

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

Cl 00 SC 0 P L # 29
 Anslow, Pete Ciena

Comment Type E Comment Status A Bucket

Many sections of this draft are making changes to clauses that are also being modified by P802.3bw (which has completed Sponsor ballot), P802.3bq, P802.3bn, P802.3bp, and P802.3by which are likely to be approved before P802.3bs.

SuggestedRemedy

Keep the base text of the draft in line with the 802.3 standard as modified by P802.3bw, P802.3bq, P802.3bn, P802.3bp, and P802.3by as they progress. Also, bring in any new instances of text that are added to any of these drafts that require modification for 400G with changes as appropriate.

Response Response Status C
 ACCEPT.

Cl 00 SC 0 P 145 L 33 # 30
 Anslow, Pete Ciena

Comment Type T Comment Status A

Having chosen to form the PCS lanes by symbol interleaving from two FEC codewords, the BER requirement for all four PMDs could be relaxed to 2.4E-4 (0.1 dB optical penalty) while still only requiring the total BER due to the electrical sub-links to be 3.5E-5 (see anslow_3bs_03_0915). This change was discussed on the SMF Ad Hoc call on 6 October and no objections were raised.

SuggestedRemedy

In 121.1.1, 122.1.1, and 123.1.1, change "2 x 10-4" to "2.4 x 10-4" (in black font).

Response Response Status C
 ACCEPT.

Cl 00 SC 0 P 145 L 34 # 31
 Anslow, Pete Ciena

Comment Type T Comment Status A

The format of the four D1.0 "Bit error ratio" subclauses follows that of Clause 95 where the additional errors due to CAUI-4 are negligible. For 400G, with 0.1 dB degradation allowed for the electrical link, a PMD that only gives an FLR of 6.2 x 10-11 when processed by Clause 119 FEC will not meet that FLR when additional errors from the electrical sub-links are added. This was discussed on the SMF Ad Hoc call on 6 October and no objections were raised to the principle of the proposed change.

SuggestedRemedy

In 121.1.1, 122.1.1, and 123.1.1, change "6.2 x 10-11" to "9.2 x 10-13" in two places for each subclause (in black font).
 Also in each subclause, add the following sentence to the end of the first paragraph: "For a complete Physical Layer, the frame loss ratio may be degraded to 6.2 x 10-11 for 64-octet frames with minimum interpacket gap due to additional errors from the electrical interfaces."

Response Response Status C
 ACCEPT.

Cl 1 SC 1.4 P 25 L # 128
 D'Ambrosia, John Independent

Comment Type ER Comment Status A

add definitions for CDMII Extender and CDXS

SuggestedRemedy

add following
 CDMII Extender - The 400 Gigaibt Media Independent Interface Extender consists of two CDXS sublayers with a physical instantiation of a CDAUI between them. It is being defined as a mechanism for future 400 Gigabit Ethernet PHYs that will utilize a PCS sublayer different than Clause 119,

CDXS Sublayer - The 400 Gigabit Extender Sublayer (CDXS) is part of the CDMII Extender (Clause 118). Its functionality is identical to the PCS Sublayer (Clause 119).

Response Response Status C
 ACCEPT IN PRINCIPLE.
 Add:

1.4.72d CDMII Extender: The 400 Gb/s Media Independent Interface Extender consists of two CDXS sublayers with a CDAUI-n between them. It is defined as a mechanism for future 400 Gigabit Ethernet PHYs that utilize a PCS sublayer other than that defined in Clause 119. (See IEEE Std 802.3, Clause 118.)

1.4.72e CDXS: The 400 Gb/s Extender Sublayer (CDXS) is part of the CDMII Extender. Its functionality is identical to the PCS Sublayer defined in Clause 119. (see IEEE Std 802.3, Clause 118.)

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Cl 1 SC 1.4 P 25 L 28 # 127
 D'Ambrosia, John Independent

Comment Type ER Comment Status A
 Definitions for -DR4, -FR8, and -LR8 do not reflect their PAM-4 modulation

SuggestedRemedy

Change definitions as noted below
 1.4.72e 400GBASE-DR4: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding and 4-level pulse amplitude modulation over four lanes of single-mode fiber, with reach up to at least 500 m. (See IEEE Std 802.3, Clause 122.)

1.4.72f 400GBASE-FR8: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding and 4-level pulse amplitude modulation over eight WDM lanes on single-mode fiber, with reach up to at least 2 km. (See IEEE Std 802.3, Clause 123.)

1.4.72g 400GBASE-LR8: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding and 4-level pulse amplitude modulation over eight WDM lanes on single-mode fiber, with reach up to at least 10 km. (See IEEE Std 802.3, Clause 123.)

Response Response Status C
 ACCEPT.

Cl 45 SC 45 P 0 L 0 # 103
 Slavick, Jeff Avago Technologies

Comment Type TR Comment Status A Bucket
 PCS receive link status includes 10/40/100BASE-R but is missing 400G

SuggestedRemedy

Add 400 to the list

Response Response Status C

ACCEPT IN PRINCIPLE.
 Bring the third sentence of 45.2.3.2.7 (as modified by IEEE Std 802.3by-201x and IEEE Std 802.3bq-201x) into the draft and change "10/25/40/100GBASE-R" to "10/25/40/100/400GBASE-R"

Cl 45 SC 45.2.1 P 32 L 8 # 121
 Marris, Arthur Cadence Design Syst

Comment Type E Comment Status A Bucket
 The style manual specifically says (18.2.2) "Replace shall be used only for figures and equations" and "Change shall be used when text and tables are being modified (...)" (deletions and instructions) should be indicated".

SuggestedRemedy

Use editing instruction "change" rather than "replace" here.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Change the editing instruction on line 8 to:
 "Change the reserved row for 1.20 through 1.29 in Table 45-3 (as modified by IEEE Std 802.3by-201x) as follows (unchanged rows not shown):" and modify the table segment accordingly.

Change the editing instruction on line 40 to:
 "Change the reserved row for 1.340 through 1.699 in Table 45-3 as follows (unchanged rows not shown):" and modify the table segment accordingly.

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CI 45 SC 45.2.1 P 32 L 34 # 145
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

There are no RS-FEC Lanes in 802.3bs. The RS-FEC is an integral part of the PCS, and therefore there are only PC Lanes. Also RS-FEC symbol errors are monitored as part of the PCS. As far as I know there is no way to map RS-FEC symbol errors to specific PMA/PMD lanes, and so any mention of RS-FEC symbol errors should be under the PCS register section.

SuggestedRemedy

Change RS-FEC Lane to PCS Lane. and move any reference of RS-FEC symbol error counts to the PCS register section.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Remove the change to the rows for "1.210 through 1.217" and "1.218 through 1.229" and remove the inserted row for "1.600 through 1.611" in Table 45-3.
 Remove the changes to 45.2.1.107.
 Remove 45.2.1.116f.

Add new registers 3.600 through 3.631 for "PCS FEC symbol error counter, lane 0" through "PCS FEC symbol error counter, lane 15"
 Add new register 3.800 for "PCS FEC control register" with bit 3.800.0 as "PCS FEC bypass correction enable"
 Add new register 3.801 for "PCS FEC status register" with bit 3.801.0 as "PCS FEC bypass correction ability"
 Add new registers 3.803 and 3.804 for "PCS FEC corrected codewords counter"
 Add new registers 3.805 and 3.806 for "PCS FEC uncorrected codewords counter" with editorial licence.

Change the rows for:
 FEC bypass correction enable
 FEC bypass correction ability
 FEC corrected codewords
 FEC uncorrected codewords
 FEC symbol errors
 in Table 119-4 to match the new registers.

If comment #115 adds a bypass error indication feature to Clause 119, then add:
 bit 3.800.1 as "PCS FEC bypass indication enable"
 bit 3.801.1 as "PCS FEC bypass indication ability"
 bit 3.801.2 as "PCS FEC high SER"

See also comments #100, #101, and #147

CI 45 SC 45.2.1 P 33 L 7 # 193
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A

Table 45-3. For Register address 1.499, the Register name should be CDAUI-16 chip-to-module recommended CTLE, since CDAUI-8 chip-to-module does not use recommended CTLE. CDAUI-8 chip-to-module only uses Adaptive Equalization.

SuggestedRemedy

Replace CDAUI-n with CDAUI-16.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #146

CI 45 SC 45.2.1 P 33 L 7 # 146
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

The "recommend CTLE value" only applies to CDAUI-16 (16x25G). Similar comment applies to line 9 and line 12.

SuggestedRemedy

Replace CDAUI-n with CDAUI-16. Check for consistency throughout rest of Clause.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Change the name of register 1.499 to "CDAUI-16 chip-to-module recommended CTLE" and change "CDAUI-n" to "CDAUI-16" throughout 45.2.1.116a and 45.2.1.116a.1.
 See also comments #193, #194, #148, #195, #149, and #197

CI 45 SC 45.2.1.101.1 P 0 L 0 # 100
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A

FEC bypass indication enable MDIO register is missing

SuggestedRemedy

Bring in 45.2.1.101.1 from 802.3by and add reference to appropriate Clause 119 sub-clause

Response Response Status C

ACCEPT IN PRINCIPLE.
 FEC bypass indication is not a feature of the PCS currently defined in Clause 119.

Note, comment #115 proposes to add this feature.
 See response to comment #145

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Cl 45 SC 45.2.1.102 P 0 L 0 # 101
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A

RS-FEC status register needs updates

SuggestedRemedy

Bring in 45.2.1.102.2 and update FEC align status, FEC AM lock *, FEC bypass indication to include Clause 119. Create new MDIO register to show the FEC AM lock status of lanes 4-15

Response Response Status C

ACCEPT IN PRINCIPLE.

In 400 GbE the FEC is part of the PCS layer, not a separate sublayer.

The alignment status is reported via bit 3.50.12.

AM lock is reported via bits 3.52.7:0 and 3.53.7:0.

FEC bypass indication is not a feature of the PCS currently defined in Clause 119.

Note, comment #115 proposes to add this feature. If this is agreed, then comment #145 adds appropriate bits to register 3.800.

Cl 45 SC 45.2.1.107 P 43 L 6 # 147
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

There are no FEC Lanes in 802.3bs. The FEC is an integral part of the PCS. Any registers associated with the RS-FEC should be included in the PCS register section and not the PMA/PMD register section.

SuggestedRemedy

Move any reference to RS-FEC to the PCS register section. Add PCS registers associated with the PCS BER monitor function shown in Figure 119-2.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #145

Cl 45 SC 45.2.1.116a P 43 L 14 # 98
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status R

A new mdio registers were created for the CDAUI-n recommended peaking register, transmitter equalization, which has identical function to the CAUI-4 version (45.2.1.96).

SuggestedRemedy

Remove 45.2.1.116a and rename 45.2.1.96 to support both CDAUI-n and CAUI-4. Update the text to reference appropriate annexes for 400G.

Response Response Status C

REJECT.

The recommended CTLE register for CDAUI-16 was created as a separate register to allow for the possibility of having both a CAUI-4 and a CDAUI-16 in the same MDIO manageable device.

The Task Force is investigating whether 16 individual recommended CTLE values are needed, so there is no consensus to make this change now.

Cl 45 SC 45.2.1.116a P 43 L 14 # 194
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A

This subclause pertains only to CDAUI-16, so title of this subclause should use CDAUI-16 and not CDAUI-n.

SuggestedRemedy

Replace CDAUI-n with CDAUI-16.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #146

Cl 45 SC 45.2.1.116a P 43 L 14 # 150
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R Bucket

This section only applies to CDAUI-16 C2M. There probably needs to be a similar section added to address any registers associated with the CDAUI-8 C2M interface. This interface is adaptive and therefore the register information is likely to be different.

SuggestedRemedy

Add a section to cover the registers associated with adaptive CDAUI-8 C2M interface.

Response Response Status C

REJECT.

Annex 120E does not define any variables that need corresponding MDIO registers.

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CI 45 SC 45.2.1.116a P 43 L 14 # 99
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status R

A new mdio register was created for the CDAUI-n recommended peaking register but only for the first 4 lanes

SuggestedRemedy

Expand the recommended peaking registers to cover all 16 lanes of the CDAUI-16 interface

Response Response Status C

REJECT.
 CAUI-4 has one Recommended CTLE peaking value to cover all 4 lanes. Similarly, CDAUI-16 has one Recommended CTLE peaking value to cover all 16 lanes. See also comment 196.

CI 45 SC 45.2.1.116a P 43 L 16 # 148
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

This section only applies to CDAUI-16.

