(544,514) FEC and there is no FEC degraded SER feature in this draft.

SuggestedRemedy

Delete the four FEC degraded SER rows

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.5.1 P 67 L 37 # 145

Nicholl, Gary Cisco Systems

Comment Type TR Comment Status A rewrite bucket

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

SuggestedRemedy

Define FEC monitoring for the SD-FEC.

Response Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

Cl 155 SC 155.5.1 P 67 L 37 # 146

Nicholl, Gary Cisco Systems

Comment Type T Comment Status A rewrite bucket

Table 155-9 has a MDIO variable called "SC-FEC AM lock, which referes to a PCS/PMS variable "amps\_locked". However when I look in section 155.4.2 (state variables), "amps\_lock" is based on locking onto the aignment marker (AM). But then in Figure 155-2 it appears that the "AM detect" block appears after the "SC-FEC decoding" block, so how can "amps\_lock" be used to lock onto the SC-FEC frame ? Are the AM frames and the SC-FEC frames aligned, and is the AM used by the SC-FEC decoding block to lock onto the SC-FEC frame .

SuggestedRemedy

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

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

CI 155 SC 155.5.1 P 67 L 46 # 406

Slavick, Jeff Broadcom

Comment Type TR Comment Status A rewrite bucket

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).

153.5.1.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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.5.1 P 67 L 46 # 407

Slavick, Jeff Broadcom

Comment Type TR Comment Status A rewrite bucket

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 Response Status W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.5.1 P 67 L 47 # 491

Dawe, Piers Nvidia

Comment Type E Comment Status A rewrite bucket

broken variable names

*SuggestedRemedy*

Widen the right column width until they fit

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

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CI 155 SC 155.5.1 P 68 L 1 # 147

Nicholl, Gary Cisco Systems

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

The description for "FEC degraded SER" is missing from the draft.

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

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 155 SC 155.5.1 P 68 L 27 # 312

Law, David Hewlett Packard Enterprise

Comment Type TR Comment Status A rewrite bucket

Register bits 3.52.3:0 (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 PCS 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<x>' 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 marker (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 is 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.

*SuggestedRemedy*

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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'.

[4] Delete the last row of Table 155-9.

[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* *Response Status* **W**

ACCEPT IN PRINCIPLE.

See response to comment #346.

<i>Cl</i> <b>155</b>	<i>SC</i> <b>155.5.1</b>	<i>P</i> <b>68</b>	<i>L</i> <b>30</b>	<i>#</i> <b>194</b>
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D'Ambrosia, John

Fuuturwei, US Subsidiary of Huawei

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

Why is there a reference to a PCS lane alignment status? There are no PCS lanes in the 400GBASE-ZR PHY

*SuggestedRemedy*

Looks like this was intended to be PMA lane alignment status

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

ACCEPT IN PRINCIPLE.

See response to comment #346.

<i>Cl</i> <b>155</b>	<i>SC</i> <b>155.7.4.1</b>	<i>P</i> <b>70</b>	<i>L</i> <b>24</b>	<i>#</i> <b>346</b>
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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 "shalls". 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* *Response Status* **W**

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](https://www.ieee802.org/3/cw/public/22_10/dambrosia_3cw_01b_221018.pdf)

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

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, Adeo 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 13 # 94

Ran, Adeo 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.

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

CI 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.

CI 156 SC 156.2 P 75 L 18 # 96

Ran, Adeo 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.

CI 156 SC 156.3.2 P 75 L 41 # 98

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

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.

*SuggestedRemedy*

Add a statement that that there is no skew variation at TP2.

If skew variation between the PMDs isn't relevant, change also the text about skew variation at SP3 and SP4, as in 140.3.2.

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

CI 156 SC 156.3.2 P 75 L 44 # 193

D'Ambrosia, John Fuuturewei, 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

*SuggestedRemedy*

Revisit skew constraints as needed.  
The diagram reference should be 116-4.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 156 SC 156.3.2 P 75 L 44 # 99

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

Figure 80-8 applies to 100GBASE-R PHYs. The diagram for skew points for 400GBASE-R PHYs is in Figure 116-5.

Also, there SP0 and SP7 are not defined for 400GBASE-R PHYs.

*SuggestedRemedy*

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.

CI 156 SC 156.3.2 P 75 L 46 # 317

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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 156 SC 156.3.2 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 W

ACCEPT IN PRINCIPLE.

See response to comment #346.

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

CI 156 SC 156.5.2 P 77 L 35 # 321

Law, David Hewlett Packard Enterprise

Comment Type E Comment Status A rewrite bucket

Rather than being requested by the PMD service interface messages, messages are passed across the PMD service interface, either from the PMA to the PMD or from the PMD to the PMA. In addition, abstract service interfaces pass data in the parameters of primitives. In the case of the inter-sublayer service interface primitives defined in subclause 116.3 referenced by IEEE P802.3cw, these parameters are tx\_symbol (see 116.3.3.1.1) and rx\_symbol (see 116.3.3.2.1).

SuggestedRemedy

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 ...'.

[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 ...'.

[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 (page 58, line 33) is changed to read 'The four analog signals are passed across the PMD service interface to the PMD in the tx\_symbol parameters of the PMD:IS\_UNITDATA\_0.request to PMD:IS\_UNITDATA\_3.request primitives.'

[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.' 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.'

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.

CI 156 SC 156.9.1 P 86 L 35 # 108

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

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.

CI 156 SC 156.9.1 P 86 L 42 # 109

Ran, Adeo Cisco

Comment Type T Comment Status A rewrite bucket

It is unclear why some parameters have pattern "valid 400GBASE-R signal, 5" while other have only 5 (which is the only test pattern defined in this clause, and sufficient for measurement of all parameters).

"valid 400GBASE-R signal" is inadequate here - 400GBASE-R usually refers to the data created by a clause 119 PCS; but ZR is a special case - any 400GBASE-R data has to be processed by the full ZR stack.

SuggestedRemedy

Change pattern to either "5" in all rows, or "valid 400GBASE-ZR signal" in all rows.

Consider removing the pattern column and just stating in text that all parameters are specified with test pattern 5.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #346.