SuggestedRemedy

Replace CDAUI-n with CDAUI-16.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #146.

CI 45 SC 45.2.1.116a P 43 L 19 # 195
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A

Table 45-90a. This table only pertains to CDAUI-16 and not CDAUI-8. The name of the table should be "CDAUI-16 chip-to-module..."

SuggestedRemedy

Replace CDAUI-n with CDAUI-16.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #146.

CI 45 SC 45.2.1.116a P 43 L 44 # 196
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status R

Table 45-90a. CDAUI-16 chip-to-module recommended CTLE register bit definitions need to be per lane and not per module. The 16 lanes are likely to be sufficiently different that a common value will not be valid. CDAUI-8 uses only Adaptive Equalization, so this register does not pertain.

SuggestedRemedy

Expand register to cover all 16 lanes.

Response Response Status C

REJECT.
 CAUI-4 has one Recommended CTLE peaking value to cover all 4 lanes. The commenter is invited to provide evidence that increasing the number of lanes from 4 to 16 means that one Recommended CTLE peaking value is insufficient. See also comment #99

CI 45 SC 45.2.1.116a.1 P 43 L 44 # 149
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

This section only applies to CDAUI-16.

SuggestedRemedy

Replace CDAUI-n with CDAUI-16.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #146.

CI 45 SC 45.2.1.116a.1 P 43 L 44 # 197
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A

This subclause only pertains to CDAUI-16. CDAUI-8 only uses Adaptive Equalization.

SuggestedRemedy

Replace CDAUI-n with CDAUI-16.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #146.

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Cl 45 SC 45.2.1.124 P 50 L 50 # 102
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status R

The replacement text at the end of the paragraph is repeating the same thing twice.
 Replace the last 4 sentences with

SuggestedRemedy

For the 400GBASE-R PMA and 100GBASE-KP4 PMA/PMD, the assertion of register 1.1501 bits 8, 9, 10 and 11 operates in conjunction with register 1.1501 bit 3. If bit 1.1501.3 is not asserted, then register 1.1501 bits 8, 9, 10 and 11 have no effect. For other PMA/PMD types register 1.1501 bits 8,9,10 and 11 have no effect.

Response Response Status C

REJECT.
 The replacement text is not repeating the same thing twice.
 For the 100GBASE-KP4 PMA/PMD, register 1.1501 bit 3 (Tx generator enable) must be asserted for the bits in this register to have an effect.
 For the 400GBASE-R PMA, either register 1.1501 bit 3 (Tx generator enable) or bit 1 (Rx generator enable) must be asserted for the bits in this register to have an effect.
 Trying to combine this different behaviour into a single statement would make it more difficult to understand.
 [Editor's note: Page set to 50]

Cl 45 SC 45.2.3.6.1 P 54 L 0 # 104
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

PCS type selection only describes looking at bits 2:0, but 400G has now made it a 4b field (3:0)

SuggestedRemedy

Update the sub-section to refer to the appropriate fields in registers 3.8 and 3.7

Response Response Status C

ACCEPT IN PRINCIPLE.
 This comment is partly overtaken by events.
 The P802.3bq draft (currently D2.3) is expanding the PCS type selection field to be 3.7.3:0, so the P802.3bs draft does not need to do this.
 Show the changes to Table 45-123 with respect to the version as modified by the latest drafts of P802.3by and P802.3bq.
 Bring 45.2.3.6.1 into the draft and show the second sentence as changing due to the allocation of bit 3.8.8.
 [Editor's note: Page set to 54]

Cl 45 SC 45.2.3.9 P 0 L 0 # 105
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A

400G has fast wake but no PCS MDIO register to indicate if feature is available

SuggestedRemedy

Add 400GBASE-R to Table 45-125 and create a new subsection to define the bit

Response Response Status C

ACCEPT IN PRINCIPLE.
 Allocate bit 3.20.14 to 400GBASE-R fast wake and insert 45.2.3.9.a to define the bit.

Cl 45 SC 45.2.3.17 P 0 L 0 # 106
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

Support for Scrambled Idle test pattern should be part of the 400GBASE-R PCS

SuggestedRemedy

Add 400G to the list of rates supporting scrambled idle test pattern

Response Response Status C

ACCEPT.

Cl 78 SC 78.1 P 57 L 4 # 97
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A

The third paragraph of contains a list of AUI's EEE operates over which is missing CDAUI

SuggestedRemedy

Add CDAUI-n for 400Gb/s to list

Response Response Status C

ACCEPT.

See also comment #122.

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Cl 78 SC 78.1 P 57 L 5 # 122
Marris, Arthur Cadence Design Syst

Comment Type T Comment Status A

Add CDAUI-n to the list of supported interfaces in the third paragraph of 78.1.

SuggestedRemedy

Change first sentence of third paragraph of 78.1 to read:
"EEE supports operation over twisted-pair cabling systems, twinax cable, electrical backplanes, optical fiber, XGXS for 10 Gb/s PHYs, XLAUI for 40 Gb/s PHYs, CAUI-n for 100 Gb/s PHYs, and CDAUI-n for 400 Gb/s PHYs."

Add CADUI-8 and CDAUI-16 to Table 78-1 with a footnote saying that "shutdown is not supported for CDAUI-n"

Response Response Status C

ACCEPT IN PRINCIPLE.
Since shutdown is not a feature of CDAUI-n, it is not appropriate to add it to Table 78-1.
See response to comment #97.

Cl 116 SC P 59 L # 126
D'Ambrosia, John Independent

Comment Type ER Comment Status R

All named PHYs use "R" as the second letter in the suffix, based on the use of 400GBASE-R encoding. However, -DR4, -FR8, and -LR8 use PAM4 signaling. In the case of 100GBASE-KP4, which uses 100GBASE-R encoding, "P" was used as the second letter in the suffix, and denoted "implementing more than 2-level pulse amplitude modulation (PAM)."

SuggestedRemedy

change the names of the PHYs to the following -
400GBASE-DR4 to 400GBASE-DP4
400GBASE-FR8 to 400GBASE-FP8
400GBASE-LR8 to 400GBASE-LP8

change accordingly throughout the rest of the document.

Response Response Status C

REJECT.

There is no consistent naming scheme in 802.3, it is the entire string that defines the interface, there is no consensus for making the change.

A straw poll of the Task Force was taken:
I support codes of:
DR4, FR8, LR8 54
DP4, FP8, LP8 18

Cl 116 SC 116.1.2 P 59 L 1 # 2
Ghiasi, Ali Ghiasi Quantum LLC

Comment Type ER Comment Status A

CDMII is not a port

SuggestedRemedy

Repalce "port" with "interface"

Response Response Status C

ACCEPT IN PRINCIPLE.
Change "interconnection port" to "interconnection point".

[Editor's note: Subclause changed from 116.1..2 to 116.1.2]

Cl 116 SC 116.1.4 P 60 L 4 # 151
Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

In Table 116-2 shouldn't we distinguish between CDAUI-n C2C and C2M clauses, e.g. that Clause 120B is CDAUI-16 C2C and Clause 120C is CDAUI-16 C2M ? ?

SuggestedRemedy

Identify CDAUI-n C2C and C2M Clauses in the table.

Response Response Status C

ACCEPT IN PRINCIPLE.
Add "C2C" and "C2M" as appropriate after CDAUI-16 and CDAUI-8 in Table 116-2

Cl 116 SC 116.3 P 61 L 26 # 234
Dawe, Piers Mellanox

Comment Type T Comment Status R

Too many service interface definitions. All the ones for 100G and work that builds on 802.3ba should all be the same and generic.

SuggestedRemedy

Combine 116.3 and 80.3.

Response Response Status C

REJECT.
The service interface definitions in 116.3 are not the same as the ones in 80.3. Also, there are currently 13 places in the P802.3bs draft that refer to this subclause so it is worth having the 400G service interfaces defined explicitly.

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Cl 116 SC 116.4 P 65 L 5 # 152
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R

In Table 116-3 the maximum delay for the different PMDs seems high. Where do these numbers come from ? The slowest PMD is SR16 with a bit period of 40ps. 2m of fiber is equivalent to 10ns.

SuggestedRemedy

Reduce the PMD maximum delays to 10.48ns.

Response Response Status C

REJECT.

The maximum delay time through the 400GBASE-SR16 PMD has been set to the same value as the delay through the 100GBASE-SR4 PMD which seems reasonable as the lanes of the two PMDs are running at almost the same rate.

The maximum delay time includes the delay through 2 m of fiber after the MDI which is 10 ns (as pointed out in the comment). This would leave only 0.48 ns for the delay through the PMD layer. However, some implementations may want to have an internal spool of fiber before the MDI, This would then be limited to 10 cm in length, which is not practical. The current value allows for a maximum of 2 m of internal fiber.

Cl 116 SC 116.4 P 65 L 7 # 130
 D'Ambrosia, John Independent

Comment Type TR Comment Status A

Table 116-3 does not include any delay constraints on the CDMII Extender or CDXS. Furthermore, there could be a CDMII based on 16x265 or 8x50 CDAUI. there could be different delay constraints related to the electrical interfaces because of the different signaling.?

SuggestedRemedy

1. Modify entry for 400GBASE-R PCS to 400GBASE-R PCS / CDXS
2. Two options to address the CDMII Extender
 - 2a - add entry for CDMII Extender with all subsequent columns TBD. There may need to be two table entries for a 16x25 CDAUI and an 8x50 CDAUI
 - 2b - add note that states CDMII Extender includes 2 CDXS, 2 PMA sublayers, and a CDAUI. There may need to be two table entries for a 16x25 CDAUI and an 8x50 CDAUI.

Response Response Status C

ACCEPT IN PRINCIPLE.

In Table 116-3, change "400GBASE-R PCS" to "400GBASE-R PCS or CDXS".

Apply a note to "CDXS":

"If a PHY includes the CDMII extender, then this includes two CDXS sublayers."

The maximum delay of 92.16 ns allocated for the PMA includes "The maximum cumulative delay contributed by up to three PMA stages in a PHY" (see 120.5.4), so this should be enough for the configuration illustrated in Figure 118-1.

[Editor's note: Clause changed from "11add" to "116"]

Cl 116 SC 116.5 P 66 L 30 # 129
 D'Ambrosia, John Independent

Comment Type ER Comment Status A Bucket

CDMII is defined as 100 Gb/s in Fig. 116-3

SuggestedRemedy

change 100 to 400

Response Response Status C

ACCEPT IN PRINCIPLE.

Change "100 Gb/s" to "400 Gb/s" in two places.

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Cl 117 SC 117.1.7 P72 L 13 # 123
 Marris, Arthur Cadence Design Syst

Comment Type T Comment Status A Bucket

For fast wake it is the system that is in the low power state rather than the PHY.

SuggestedRemedy

Change:
 "when the PHY is in its low power state"
 To:
 "until the system recovers from its low power state"

Response Response Status C

ACCEPT IN PRINCIPLE.

Change:
 "when the PHY is in its low power state"

To:
 "until the system returns from its low power state"

Cl 118 SC 118.1 P78 L 5 # 131
 D'Ambrosia, John Independent

Comment Type TR Comment Status A

As noted, the clause is yet to be completed, but the current direction seems to be causing some issues through the basic architecture defined in the document. The clause is titled CDMII Extender, but then the first sentence states that it is defining the functional characteristics for the CDMII extender sublayer (CDXS). Per dambrosia_3bs_02b_0115 - the CDXS is a sublayer in the CDMII Extender - not the CDMII. There is no description of the CDXS sublayer in Clause 116.2 summary of 400G Sublayers

SuggestedRemedy

1. Change title of Clause 118 to CDMII Extender and CDXS Sublayer
2. Add column in Table 116-2 for Clause 118 (CDMII Extender / CDXS). Entries for all PHYs to be optional.
3. Add subclause in 116.2 describing CDXS. Proposed Text
 The 400 Gigabit Extender Sublayer (CDXS) is part of the CDMII Extender (Clause 118). It is identical in function to the PCS (Clause 119).

Response Response Status C

ACCEPT IN PRINCIPLE.

1. Change title of Clause 118 to "CDMII Extender and CDMII Extender Sublayer (CDXS)"
2. Make no change, the CDMII extender sublayer is not needed for any of the current PMDs as they all use the Clause 119 PCS. So no need to add a column to the table at this point in time.
3. Add subclause in 116.2 describing CDXS: The 400 Gigabit Extender Sublayer (CDXS) is part of the CDMII Extender (Clause 118). It is identical in function to the PCS (Clause 119).

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Cl 119 SC 119 P 81 L 1 # 28
 Gustlin, Mark Xilinx

Comment Type T Comment Status A

There are many TBDs around how PCS lanes are formed from Codewords.
 There has been consensus building around how to form the lanes.

SuggestedRemedy

Make the changes as detailed in gustlin_3bs_02_1115 on how to form the PCS lanes from codewords.

This includes forming them from two codewords as adopted in Motion #4 from the September 2015 meeting.

Response Response Status C

ACCEPT IN PRINCIPLE.

See also comments 27, 114, 154.

Adopt gustlin_3bs_02_1115 and correct the symbol distribution equations on page 16 to:

For all k=0 to 67

For all j=0 to 7

For all i=0 to 9

if even(k)

tx_out<160k+20j+i> = tx_postfec0<80k+10j+i>

tx_out<160k+20j+i+10> = tx_postfec1<80k+10j+i>

else

tx_out<160k+20j+i> = tx_postfec1<80k+10j+i>

tx_out<160k+20j+i+10> = tx_postfec0<80k+10j+i>

[Editor's note: Page set to 81]

Cl 119 SC 119.2 P 84 L 35 # 109
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

The deskew process is done as part of the post alignment marker routine.

SuggestedRemedy

Change "After alignment markers are found on all PCS lanes, the individual PCS lanes are identified using TBD. The PCS lanes can then be reordered and deskewed."

to "After alignment markers are found on all PCS lanes, the individual PCS lanes are identified using TBD and then re-ordered and deskewed."

Response Response Status C

ACCEPT.

Cl 119 SC 119.2 P 84 L 35 # 108
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

AM0 is common to all lanes, not repeated within in lane.

SuggestedRemedy

Change "It attains alignment marker lock based on the repeated AM0 value on each one of the PCS lanes."

to "It attains alignment marker lock based on the common AM0 pattern that is transmitted on every PCS lane."

Response Response Status C

ACCEPT IN PRINCIPLE.

Change to:

It attains alignment marker lock based on the common AM0 pattern that is periodically transmitted on every PCS lane.

Cl 119 SC 119.2.1 P 84 L 15 # 37
 Ofelt, David Juniper Networks

Comment Type E Comment Status A

The document says "Note that these serial streams originate from a common clock in each direction, but may vary in phase and 15 skew dynamically." It is unclear whether the common clock refers to the upper and lower sides but with independent transmit & receive clocks or if it refers to the transmit and receive clocks being common.

SuggestedRemedy

I think the transmit and receive clocks are independent.

Response Response Status C

ACCEPT IN PRINCIPLE.

Change:

When communicating with the PMA, the 400GBASE-R PCS uses 16 encoded bit streams. The PMA sublayer operates independently of block and packet boundaries. The PCS provides the functions necessary to map packets between the CDMII format and the PMA service interface format.

Note that these serial streams originate from a common clock in each direction, but may vary in phase and skew dynamically.

To:

When communicating with the PMA, the 400GBASE-R PCS uses 16 encoded bit streams. Per direction (RX or TX), these serial streams originate from a common clock but may vary in phase and skew dynamically.

The PMA sublayer operates independently of block and packet boundaries. The PCS provides the functions necessary to map packets between the CDMII format and the PMA service interface format.

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

Cl 119 SC 119.2.1 P 84 L 41 # 27
 Gustlin, Mark Xilinx

Comment Type T Comment Status A

This statement does not accurately reflect the data flow and is not consistent with Figure 119-2:

The PCS deskew process deskews and aligns the individual PCS lanes, removes the alignment markers, forms a single stream, and sets the align_status flag to indicate whether the PCS has obtained alignment. The PCS then processes the FEC blocks, transcodes the data back to 64B/66B, descrambles the data and then decodes the 64B/66B encoded data.

SuggestedRemedy

Change to:

The PCS deskew process deskews, aligns and reorders the individual PCS lanes, forms a single stream, and sets the align_status flag to indicate whether the PCS has obtained alignment. The PCS then processes the FEC codewords, removes alignment markers, descrambles the data, transcodes the data back to 64B/66B, and then decodes the 64B/66B encoded data.

Response Response Status C

ACCEPT IN PRINCIPLE.

See the response to comment #28.

Cl 119 SC 119.2.3.1 P 85 L 19 # 38
 Ofelt, David Juniper Networks

Comment Type E Comment Status A Bucket

The C, O, T, and Z codes need to have their index numbers subscripted.

SuggestedRemedy

Subscript the numbers

Response Response Status C

ACCEPT IN PRINCIPLE.

Subscript the numbers for C0, C7, O0, S0, T0, T7, Z4, Z7

Cl 119 SC 119.2.3.2 P 85 L 40 # 39
 Ofelt, David Juniper Networks

Comment Type E Comment Status A Bucket

No need to mention that the sync bits always contain a transition since this encoding will never hit the line and may never directly exist.

SuggestedRemedy

Delete the relevant sentence.

Response Response Status C

ACCEPT IN PRINCIPLE.

Delete:

Thus, there is always a transition between the first two bits of a block.

Cl 119 SC 119.2.4 P 87 L 36 # 110
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

The amount of data needed to added is more then just alignment markers, the pad is there too. You're also pointing to 119.2.4.4 for details on them, have the reader go there to see bit counts

SuggestedRemedy

Remove "120-bit"

Response Response Status C

ACCEPT.

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

CI 119 SC 119.2.4.1 P 87 L 27 # 36
 Ofelt, David Juniper Networks

Comment Type T Comment Status D

The document describes the PCS as deleting idles to make room for the alignment markers and/or compensating for clocking differences. Our OTN reference point is higher up in the stack than this, so deleting idles here will violate the concept of an unmolested 64b66b codestream.

SuggestedRemedy

It would be better to change the description to a backpressure-based mechanism. I don't have a suggestion on how exactly to do this. If we end up not changing the description, then we need a note describing the implications of implementing your PCS in the way the standard describes.

Proposed Response Response Status Z

REJECT.

This comment was WITHDRAWN by the commenter.

The commenter will do some in depth investigation on this issue and propose a remedy in the future.

CI 119 SC 119.2.4.4 P 90 L 9 # 112
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

AM insertion occurs into the Single stream of data, so there aren't any PCS lanes yet. The inserted pattern is done to account for the future PCS lane creation

SuggestedRemedy

Change: "In order to support deskew and reordering of individual PCS lanes at the receive PCS, alignment markers are added periodically to each PCS lane. Each alignment marker is defined as a unique 120-bit block. The alignment markers are inserted as a group, aligned to the ..."

To: "In order to support deskew and reordering of individual PCS lanes at the receive PCS, alignment markers are added periodically for each PCS lane. The alignment marker for each PCS lane is a unique 120-bit block. The alignment markers for all PCS lanes are inserted as a group, aligned to the ..."

Response Response Status C

ACCEPT.

CI 119 SC 119.2.4.4 P 90 L 9 # 153
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status D

the alignment marker is also used to

SuggestedRemedy

Proposed Response Response Status Z

REJECT.

This comment was WITHDRAWN by the commenter.

CI 119 SC 119.2.4.4 P 90 L 13 # 111
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

Don't want the pad bits to be all 0, or the PRBS to get stuck at 0.

SuggestedRemedy

Change: "The pad bits shall be set to a free running PRBS9 pattern, defined by the polynomial $x^9 + x^5 + 1$."

To: "The pad bits shall be set to a (non-zero) free running PRBS9 pattern, defined by the polynomial $x^9 + x^5 + 1$."

Response Response Status C

ACCEPT IN PRINCIPLE.

Change: "The pad bits shall be set to a free running PRBS9 pattern, defined by the polynomial $x^9 + x^5 + 1$."

To: "The pad bits shall be set to a free running PRBS9 pattern, defined by the polynomial $x^9 + x^5 + 1$. The initial value of the PRBS9 pattern generator may be any pattern other than all zeros."

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Cl 119 SC 119.2.4.4 P 90 L 21 # 155
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

It is important to make it clear that the receiver has to be able to find the alignment markers in the presence of a high bit error rate. Although the alignment markers are technically covered by the FEC (not sure this is necessary), the receiver has to be able to lock onto them prior to decoding the FEC, and therefore cannot take advantage of the fact that the alignment markers are covered by the FEC.

SuggestedRemedy

Suggest adding some text to make this clear.

Response Response Status C

ACCEPT IN PRINCIPLE.

This is a more appropriate thing to discuss in the receive function description.

Add after line 45 on page 96:

Note that alignment marker lock is achieved before FEC codewords are processed and therefore the markers are processed in a high error probability environment.

Cl 119 SC 119.2.4.4 P 90 L 24 # 25
 Gustlin, Mark Xilinx

Comment Type T Comment Status A

The group of alignment markers shall be inserted once every 161920 257-bit blocks, one alignment marker per PCS lane.

161920 is incorrect (distance of 8096 FEC codewords). Per the adopted baseline, it should be 163840 257b blocks (distance of 8192 FEC codewords).

SuggestedRemedy

Change to:

The group of alignment markers shall be inserted once every 163840 257-bit blocks, one alignment marker per PCS lane.

Response Response Status C

ACCEPT IN PRINCIPLE.

Change to:

The group of alignment markers shall be inserted once every 163 840 257-bit blocks.

This incorporates comment #156 and #113 also.

Cl 119 SC 119.2.4.4 P 90 L 24 # 113
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A

Adding "one alignment marker per PCS lane" is confusing remove it

SuggestedRemedy

Delete ", one alignment marker per PCS lane"

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #25

Cl 119 SC 119.2.4.4 P 90 L 24 # 156
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A

"shall be inserted once every 161920 257-bit blocks, one alignment marker per PCS lane". I thought PCS lanes were only created after the FEC encoder and symbol distribution as shown in Figure 119-2. I don't believe there are any PCS lanes at this stage of the description.

SuggestedRemedy

Suggest removing the text "one alignment marker per PCS lane" ..

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #25

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CI 119 SC 119.2.4.4 P 90 L 27 # 157
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A

"There is a portion that is common across all alignment markers, and then a unique portion per PCS lane." It is unclear to me the reason/value for having a common marker and a unique marker.

SuggestedRemedy

Suggest adding some brief text explaining the reason for having a common and unique part. At the end of the day you have to lock onto to the unique part anyway to be able to reorder the PCS lanes, so what value does having a separate common part have ?

Response Response Status C

ACCEPT IN PRINCIPLE.

Change:
 and then a unique portion per PCS lane.

To:
 and then a unique portion per PCS lane. Common synchronization logic independent of the received PCS lane number can be used with the common part of the alignment marker.

CI 119 SC 119.2.4.4 P 90 L 34 # 114
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A

Missing how to map the AM blocks into the group to account for the symbol distribution method.

SuggestedRemedy

Add a paragraph to 119.2.4.4 to talk about how to form the AM payload to account for RS-symbol distribution so the AM ends up on each physical lane as desired

Response Response Status C

ACCEPT IN PRINCIPLE.

Since the interleaving had not been defined, this was not added. See the response to comment #28.

CI 119 SC 119.2.4.4 P 91 L 4 # 154
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A

Is Table 119-1 the format of the alignment markers as they are inserted into the data stream, or the way they should appear on the 16x PCS lanes after the FEC encode and symbol distribution (Figure 119-2)

SuggestedRemedy

I believe this is the format of the alignment markers at the output of the PCS, and it might be worth clarifying this fact.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #28.

This is the format of the alignment markers as they appear on the PCS lane outputs. Changes being made by comment #28 will make this clearer, for example the bit pattern example that is being added makes it clear how they appear on the line.

CI 119 SC 119.2.4.4 P 92 L 25 # 158
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

Figure 119-6. I guess it isn't clear to me what happens at the bottom right of the figure where the 'zig-zag' is (rows 13-15). What is transmitted in RS symbol 12 for PCS lanes 13,14 and 15 ? I guess the blank does not mean that nothing is transmitted in those PCS lanes, but that the RS symbol carries normal 257 bit data rather than alignment marker ?

SuggestedRemedy

Suggest clarifying this in the figure. Perhaps use a different shading to show that RS Symbol 12 of PCS lanes 13,14 and 15 contains 'real' 257b data, and is not blank.

Response Response Status C

ACCEPT IN PRINCIPLE.

Add additional shading and a footnote to explain this.

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Cl 119 SC 119.2.5.1 P 96 L 43 # 159
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

"The RS-FEC receive function forms 16 bit streams by concatenating the bits from each of the 16 PMA:IS_UNITDATA_i.indication primitives". It reads a little strange and almost like you are somehow chopping the data into 16 bit blocks which I don't beleive is the intentent.

SuggestedRemedy

Suggest adding the word separate as below: "The RS-FEC receive function forms 16 separate bit streams by concatenating the bits from ..."

Response Response Status C

ACCEPT.

Cl 119 SC 119.2.5.1 P 96 L 47 # 160
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

Suggest changing the text.

SuggestedRemedy

Change the text to read " After alignment marker lock is achieved on each of the 16 lanes (bit streams), inter-lane Skew is removed as specified ..." OR "After alignment marker lock is achieved on all of the 16 lanes (bit streams), inter-lane Skew is removed as specified ..."

Original:
 After alignment marker lock is achieved on all 16 lanes, all inter-lane Skew

After alignment marker lock is achieved on each of the 16 lanes (bit streams), inter-lane Skew

After alignment marker lock is achieved on all of the 16 lanes (bit streams), inter-lane Skew

Response Response Status C

ACCEPT IN PRINCIPLE.

Change:
 After alignment marker lock is achieved on all 16 lanes,

To:
 After alignment marker lock is achieved on each of the 16 lanes (bit streams),

Cl 119 SC 119.2.5.2 P 97 L 4 # 161
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

"The PCS lane number is defined by the alignment marker that is mapped to each PCS lane (see 119.2.4.4)."

SuggestedRemedy

Suggest changing the text to read; "The PCS lane number is defined by the unique portion of the alignment marker that is mapped to each PCS lane (see 119.2.4.4)."

Response Response Status C

ACCEPT.

Cl 119 SC 119.2.5.3 P 97 L 28 # 115
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status D

Bypass error indicationis not included. This is a very useful feature to reduce latency.

SuggestedRemedy

Add the error indication paragraphs from 91 (with editorial licesnse).
 "The Reed-Solomon decoder may optionally provide the ability to bypass the error indication feature to reduce the delay contributed by the RS-FEC sublayer. The presence of this option is indicated by the assertion of the FEC_bypass_indication_ability variable (see X). When the option is provided it is enabled by the assertion of the FEC_bypass_indication_enable variable (see X).

When FEC_bypass_correction_enable is asserted, the decoder shall not bypass error indication and the value of FEC_bypass_indication_enable has no effect.

When FEC_bypass_indication_enable is asserted, additional error monitoring is performed by the RS-FEC sublayer to reduce the likelihood that errors in a packet are not detected. The Reed-Solomon decoder counts the number of symbol errors detected on all four FEC lanes in consecutive non-overlapping blocks of 8192 codewords. When the number of symbol errors in a block of 8192 codewords exceeds K, the Reed-Solomon decoder shall cause synchronization header rx_coded<1:0> of each subsequent 66-bit block that is delivered to the PCS to be assigned a value of 00 or 11 for a period of 60 ms to 75 ms. As a result, the PCS sets hi_ber=true, which inhibits the processing of received packets.

Proposed Response Response Status Z

REJECT.

This comment was WITHDRAWN by the commenter.

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Cl 119 SC 119.2.5.3 P 97 L 34 # 162
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

It is not clear to me how the FEC decoder achieves the following "it shall ensure that, for every 257-bit block within the 34 codeword, the synchronization header for all 66-bit blocks at the output of the 256B/257B to 64B/66B 35 transcoder, rx_coded_0<1:0>, is set to 11."

SuggestedRemedy

Provide a description of how this is assumed to be achieved. Is it via some kind of in-band signalling, or is it assumed to be out-of-band, or is the exact method left to the implementor and not covered in the standard? If it is the latter it would still be useful to list a couple of examples.

Response Response Status C

ACCEPT IN PRINCIPLE.

We don't need to show how something is done within a sublayer. It is up to the implementer to decide how to do this.

Cl 119 SC 119.2.5.4 P 97 L 41 # 26
 Gustlin, Mark Xilinx

Comment Type T Comment Status A Bucket

This is incorrect, should be every 8192nd codeword per the adopted baseline.

The first 2056 message bits in every 8096th codeword is the vector am_rx<2055:0> where bit 0 is the first bit received.

SuggestedRemedy

Change to:

The first 2056 message bits in every 8192nd codeword is the vector am_rx<2055:0> where bit 0 is the first bit received.

Response Response Status C

ACCEPT.

Cl 119 SC 119.2.6.2.2 P 99 L 45 # 166
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R Bucket

cw_bad_count used in Figure 119-3 is not listed

SuggestedRemedy

Please add a description of the cw_bad_count variable

Response Response Status C

REJECT.

This is described under counters in 119.2.6.2.4.

Cl 119 SC 119.2.6.2.2 P 100 L 2 # 116
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status D

amp_valid will only be checking the common (AM0) portion of the AM blocks.

SuggestedRemedy

Change "if the received 120-bit block is a valid alignment marker payload. The alignment marker payload, mapped to an PCS lane according to the process described in 119.2.4.4, consists of 120b known bits."

To: "if the received 64-bit block is a valid common marker. See Figure 119-5 and Table 119-1 for the common marker pattern."

Proposed Response Response Status Z

REJECT.

This comment was WITHDRAWN by the commenter.

There are additional changes to be made in this area, the commenter come back to the next meeting with complete proposed changes.

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Cl 119 SC 119.2.6.3 P 104 L 44 # 163
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R

Figure 119-11. Has this figured been modified from the one used in 802.3ba to account for the fact that the alignment marker lock has to be achieved reliably in the presence of a high bit error rate (i.e. pre FEC decoder).

SuggestedRemedy

Please clarify.

Response Response Status C

REJECT.

This diagram leverages 802.3bj, and the locking is governed by amp_valid, and how amp_valid works is TBD in draft 1.0. We need a contribution to define how it works. In 802.3bj amp_valid is resistant to a high BER, but we need to define this function.

Cl 119 SC 119.2.6.3 P 105 L 42 # 164
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

Figure 119-13. Where did Figure 119-12 go to ?

SuggestedRemedy

Appear to be missing a Figure, or Figures need to be renumbered.

Response Response Status C

ACCEPT IN PRINCIPLE.

Correct figure numbering and references.

Cl 119 SC 119.2.6.3 P 105 L 42 # 165
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status D

Figure 119-13. Do we want to add a Hi_BER condition , based on monitoring the preFEC bit error rate, as a condition for dropping out of PCS sync ?

SuggestedRemedy

This is something I have discussed with Dave Ofelt before. Some customer would like to have a user programmable bit error rate threshold (in this case based on monitoring the FEC) as a condition for causing the PCS to drop out of sync. Perhaps a topic for a future contribution.

Proposed Response Response Status Z

REJECT.

This comment was WITHDRAWN by the commenter.

Cl 120 SC 120 P 230 L 44 # 244
 Valliappan, Magesh Broadcom

Comment Type T Comment Status R Precoder

An optional differential precoder (as in 94.2.2.6 Precoding) should be included to allow receivers that use larger DFE taps to attain better effective BER through FEC. Motivation is in http://www.ieee802.org/3/bs/public/15_09/hegde_3bs_01a_0915.pdf

SuggestedRemedy

Add a line stating - "CDAUI8 Transmitter shall provide an optionally enabled precoder described in 94.2.2.6"

Response Response Status C

REJECT.

This proposal has not yet achieved consensus in the TF. Precoding is a PMA function (like gray coding), so the comment should be against the PMA clause.

[Editor's note: Clause changed from 120D to 120 and Subclause changed from 120D.3.1 to 120. This comment was sent after the close of the comment period.]

A straw poll of the Task Force was taken:
 I support adding optional pre-coding 19
 I do not support adding optional pre-coding 11
 I need more information 22

Cl 120 SC 120.1.3 P 118 L 6 # 167
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A

"Adapt the PCSL formatted signal" Is PCSL defined somewhere else. This is the first time I have come across the term in the document.

SuggestedRemedy

Define PCSL.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See comment #87

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Cl 120 SC 120.1.3 P 118 L 6 # 87
 Dudek, Mike QLogic

Comment Type E Comment Status A

PCSL has not been used prior to this in this clause and the only previous uses in the document are part of boolean variables indicating the PCS lane numbers in clause 119

SuggestedRemedy

Change "PCSL" to "PCS lane (PCSL)"

Response Response Status C

ACCEPT IN PRINCIPLE.

Clause 120 is based on Clause 83, which uses the term PCSL without the expansion. PCSL is defined in section 1, clause 1.4.325. Amend that definition to read: "1.4.325 PCS lane (PCSL): In 40GBASE-R, 100GBASE-R, and 400GBASE-R, the PCS distributes encoded data to multiple logical lanes, these logical lanes are called PCS lanes. One or more PCS lanes can be multiplexed and carried on a physical lane together at the PMA service interface. (See IEEE Std 802.3, Clause 83 and Clause 120.)"

Cl 120 SC 120.1.3 P 118 L 19 # 168
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R

Do we need to mention Grey Coding as a principal function ?

SuggestedRemedy

Add another entry into the list to say something like "Perform Grey coding where PAM4 coding is used for the physical lanes" OR "Perform Grey coding where the number of physical lanes is 4 or 8"

Response Response Status C

REJECT.

This comment was WITHDRAWN by the commenter.

Cl 120 SC 120.1.4 P 118 L 53 # 88
 Dudek, Mike QLogic

Comment Type E Comment Status A Bucket

missing periods.

SuggestedRemedy

Add a period after function. and also after connection on line 54 and page 119 line 29

Response Response Status C

ACCEPT.

Cl 120 SC 120.1.4 P 118 L 54 # 169
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A Bucket

I think it reads better to list CDAUI-16 before CDAUI-8.

SuggestedRemedy

Swap the order of bullets 2 and 3, i.e. list CDAUI-16 first , followed by CDAUI-8.

Response Response Status C

ACCEPT.

While the editor believes that CDAUI-16 is the short term/first generation interface and CDAUI-8 will become more common in the long term (that plus numerical order suggests CDAUI-8 would go first), reversing the order matches clause 116 and the order of Annexes 120A,B,C,D

Cl 120 SC 120.2 P 120 L 14 # 170
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status R

Figure 120-3 uses 'm' inputs and 'n' outputs, whereas section 120.1.4 on page 118 talks about "p" inputs and "q" outputs.

SuggestedRemedy

Suggest using consistent terminology, i.e. either m/n or p/q.

Response Response Status C

REJECT.

This nomenclature follows the precedent set in comment resolution against clause 83. "p" and "q" are used in a bi-directional context ("p" input lanes and "q" output lanes in the Tx direction and "q" input lanes and "p" output lanes in the Rx direction). "m" and "n" are used when describing one direction of transmission (Tx or Rx) in a generic sense where "m" is the number of input lanes an "n" is the number of output lanes.

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CI 120 SC 120.2 P 121 L 44 # 89
 Dudek, Mike QLogic

Comment Type T Comment Status A Bucket

There is no need to have two separate footnotes c and d in Figure 120-5 and it could be confusing to try to work out what the difference is (if there is one it isn't obvious)

SuggestedRemedy

Delete footnote d and replace the footnote pointer to d with c.

Response Response Status C

ACCEPT.

These were separate footnotes in clause 83 because footnote d had more qualifications (local loopback was required for copper PHYs). Since there are no copper PHYs in P802.3bs, the footnotes can be merged. If a future project adds 400 Gb/s copper PHYs, the footnotes will need to be split again. See also comment #117.

CI 120 SC 120.2 P 121 L 44 # 117
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A Bucket

In Figure 120-5, Footnote C is optional, Footnote D is also optional. Don't need both

SuggestedRemedy

Remove footnote c and replace the d reference in Figure 120-5 with c

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #89

CI 120 SC 120.2 P 121 L 46 # 172
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

Shouldn't this functional block diagram also show the optional grey coding/decoding and PAM4 symbol encoding/decoding that is required depending on the number of physical input and output lanes that instantiated ?

SuggestedRemedy

Modify diagram to show optional grey encoding/decoding and pam4 symbol encoding/decoding, on both p and q interfaces.

Response Response Status C

ACCEPT IN PRINCIPLE.

The corresponding figure in clause 83 didn't explicitly show CDR for the input lanes or signal drivers for the output lanes even though these are functions of the PMA. Redraw the figure to add boxes for each group of input or output lanes. Input lanes will show "Clock and Data Recovery" and "PAM4 decoding" with a footnote indicating "where p (or q)=4 or 8". Output lanes will show "PAM4 encoding" with a footnote indicating "where p (or q)=4 or 8", and "Signal Drivers". It is not necessary to explicitly mention Gray coding/decoding since this is an essential and inseparable part of the process whereby pairs of bits are converted to/from PAM4 symbols.

CI 120 SC 120.2 P 122 L 12 # 90
 Dudek, Mike QLogic

Comment Type T Comment Status A

It is ambiguous here whether lane is PCS lane or physical lane. As there may be skew between PCS lanes introduced in prior PMA's it would be good to alert the reader that the independence of arrival applies to the PCS lanes.

SuggestedRemedy

replace. "each lane" with "each PCS lane"

Response Response Status C

ACCEPT IN PRINCIPLE.

The paragraph is flawed in several ways: the bit-rate rather than the symbol rate is 16/p times the PCSL rate. The 2nd sentence could be misread that the symbols received on the physical laves correspond to PCSLs, rather than the bits.

Replace paragraph with: "If a PMA client is another PMA, a PMA with p=16 physical input lanes receives bits from one PCSL on each of its input lanes. A PMA with p=4 or p=8 physical input lanes receives PAM4 symbols on each of its input lanes at 8/p times the PCSL rate, each symbol formed from two bits. The bit stream represented by the input symbols carries, bit-multiplexed, 16/p PCSLs on each physical input lane. Skew may exist between different PCSLs received on the same physical input lane even though all PCSLs originate from the same synchronous source, so there is independence of arrival of bits from each PCSL on each physical input lane."

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Cl 120 SC 120.3 P 122 L 18 # 171
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status R
 "...cross input lanes, and multiplex PCSs to output lanes."

SuggestedRemedy

Suggest adding the word 'bit' in front of multiplex. "...cross input lanes, and bit multiplex PCSs to output lanes." it is important to make it clear that although the PMA may be dealing with PAM4 symbols on its interfaces, that any internal multiplexing/demultiplexing is performed at the bit level on the PCS Lane bit streams, and with no knowledge of any PAM4 symbol boundaries.

Response Response Status C

REJECT.
 The current text is clear. The 2nd sentence converts PAM4 symbols to pairs of bits, and the 4th sentence converts pairs of bits to PAM4 symbols. This comment is about the 3rd sentence, which begins: "BITS are routed through the PMA to an output lane through a process that may ...". If you add "bit multiplex", you also have to say "bit demultiplex" and the sentence becomes awkward.

Cl 120 SC 120.4 P 123 L 7 # 118
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status A
 The skew buffers tolerate or allow for the skew variation, don't need both words

SuggestedRemedy

Change: "buffers are filled to allow tolerating the Skew Variation"
 to: "buffers are filled tolerating the Skew Variation"

Response Response Status C

ACCEPT IN PRINCIPLE.
 Change to
 "buffers are filled to provide the ability to tolerate Skew Variation"

Cl 120 SC 120.5 P 124 L 5 # 119
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status R
 The relationship of baudrate to data rate is solely dependent upon the PAM2 v. PAM4 value and not the PCS lane count.

SuggestedRemedy

Change: "Note that the signaling (Baud) rate is equal to the bit rate when the number of physical lanes is 16 (bits are sent or received on the lanes), and equal to half of the bit rate when the number of lanes is 8 or 4 (PAM4 symbols are sent or received on the lanes)."
 To: "Note that the signaling (Baud) rate is equal to the bit rate when PAM2/NRZ are sent or received on the lane,, and equal to half of the bit rate when PAM4 symbols are sent or received on the lanes."

Response Response Status C

REJECT.
 There are numerous places throughout clause 120 where the number of lanes is used as an indicator of the modulation format and therefore the baud rate (e.g., 120.1.3(j), 120.5, 120.5.6.1, 120.5.10.1, 120.5.10.2). The number of lanes is something the PMA knows from its local configuration (PICS LANES_UPSTREAM, LANES_DOWNSTREAM), whereas the modulation format can only be determined by looking at the adjacent sublayer and drilling into Annex 120 B, C, D, or E, or clauses 121, 122, 123 to see what modulation format is used by the adjacent sublayer to figure out the baud rate of the PMA interface.

Cl 120 SC 120.5.3.2 P 126 L 23 # 238
 Dawe, Piers Mellanox

Comment Type T Comment Status R
 200 ps represents about 1" of PCB, or 80 bits, which costs power to buffer in an optical module, e.g. one with a CDAUI-16 input and 8-lane or 4-lane optics. To get that much Skew Variation one might imagine lanes that differ in length by 10" (over possibly 2 CAUI hops: C2C then C2M), and PCB trace effective dielectric constant that differ by 10% over operating temperature and humidity; is this too conservative? In 802.3ba we chose this number without accurate information; now we should review it because we have 4x as much to buffer, and we have the experience.

SuggestedRemedy

Review whether this much Skew Variation is ever needed; reduce the limit to e.g. 100 or 150 ps if appropriate.

Response Response Status C

REJECT.
 This number should only be revised after a similar analysis to http://ieee802.org/3/ba/public/may08/anslow_01_0508.pdf is performed to justify a different number.

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Cl 120 SC 120.5.3.4 P 126 L 37 # 91
 Dudek, Mike QLogic

Comment Type T Comment Status A Bucket

This should be skew at SP5 not at SP2. However I think there is a problem. The PMA needs to tolerate this amount of skew whether or not it can be measured or not.

SuggestedRemedy

Delete "so that the skew can be measured at SP2" or at least change SP2 to SP5.

Response Response Status C

ACCEPT IN PRINCIPLE.
 These requirements follow those in 802.3ba where no requirement was set if it could not be verified due to a particular interface not being physically instantiated.
 Change SP2 to SP5.

Cl 120 SC 120.5.4 P 127 L 10 # 173
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R

"The maximum cumulative delay contributed by up to three PMA stages in a PHY". What happens if there are more than three stages of PHY? Is the delay constraint unspecified?

SuggestedRemedy

Propose replace the phrase "up to three" with "all the", i.e. "The maximum cumulative delay contributed by all the PMA stages in a PHY"

Response Response Status C

REJECT.
 This is consistent with the corresponding text in clause 83 which says "The maximum cumulative delay contributed by up to four PMA stages in a PHY", and clause 120 reduces this number because there is no case of a standalone FEC separated by CDAUI (although there may be CDXS). In principle, there is no way you should be able to build a PHY with more than three PMA stages since you run out of MMD addresses, but we don't want to say that no matter how many PMAs and CDAUIs you concatenate, you won't ever exceed the delay constraints.

Cl 120 SC 120.5.4 P 127 L 21 # 174
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R

The maximum delay for the PMA of 92.16ns seems fairly high, given that we recently made a change to the FEC architecture (from serial to parallel fill of the codewords) just to save 12ns!

SuggestedRemedy

Propose tightening up the maximum PMA delay constraint after consulting with PMA chip vendors.

Response Response Status C

REJECT.
 Insufficient remedy proposed. In principle, since both the 100GBASE-R PMA and 400GBASE-R PMA use bit multiplexing, there is not likely to be a substantial difference in delay, and the 92.16ns comes from 802.3ba. If it is confirmed that P802.3bs is limited to maximum 3 PMA stages rather than maximum 4 PMA stages, this number might be scaled accordingly. But further analysis is required to determine a better value for this number than the one that is present in the draft.

Cl 120 SC 120.5.5 P 127 L 25 # 175
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status R

Good section on clocking. However I think it would be useful to add a sentence to state that if the data on a given output lane comes from multiple input lanes (which I assume only happens when # input lanes > # output lanes), that an elastic buffer must be included to remove the skew variation (as defined in table 116-5) between the different input lanes before the data is bit multiplexed onto the output lane.

SuggestedRemedy

Add a note to make it clear that elastic buffers must be used to remove skew variation between input lanes, if multiple input lanes are multiplexed onto a single output lane.

Response Response Status C

REJECT.
 This section is only about clocking, and how the clock of the output lanes is derived from the clock of the input lanes. The issue of skew variation tolerance is nothing to do with where the clock comes from, but that the bit ordering can be maintained as long as the skew variation stays within limits. This is addressed in 120.5.2 and 120.5.3. See in particular the first sentence of the 2nd paragraph of 120.5.3: "Any PMA that combines PCSs from different input lanes onto the same output lane must tolerate Skew Variation between the input lanes without changing the PCSL positions on the output."

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CI 120 SC 120.5.6.1 P 128 L 13 # 120
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status R

The bit order for gray mapping is {A,B} with A being 1st bit. I believe that's opposite of what is desired. A stream of 00111001 (transmitted right bit first in PAM2) would convert to 0312->0213 (gray) in the current scheme while I would expect it to be 0321->0231.

SuggestedRemedy

Change the two instances of {A,B} to {B,A} in 120.5.6.1

Response Response Status C

REJECT.

The documented order exactly matches the gray mapping for the only previous use of PAM4 in 802.3 (100GBASE-KP4) in clause 94.2.2.5.

CI 120 SC 120.5.10.2 P 131 L 26 # 235
 Dawe, Piers Mellanox

Comment Type T Comment Status R

Want to allow QPRBS31, compatible with existing test equipment (which test binary signals and can handle PRBS31), as CEI-56G-VSR-PAM4 uses.

SuggestedRemedy

Add optional QPRBS31 generators and checkers.

If a QPRBS31 on a /4 or /8 lane is demuxed to /16 NRZ lanes, binary PRBS31 signals can be checked with conventional test equipment.

Response Response Status C

REJECT.

The PMA clause is not where we decide to add new test patterns. When the TBDs are resolved for the test patterns required for PAM4 interfaces (Tables 122-9, 123-10 for optical interfaces, and anything that may be required for CDAUI-8), they can be added to the PMA.

CI 120 SC 120.5.10.2 P 131 L 32 # 236
 Dawe, Piers Mellanox

Comment Type T Comment Status R

Unnecessary special patterns from KP4.

SuggestedRemedy

Delete JP03A and JP03B. Delete 120.5.10.2.4 Transmitter linearity test pattern - it's too unrealistic and we can use QPRBS9 or QPRBS13 instead.

Response Response Status C

REJECT.

Table 120D-1 has rows for "Clock random jitter, RMS" and "Clock deterministic jitter, pp" with a reference of 94.3.12.6.1, which requires the use of the JP03A test pattern. Table 120D-1 also has a row for "Even-odd jitter" with a reference of 94.3.12.6.2, which requires the use of the JP03B test pattern. Table 120D-1 also has a row for "Signal-to-noise-and-distortion ratio" with a reference of 94.3.12.7, which suggests the use of the "transmitter linearity test pattern" So all of these patterns are called out by the current Annex 120D and they should not be removed without changing the requirements in the Annex.

However, Comment #45 against 120D.3.1 proposes to change the requirements for CDJ and CRJ which, if accepted, would remove the need for JP03A. So the suggestion to remove JP03A can be revisited depending on the final response to Comment #45.

CI 120 SC 120.5.10.2.3 P 132 L 17 # 56
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

QPRBS13 is not an appropriate test pattern since, unlike the 100GBASE-KP4 PMA, the 400 Gb/s PMA does not include block termination. The definition of QPRBS13 requires every other cycle of the underlying PRBS13 pattern to be inverted. While this is presumably done to ensure DC balance, it can be shown that this is unnecessary and actually makes the DC balance of the resulting PAM4 sequence slightly worse.

SuggestedRemedy

Replace this test pattern with a [to be named] test pattern that is the result of a Gray mapping of the bits output from a PRBS13 pattern generator (where the "A" bit is the first bit output by the generator) to PAM4 symbols.

Response Response Status C

ACCEPT IN PRINCIPLE.

Apply the suggested remedy using a pattern name of PRBS13Q with editorial license.

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

Cl 120 SC 120.5.10.2.3 P 132 L 19 # 92
 Dudek, Mike QLogic

Comment Type T Comment Status R

The 100GBASE-KP4 training pattern specified in 94.3.10.8 contains additional pre-coding to include termination bits that are not part of the normal 400GBASE-R sequence.

SuggestedRemedy

Replace this training sequence with a more representative sequence such as a QPRBS13 like sequence that does not include this pre-coding such as the one being used in the OIF PAM4 clauses that have been sent in Liasion.

Response Response Status C

REJECT.
 See comment #56.

Cl 120 SC 120.5.10.2.3 P 132 L 27 # 237
 Dawe, Piers Mellanox

Comment Type T Comment Status R

The 100GBASE-KP4 training pattern isn't compatible with P802.3bs because it includes termination bits and precoding.

SuggestedRemedy

Revise this to use a QPRBS13 without termination bits and precoding. Also I believe there is no need to re-initialize the scrambler: the pattern should be 8191 symbols long as in CEI-56G-VSR-PAM4.

Response Response Status C

REJECT.
 See comment #56

Cl 120B SC 120B.1 P 216 L 17 # 107
 Slavick, Jeff Avago Technologies

Comment Type T Comment Status R

Length of a CDAUI should not be included. It could be read that this section only applies to channels of that distance.

SuggestedRemedy

Remove "of approximately 25cm in length" from the last sentence in 120B.1

Response Response Status C

REJECT.
 The individual lanes of CDAUI-16 chip-to-chip are the same as the lanes of CAUI4 chip-to-chip. 83D.1 contains the same text: "with electrical interconnect of approximately 25 cm in length."

Cl 120B SC 120B.1 P 217 L 1 # 59
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

It is stated that the 16 differential lanes are AC-coupled but no further description of the properties of the AC-coupling are provided.

SuggestedRemedy

Incorporate the content of 93.9.4 (perhaps by reference).

Response Response Status C

ACCEPT IN PRINCIPLE.
 Add the line
 "The low-frequency 3 dB cutoff of the AC-coupling shall be less than 50 kHz." with editorial license

Cl 120B SC 120B.3.1 P 217 L 40 # 93
 Dudek, Mike QLogic

Comment Type T Comment Status A

Footnote d is not a BER value it is a probability.

SuggestedRemedy

Change "the BER value" to "the value of the probability "

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #60

Cl 120B SC 120B.3.1 P 217 L 40 # 259
 Li, Mike Altera

Comment Type TR Comment Status R

CDAUI-16 BER should be the same as CAUI-4, which is 1e-15, as from the host point, likely the same SERDES will support both, and it would be beneficial to make them consistent, which saves the cost in terms of design and test

SuggestedRemedy

change BER from TBD to 1e-15 for CDAUI-16 c2c link

Response Response Status C

REJECT.
 Since the existing parts can support a BER of 1E-15, they should also be able to support a more relaxed requirement of 1E-6.
 See response to comment #60
 [Editor's note: Clause changed from "Annex 120D" to "120B"]

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

CI 120B SC 120B.3.1 P 217 L 40 # 60
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

The BER is TBD. Assuming that CDAUI-16 chip-to-chip is allowed to take advantage of the Forward Error Correction (FEC) in the PCS, a higher bit error ratio can be targeted. If this is the case, then changing only footnote d) of Table 83D-1 is not appropriate since the total uncorrelated jitter value (0.26 UI) is based on target BER of 1E-15. Such jitter would likely be too large for a higher BER target (such as 1E-6).

SuggestedRemedy

Change TBD to 1E-6. Also, in 93.8.1.7 specify that the total uncorrelated jitter (max) value is 0.19 UI as another exception to Table 83D-1.

Response Response Status C

ACCEPT IN PRINCIPLE.

Change:

"with the exceptions that the signaling rate per lane is 26.5625 Gbd ± 100 ppm and the BER value in Table 83D-1 footnote d is TBD." to:

"with the following exceptions:

- The signaling rate per lane is 26.5625 Gbd ± 100 ppm.
- The value for the Effective total uncorrelated jitter, peak-to-peak in Table 83D-1 is 0.19 UI.
- The value of the probability in Table 83D-1 footnote d is 10⁻⁶."

See also comments #259 and #93

CI 120B SC 120B.3.2 P 217 L 49 # 125
 Marris, Arthur Cadence Design Syst

Comment Type T Comment Status R

CDAUI should probably just keep running normally while transporting LPI. The only thing to consider is whether significant power can be saved by allowing a higher BER while transporting LPI.

SuggestedRemedy

Change:

"[Editor's note: As none of the current 400G PMDs support deep sleep, should optional CDAUI-16 shutdown be specified here?]"

To:

"[Editor's note: If significant power can be saved by allowing a higher BER while transporting LPI then consider introducing signalling of the TX_LI and RX_LI states from the PCS to the CDAUI layers and introducing power saving measures when the PCS is in these states.]"

Same applies for 120D.3.2.

Response Response Status C

REJECT.

Commenter is invited to demonstrate that significant power savings can be made by allowing a higher BER and then bringing in a detailed proposal.

See also comment #58.

[Editor's note: Clause changed from "Annex" to "120B"]

CI 120B SC 120B.3.2 P 217 L 49 # 58
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

Since IEEE P802.3bs does not define "deep sleep" for 400 Gb/s Ethernet, remove subclause 120B.3.2.

SuggestedRemedy

Per comment.

Response Response Status C

ACCEPT IN PRINCIPLE.

Remove subclause 120B.3.2 together with the editor's note.

In 120B.5.3, remove item *LPI.

In 120B.5.4.1, remove items TC10 and TC11.

In 120B.5.4.2, remove item RC4.

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

Cl **120B** SC **120B.3.3** P **218** L **2** # **61**
 Healey, Adam Avago Technologies

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

The BER is TBD. Assuming that CDAUI-16 chip-to-chip is allowed to take advantage of the Forward Error Correction (FEC) in the PCS, a higher bit error ratio can be targeted. If this is the case, then target [RS-FEC] symbol error ratio will likely be measured and the COM value increased (in these regards, the scenario has more in common with 100GBASE-KR4 than CDAUI-4 chip-to-chip).

SuggestedRemedy

Change the list of exceptions to include the following: 1) the signaling rate per lane is 26.5625 Gbd +/- 100 ppm, 2) the "Bit error ratio" row in Table 83D-5 is replaced with "Symbol error ratio" and the max values are 1E-5, and 3) the target values for the "COM including effects of broadband noise" row in Table 83D-5 are 3 dB. In addition, notes a) and b) from Table 83D-5 would no longer apply and note a) should actually be replaced with note a) from Table 93-6.

Response Response Status **C**

ACCEPT IN PRINCIPLE.

Change:

"with the exceptions that the signaling rate per lane is 26.5625 Gbd ± 100 ppm and the BER value in Table 83D-5 is TBD." to:

"with the following exceptions:

- The signaling rate per lane is 26.5625 Gbd ± 100 ppm.
- The "Bit error ratio" parameter in Table 83D-5 is replaced with "RS-FEC symbol error ratio" with max values of 10⁻⁵.
- The target values for the parameter "COM including effects of broadband noise" in Table 83D-5 are 3 dB.
- Table 83D-5 footnote a is replaced by Table 93-6 footnote a.
- Table 83D-5 footnote b does not apply.

See also comment #260

Cl **120B** SC **120B.3.3** P **218** L **2** # **260**
 Li, Mike Altera

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

CDAUI-16 BER should be the same as CAUI-4, which is 1e-15, as from the host point, likely the same SERDES will support both, and it would be beneficial to make them consistent, which saves the cost in terms of design and test

SuggestedRemedy

change BER from TBD to 1e-15 for CDAUI-16 c2c RX

Response Response Status **C**

REJECT.

Since the existing parts can support a BER of 1E-15, they should also be able to support a more relaxed requirement of 1E-6.

See response to comment #61

[Editor's note: Clause changed from "Annex 120D" to "120B"]

Cl **120B** SC **120B.4** P **218** L **13** # **62**
 Healey, Adam Avago Technologies

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

The DER0 value is TBD. Assuming that CDAUI-16 chip-to-chip is allowed to take advantage of the Forward Error Correction (FEC) in the PCS, a higher bit error ratio can be targeted, the constraints imposed on the decision feedback equalizer (bmax) could be relaxed, and the target COM could be similar to what is used for 100GBASE-KR4.

SuggestedRemedy

Change the list of exceptions to include the following: a) the signaling rate per lane is 26.5625 Gbd +/- 100 ppm, b) DER0 is 1E-6, c) the bmax value is 1 for all n, and d) the minimum COM value is 3 dB.

Response Response Status **C**

ACCEPT IN PRINCIPLE.

Change:

"with the exceptions that the signaling rate per lane is 26.5625 Gbd ± 100 ppm and the DER0 value in Table 83D-6 is TBD." to:

"with the following exceptions:

- The signaling rate per lane is 26.5625 Gbd ± 100 ppm.
- The "Target detector error ratio" (DER0) value in Table 83D-6 is 10⁻⁶.
- The "Normalized DFE coefficient magnitude limit, for n = 1 to Nb" (bmax(n)) value in Table 83D-6 is 1.
- The Channel Operating Margin (COM) shall be greater than or equal to 3 dB.

In 120B.5.4.3, item CC1, change "2 dB" to "3 dB".

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Cl **120B** SC **120B.4** P **218** L **13** # **261**
 Li, Mike Altera

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

CDAUI-16 DER0 should be the same as CAUI-4, which is 1e-15, as from the host point, likely the same SERDES will support both, and it would be beneficial to make them consistent, which saves the cost in terms of design and test

SuggestedRemedy

change DER0 from TBD to 1e-15 for CDAUI-16 c2c COM

Response Response Status **C**

REJECT.

Since the existing parts can support a BER of 1E-15, they should also be able to support a more relaxed requirement of 1E-6.

See response to comment #62

[Editor's note: Clause changed from "Annex 120D" to "120B"]

Cl **120C** SC **120C.1.1** P **223** L **22** # **239**
 Dawe, Piers Mellanox

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

C2M CDAUI-16 BER is TBD. Shouldn't it be just the same as CDAUI-8, because it has the same place in the architecture?

SuggestedRemedy

Change

The bit error ratio (BER) shall be less than TBD with any errors sufficiently uncorrelated to ensure an acceptably high mean time to false packet acceptance (MTTFPA) assuming 64B/66B coding.

to

The bit error ratio (BER) shall be less than 10^{-6} provided that the error statistics are sufficiently random that this results in a frame loss ratio (see 1.4.223) of less than 6.2×10^{-13} for 64-octet frames with minimum interpacket gap when processed according to Clause 119.

If the error statistics are not sufficiently random to meet this requirement, then the BER shall be less than that required to give a frame loss ratio of less than 6.2×10^{-13} for 64-octet frames with minimum interpacket gap when processed according to Clause 119.

Response Response Status **C**

ACCEPT IN PRINCIPLE.

Change:

"The bit error ratio (BER) shall be less than TBD with any errors sufficiently uncorrelated to ensure an acceptably high mean time to false packet acceptance (MTTFPA) assuming 64B/66B coding." to:

"The bit error ratio (BER) shall be less than 10^{-6} ."

The 400GbE MTTFPA is protected by the requirement that the probability of not indicating an uncorrected codeword is less than $1E-6$ (see 119.2.5.3).

The FLR limit of $6.2E-11$ has to be met with most of the errors coming from the optical interface. To check for sufficiently random error statistics on this interface alone (see comment #31) would require that the FLR equivalent to the limiting BER for this interface be measured. For a BER of $1E-6$ this would be an FLR of $2E-50$. Even for the limiting value for the sum of the electrical interfaces with random errors of $8.2E-5$ (see http://www.ieee802.org/3/bs/public/15_09/anslow_3bs_03_0915.pdf#page=27), this would be an FLR of $7E-20$.

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Cl 120C SC 120C.3.4 P 224 L 5 # 189
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A

Adaptive equalization for the CDAUI-16 receiver is not included explicitly in the body of Clause 120C although it is included in the PICS.

SuggestedRemedy

As adopted in P802.3by Clause 109B.3.4, add "Channel equalization is provided by an equalizer in the module which uses the reference CTLE setting provided by the host or an adaptive equalizer in the module which does not use the setting provided by the host."

Response Response Status C

ACCEPT IN PRINCIPLE.
 add "Channel equalization is provided by an equalizer in the module which uses the Recommended_CTLE_value provided by the host or an adaptive equalizer in the module which does not use the setting provided by the host."

Cl 120C SC 120C.4 P 224 L 13 # 240
 Dawe, Piers Mellanox

Comment Type T Comment Status A

Need to choose a probability limit for eye height and width appropriate to the spec BER.

SuggestedRemedy

Maybe use EH8 and EW8?

Response Response Status C

ACCEPT IN PRINCIPLE.
 Analysis of an appropriate probability limit and any associated changes to the eye width and eye height requirements are invited.

Cl 120C SC 120C.5.3 P 226 L 11 # 190
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status R

Item ADR does not mention equalization when adaptive is really describing the behavior of the equalizer. This item in the PICS should be about adaptive equalization.

SuggestedRemedy

Change "ADR" to "ADE" and change "Adaptive receiver" to "Adaptive equalizer." This suggested remedy aligns with that adopted by P802.3by for 109B.5.3.

Response Response Status C

REJECT.
 The lanes of CDAUI-16 chip-to-module are the same as the lanes of CAUI4 chip-to-module. 120C.3.4 references 83E.3.4 with the noted exceptions. Differences between the PICS in Annex 120C and the PICS in Annex 83E have only been made when necessary. There is no difference between CAUI-4 chip-to-module and CDAUI-16 chip-to-module in this respect, so changing the name and content of this PICS item to be different from Annex 83E would be misleading.

Cl 120D SC 120D.1 P 228 L 17 # 10
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R

OIF MR states reach is 50 cm but in Clause it says 25 cm

SuggestedRemedy

The reach will be 50 cm on improved PCB

Response Response Status C

REJECT.
 25cm is consistent with the assumptions made for CAUI-4. There was no consensus to make the proposed change.

Straw Poll
 Change to "up to 50cm"
 Yes : 8
 No : 10

[Editor's note: Subclause changed from 120.D.1 to 120D.1]

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Cl 120D SC 120D.1 P 229 L 1 # 40
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

It is stated that the 8 differential lanes are AC-coupled but no further description of the properties of the AC-coupling are provided.

SuggestedRemedy

Incorporate the content of 93.9.4 (perhaps by reference).

Response Response Status C

ACCEPT IN PRINCIPLE.

Add the line

"The low-frequency 3 dB cutoff of the AC-coupling shall be less than 50 kHz." with editorial license

Cl 120D SC 120D.1 P 229 L 4 # 41
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

The reference to the transmitter training mechanism is TBD but the mechanism is explicitly defined in subsequent subclauses.

SuggestedRemedy

Replace "TBD" with "120D.3.1.1 and "120D.3.3.3".

Response Response Status C

ACCEPT IN PRINCIPLE.

Replace TBD with "120D.3.3.3" to be consistent with Annex 83D

Cl 120D SC 120D.1 P 229 L 24 # 42
 Healey, Adam Avago Technologies

Comment Type E Comment Status A

"The normative channel compliance is through chip-to-chip CDAUI-8 channel operating margin (COM)..." seems awkwardly worded.

SuggestedRemedy

Change to: "The channel is normatively defined using channel operating margin (COM) as described in 120D.4."

Response Response Status C

ACCEPT.

Cl 120D SC 120D.1 P 229 L 28 # 11
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A

Loss for equation is 20.457 dB instead of 20 dB at Nyquist of 13.275 GHz

SuggestedRemedy

Adjust equation to get 20 dB

$L=1.059+2.486*\sqrt{f}+0.744*f$

It might be helpful to also mention with nominal loss of 20 dB

Response Response Status C

ACCEPT IN PRINCIPLE.

This equation was explicitly adopted in Motion 6 in the January 2015 Interim meeting, and was also part of the adopted baseline
 - see slide 4 of li_3bs_01a_0315.pdf

However the loss at Nyquist will be added with editorial license.

Cl 120D SC 120D.1 P 230 L 10 # 186
 Tooyserkani, Pirooz Cisco Systems

Comment Type T Comment Status R ILD

ILD is not specified for the Chip-to-Chip interface IL plot or table. PAM4 signal is more sensitive to ISI than NRZ

SuggestedRemedy

Add ILD number either in ILDrms figure or mask in the IL plot

Response Response Status C

REJECT.

Chip-to-Chip use COM to specify the channel and includes the effect of ILD.

The commenter should provide a supporting presentation justifying the need and showing consensus that COM is not adequate.

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Cl 120D SC 120D.3.1 P 230 L 41 # 43
 Healey, Adam Avago Technologies

Comment Type E Comment Status A

The second sentence of the paragraph seems unnecessary and may end up being inaccurate as modifications are made to the draft annex.

SuggestedRemedy

Delete the sentence: "While the CDAUI-8 chip-to-chip transmitter requirements are similar to those in Clause 94, they differ in that they do not assume transmitter training or a back-channel communications path."

Response Response Status C

ACCEPT IN PRINCIPLE.

Delete the sentence: "While the CDAUI-8 chip-to-chip transmitter requirements are similar to those in Clause 94, they differ in that they do not assume transmitter training or a back-channel communications path."

and also remove the "Also" and "is not manipulated via the PMD control function described in 94.3.10, but " from the sentence that follows.

Cl 120D SC 120D.3.1 P 231 L 14 # 94
 Dudek, Mike QLogic

Comment Type T Comment Status A

The referenced equation 93-7 is for the 100GBASE-KR4 channel and therefore it is rather strange to point to it for the transmitter spec, however a more stringent specification like this one is likely to be needed. Also equation 93-8 does not exist. There is a significant likelihood also that these equations will have to change.

SuggestedRemedy

Create local equations and point to them. Copy the equation 93-7 for the differential return loss (no technical change) and copy equations 93-4 as the starting point for the common mode return loss. Extend their frequency range to 20GHz. Change the TC6 and TC7 PICS to match.

Response Response Status C

ACCEPT IN PRINCIPLE.

The Baseline says "Reuse Eq. (93-3) and Fig (93-7)", so the referenced equation is wrong. In Table 120D-1:

change the value for "Differential output return loss (min)" from "Equation 93-7" to "Equation 93-3"

change the value for "Common-mode output return loss (min)" from "Equation 93-8" to "Equation 93-4"

Cl 120D SC 120D.3.1 P 231 L 22 # 44
 Healey, Adam Avago Technologies

Comment Type T Comment Status A TXEQ Coeff

The transmitter equalizer coefficient range and resolution are defined in Table 120D-2 and Table 120D-3.

SuggestedRemedy

In Table 120D-1, replace the rows "Normalized coefficient step size(min)" through "Post-cursor full-scale range (max)" with references to Table 120D-2 and Table 120D-3.

Response Response Status C

ACCEPT IN PRINCIPLE.

See response to comment #95

Cl 120D SC 120D.3.1 P 231 L 27 # 45
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

As demonstrated in <http://www.ieee802.org/3/bs/public/15_09/healey_3bs_01_0915.pdf>, the fit of a measured jitter distribution to a dual-Dirac model tends to underestimate bounded uncorrelated jitter (in this case CDJ) and over-estimate random jitter (in this case CRJ) by significant amounts. As a result, limits on the fit components can be onerous (in the case of CRJ) and/or not very meaningful (in the case of CDJ). A direct and more meaningful measurement of the peak-to-peak jitter is possible because of the higher target error ratio. If direct measurement is not possible due to constraints on test time, extrapolation of the peak-to-peak value based on a fit to the dual-Dirac model is acceptable since this will tend to over-estimate the peak-to-peak jitter. Non-Gaussian components of the jitter can be bounded via a constraint on the RMS value or a second measurement of the peak-to-peak jitter at a higher probability e.g., 1E-2 (both of which are simple and direct measurements). Finally, measurement of clock-like test pattern is convenient but is unlikely to capture the full extent of the transmitter output jitter. It is better to use a reasonably rich PRBS pattern for the measurement.

SuggestedRemedy

In Table 120D-1, replace the CDJ and CRJ rows with "Output jitter, pk-to-pk (max)" and "Output jitter, RMS (max)". Add a new subclause, e.g., 120D.3.1.2, to define a new output jitter measurement based on PAM4-encoding PRBS13 or similar test pattern (not QPRBS13 as addressed in a different comment). Remove the JP03A test pattern as an optional PMA test pattern (120.5.10.2.1). A presentation will be provided with additional details for the proposed measurement method and requirement.

Response Response Status C

ACCEPT IN PRINCIPLE.

The proposal is promising but more investigation and a more detailed proposal is needed before the draft can be changed.

No change to draft.

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Cl 120D SC 120D.3.1 P 231 L 28 # 46
 Healey, Adam Avago Technologies

Comment Type E Comment Status A Bucket

IEEE 802.3 editorial convention
 <http://www.ieee802.org/3/WG_tools/editorial/requirements/words.html> is to use "pk-pk"
 as the abbreviation of "peak-to-peak".

SuggestedRemedy

Replace "pp" with "pk-pk".

Response Response Status C

ACCEPT.

Cl 120D SC 120D.3.1.1 P 231 L 21 # 95
 Dudek, Mike QLogic

Comment Type T Comment Status A TXEQ Coeff

The normalized coefficient step size min and max and pre-cursor and post cursor full-scale ranges are in conflict to section 120D.3.1.1. Singal to noise and distortion is also not part of "output jitter and linearity"

SuggestedRemedy

Use table 83D-1 as a template pointing at tables 120D-2 and 120D-3 for the equalization rows.

Response Response Status C

ACCEPT.

Replace the last 4 parameters under Output waveform with:

Pre-cursor equalization 120D.3.1.1 Table 120D-2 -

Post-cursor equalization 120D.3.1.1 Table 120D-3 -

Move the row for "Signal-to-noise-and-distortion ratio (min)" to be above "Output Jitter and linearity" as per Table 83D-1

Note however that the values in Table 120D-1 came directly from the adopted baseline.
 See also comment #44

Cl 120D SC 120D.3.1.1 P 231 L 31 # 12
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

No definition of CRU requirement to measure the output waveform and jitter

SuggestedRemedy

Add footnote to table or subsection to be referenced

"The clock recovery unit (CRU) used in the optical waveform measurement has a corner frequency of 4 MHz and a slope of 20 dB/decade. When using a clock recovery unit as a clock for BER measurements, passing of low- frequency jitter from the data to the clock removes this low-frequency jitter from the measurement."

Response Response Status C

REJECT.

There is no consensus yet on changing the CRU BW frequency.

[Editor's note: Subclause changed from 120.5.3.1.1 to 120D.3.1.1]

Cl 120D SC 120D.3.1.1 P 231 L 34 # 47
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

The reference 93.8.1.5.1 is incorrect. 94.3.12.5.2 is more appropriate for PAM4 signaling. However, 94.3.12.5.2 specifies QPRBS13 as the test pattern which is not appropriate for 400 Gb/s Ethernet (this is the subject of a comment against 120.5.10.2.3).

SuggestedRemedy

Change to: "The transmitter output equalization is characterized using the linear fit method described in 94.3.12.5.2 with the exception that the [to be named] test pattern is used. The state of the CDAUI-8 transmit output is manipulated via management."

Response Response Status C

ACCEPT IN PRINCIPLE.

Change to: "The transmitter output equalization is characterized using the linear fit method described in 94.3.12.5.2 with the exception that the [to be named QPRBS13 equivalent] test pattern is used. The state of the CDAUI-8 transmit output is manipulated via management."

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CI 120D SC 120D.3.1.1 P 231 L 37 # 48
 Healey, Adam Avago Technologies

Comment Type E Comment Status A Bucket

Since c is a variable, it should be shown in italic text (2014 IEEE-SA Standards Style Manual 15.3).

SuggestedRemedy

Change "c" to italic text here and in similar instances throughout the annex.

Response Response Status C

ACCEPT.

CI 120D SC 120D.3.2 P 233 L 3 # 49
 Healey, Adam Avago Technologies

Comment Type T Comment Status A EEE

"Optional EEE operation" is TBD.

SuggestedRemedy

Since IEEE P802.3bs does not define "deep sleep" for 400 Gb/s Ethernet, remove subclause 120D.3.2.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Remove subclause 120D.3.2
 In 120D.6.3, remove item *LPI.
 In 120D.6.4.1, remove items TC10 and TC11.
 In 120D.6.4.2, remove item RC5.

CI 120D SC 120D.3.3.1 P 233 L 42 # 50
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

The receiver jitter tolerance requirements are confusing. Table 120D-4 marks receiver jitter tolerance to be TBD. In 120D.3.3.1, item c) states that sinusoidal jitter is added to the test transmitter by modulating the clock source and Table 120D-5 includes a reference to Table 8-13 (likely intended to Table 88-13). Another receiver jitter tolerance test is defined in 120D.3.3.2.

SuggestedRemedy

There are a number of possible remedies.

- 1) In Table 120D-4, change the value for the jitter tolerance row to be "Table 120D-6". In 120D.3.3.1, remove item c) and "Applied pk-pk sinusoidal jitter" row from Table 120D-5.
- 2) In Table 120D-4, remove the "Jitter tolerance" row. In Table 120D-5, change the reference in the "Applied pk-pk sinusoidal jitter" row to be Table 88-13. Remove 120D.3.3.2.

Response Response Status C

ACCEPT IN PRINCIPLE.

In Table 120D-4, change the value for the jitter tolerance row to be "Table 120D-6". In 120D.3.3.1, remove item c) and "Applied pk-pk sinusoidal jitter" row from Table 120D-5.

CI 120D SC 120D.3.3.1 P 233 L 43 # 96
 Dudek, Mike QLogic

Comment Type E Comment Status A

Table 8-13 is not applicable. Also it is likely that the values for the table that was probably meant, (the equivalent one for CAUI4) will need to be changed, as the allowed Tx jitter has been reduced from the equivalent number for CAUI4.

SuggestedRemedy

Replace "table 8-13" with a local table that has the same contents as table 88-13 but with TBD values.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #50

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CI 120D SC 120D.3.3.1 P 233 L 45 # 51
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

The tests are normally ordered in terms of increasing insertion loss in receiver interference tolerance parameter tables.

SuggestedRemedy

Swap the test 1 and test 2 values.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Swap the test 1 and test 2 values.
 Add text to column headers to identify low and high loss cases as in Table 110-5 (P802.3by)

Straw Poll
 Swap columns : 6
 Yes : 6; No 2;

CI 120D SC 120D.3.3.2 P 234 L 19 # 13
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A

Receiver jitter tolerance must test for full range of sinusoidal jitter component allowed to propagate down the link by the Golden PLL.

SuggestedRemedy

Replace Table 120D-6 with Table 87-13 without identifying any specific test cases. Users will choose how many frequencies is required to guarantee interoperability

Response Response Status C

ACCEPT IN PRINCIPLE.

Straw poll
 Increase the number of points in jitter tolerance from 2 points
 Yes 4; No 2;

Do not change the draft.
 The editor requests further work on the jitter tolerance frequencies.

[Editor's note: Subclause changed from 120.D.3.3.2 to 120D.3.3.2]

CI 120D SC 120D.3.3.2 P 234 L 19 # 57
 Healey, Adam Avago Technologies

Comment Type T Comment Status A

For receiver interference tolerance, the maximum symbol error ratio is defined. In Table 120D-6, the maximum pre-FEC BER is defined.

SuggestedRemedy

In Table 120D-6, remove the "Maximum Pre-FEC BER" row. Add the following sentence to end of the last paragraph of 120D.3.3.2: "The RS-FEC symbol error ratio shall be less than or equal to 1E-5 for each case listed in Table 120D-6."

Response Response Status C

ACCEPT IN PRINCIPLE.
 In Table 120D-6, Change the "Maximum Pre-FEC BER" row header to "RS-FEC Symbol error ratio", and change 10-6 to 10-5 for both cases.
 Change "Symbol error ratio" to "RS-FEC symbol error ratio" in Table 120D-5 for consistency.

CI 120D SC 120D.3.4 P 234 L 52 # 124
 Marris, Arthur Cadence Design Syst

Comment Type T Comment Status A EEE

It is not necessary to specify CDAUI shutdown and there is no need for the energy detect signal.

SuggestedRemedy

Delete 120D.3.4

Response Response Status C

ACCEPT.
 See also comment #52

[Editor's note: Clause changed from "Annex" to "120D"]

CI 120D SC 120D.3.4 P 234 L 53 # 52
 Healey, Adam Avago Technologies

Comment Type T Comment Status A EEE

The Global energy detect function is TBD.

SuggestedRemedy

Since IEEE P802.3bs does not define "deep sleep" for 400 Gb/s Ethernet, remove subclause 120D.3.2.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #124
 [Editor's note: Subclause changed from 120D.4 to 120D.3.4]

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CI 120D SC 120D.4 P 235 L 10 # 187
 Tooyserkani, Pirooz Cisco Systems
 Comment Type T Comment Status R ILD
 No ILD parameter in the COM table
 SuggestedRemedy
 Add ILD figure in the table
 Response Response Status C
 REJECT.
 COM does not use an ILD value, so there is no need to specify it.
 The commenter should provide a supporting presentation justifying the need and showing consensus on the value suggested.

CI 120D SC 120D.4 P 235 L 17 # 54
 Healey, Adam Avago Technologies
 Comment Type E Comment Status A Bucket
 In Table 120D-7 Cd, zp, Cb, R0, and Rd are variables and should be shown in italic text (2014 IEEE-SA Standards Style Manual 15.3).
 SuggestedRemedy
 Change "Cp", "zp", "Cb", "R0" (R only), and "Rd" to italic text here and in similar instances throughout the annex.
 Response Response Status C
 ACCEPT.

CI 120D SC 120D.4 P 235 L 17 # 53
 Healey, Adam Avago Technologies
 Comment Type T Comment Status A COM
 The Channel Operating Margin parameters table is incomplete.
 SuggestedRemedy
 A presentation will be submitted with suggested values.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 Straw Poll :
 Incorporate the COM parameter value changes shown in yellow in Slides 6-8 of healey_3bs_02_1115.pdf into Table 120D-7 with the exception of the Single-ended termination resistance (Rd) value which should be 55 ohm. All changes will be made in Magenta
 Yes 10; No 0;
 Incorporate the COM parameter value changes shown in yellow in Slides 6-8 of healey_3bs_02_1115.pdf into Table 120D-7 with the exception of the Single-ended termination resistance (Rd) value which should be 55 ohm. All changes will be made in Magenta

CI 120D SC 120D.5 P 236 L 20 # 55
 Healey, Adam Avago Technologies
 Comment Type E Comment Status A
 Much of this subclause seems redundant (similar text appears in 120D.1 with the exception of the citation of an example).
 SuggestedRemedy
 Remove 120D.5. Move the sentence "An example of a possible transmitter equalization tuning process using transmitter equalization feedback is provided in 83D.5." to an appropriate location in 120D.1 (suggest after the sentence "If implemented, the transmitter equalization feedback mechanism described in TBD may be used to identify an appropriate setting.").
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 Remove section 120D.5 and Move the sentence "An example of a possible transmitter equalization tuning process using transmitter equalization feedback is provided in 83D.5." to an appropriate location in 120D.3.3.3

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Cl 120E SC 120E.1 P 240 L 10 # 185
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A Adaptive Equalizer

There is absolutely no mention in this Clause that the module should use an adaptive CTLE equalizer.

SuggestedRemedy

Even if it is not necessary as part of the normative specification, I think there should be an informative note stating that it is assumed the module shall use an adaptive CTLE equalizer, and that the module shall not rely on the host to provide any information on the CTLE settings.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #191

Cl 120E SC 120E.1 P 241 L 1 # 182
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A CEI-56G

"The chip-to-module interface is defined using a specification and test methodology that is similar to that used for CEI-28G-VSR-PAM4 defined in OIF-CEI-03.x [Bx1]." Shouldn't the reference be to CEI-56G-VSR-PAM4 and not CEI-28G-VSR-PAM4

SuggestedRemedy

Change "28G" to "56G"

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #86

Cl 120E SC 120E.1 P 241 L 2 # 14
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A CEI-56G

CEI-28G-VSR-PAM4 is not right reference

SuggestedRemedy

The methodology is actually based on CAUI-4 CL83E with everything scaled 2x the bit rate

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #86

[Editor's note: Subclause changed from 120.E.1 to 120E.1]

Cl 120E SC 120E.1 P 241 L 18 # 15
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A

Equation 120-E1 loss is 10.275 dB instead of 10.2 dB

SuggestedRemedy

Here is equation scaled to have loss of 10.2 dB
 $L=0.0801+0.5736*\sqrt{f}+0.6046*f$

Response Response Status C

ACCEPT.
 This equation was explicitly adopted in Motion 8 in the January 2015 Interim meeting, and was also part of the adopted baseline
 - see slide 8 of brown_3bs_01a_0315.pdf

However there is a discrepancy with the loss shown in Figure 120E-2. It is not clear which of the constituent parts of the loss in the figure should be changed to correct this problem.

Straw Poll
 Change equation 4;
 Change diagram 1;

[Editor's note: Subclause changed from 120.E.1 to 120E.1]

Cl 120E SC 120E.1 P 241 L 37 # 16
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R

Straight line loss up to 28 GHz is not representative of real channel under consideration
http://www.ieee802.org/3/bs/public/adhoc/elect/24Aug_15/mazzini_01_082415_elect.pdf

SuggestedRemedy

Need to add break at 18 GHz with same slope as CAUI-4 C2M
 $L=-22 + 2*f$ from 18 GHz to 28 GHz

Response Response Status C

REJECT.
 This equation was explicitly adopted in Motion 8 in the January 2015 Interim meeting, and was also part of the adopted baseline
 - see slide 8 of brown_3bs_01a_0315.pdf

The commenter is invited to show the change does not degrade performance and gain consensus in the Task Force to make the change.

[Editor's note: Subclause changed from 120.E.1 to 120E.1]

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CI 120E SC 120E.1.1 P 242 L 3 # 198
 Dawe, Piers Mellanox

Comment Type T Comment Status A

As this annex deals in PAM4 symbols, there isn't a bit error ratio unless we define one. As a PMA may split up and rearrange the symbols before the signal gets to a PCS or pattern checker, measuring PAM4 symbol error ratio isn't convenient.

SuggestedRemedy

For this and similar situations (400GBASE-DR4, 400GBASE-FR8, 400GBASE-LR8, Chip-to-chip CDAUI-8), define bit error ratio as the bit error ratio after PAM4 decoding/Gray (de)mapping.

Response Response Status C

ACCEPT IN PRINCIPLE.

In 120E.1.1, 122.1.1, and 123.1.1, change:

"The bit error ratio (BER) shall be less than..." to:

"The bit error ratio (BER) when processed according to Clause 120 shall be less than..."

Also, in 120E.1.1, 122.1.1, and 123.1.1, change:

"when processed according to Clause 119" to "when processed according to Clause 120 and Clause 119" in two places each.

Also see comment #222

CI 120E SC 120E.2 P 242 L 10 # 188
 Tooyserkani, Pirooz Cisco Systems

Comment Type T Comment Status R ILD

ILD is not specified for the Chip-to-Module interface IL plot or table. PAM4 signal is more sensitive to ISI than NRZ

SuggestedRemedy

Add IL number either in ILDrms figure or mask in the IL plot

Response Response Status C

REJECT.

The chip-to-module interface is specified at the connector and a normative channel specification is not appropriate.

There is an informative channel IL specification and if the commenter wishes to add to it he is should provide a supporting presentation justifying the need.

CI 120E SC 120E.3.1 P 243 L 41 # 243
 Dawe, Piers Mellanox

Comment Type T Comment Status R

The RMS AC common-mode output voltage limit, 17.5 is the same as for C2M CAUI-4 yet 100GBASE-CR4 has 30 mV, 100GBASE-KR4 has 12 mV, and C2C CDAUI-8 following 100GBASE-KP4 has 30 mV although its PICS says 12. A little intrapair skew is to be expected at the multilane connector, and it seems that 30 mV could be tolerated for C2M CAUI-4. Here for C2M CDAUI-8, the signalling rate is a little higher, the transmitter should be a little faster and may be using some FFE to get a reasonable opening of a multilevel eye, so for the same channels, a higher limit should apply.

SuggestedRemedy

Change 17.5 to 20 or 25, here and in Table 120E-2 for the module output. Update the PICS.

Response Response Status C

REJECT.

The RMS AC common-mode output voltage value of 17.5mV rms is defined as part of the adopted Baseline.

See slide 9 of brown_3bs_01a_0315.pdf

Commenter is invited to gain consensus in the Task Force for a change to the value.

CI 120E SC 120E.3.1 P 243 L 53 # 199
 Dawe, Piers Mellanox

Comment Type T Comment Status R Transition time

The C2M CAUI-4 host output 20% to 80% transition time min is 10 ps. Here for C2M CDAUI-8, the signalling rate is a little higher, the transmitter should be a little faster and may be using some FFE to get a reasonable opening of a multilevel eye. The compliance board is the same. So a lower limit should apply. On the other hand, the host output already contains most of the channel impairments from the connector, so it would be surprising if a very fast host output would ever be a worst case. We need to review the reflection specs before finalising this.

SuggestedRemedy

Change magenta TBD to magenta 9, or delete the row. Update the PICS.

Response Response Status C

REJECT.

Comments #17 & #199 propose different transition time values. Commenters agreed during the meeting to 9ps, but couldn't achieve consensus in the group to make this change.

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Cl 120E SC 120E.3.1 P 243 L 53 # 17
 Ghiasi, Ali Ghiasi Quantum LLC
 Comment Type TR Comment Status R Transition time
 Transition time is TBD
 SuggestedRemedy
 Minimum transition time = 10 ps
 Add note between any two PAM levels
 Response Response Status C
 REJECT.
 Comments #17 & #199 propose different transition time values. Commenters agreed during the meeting to 9ps, but couldn't achieve consensus in the group to make this change.
 [Editor's note: Subclause changed from 120.E.3.1 to 120E.3.1 and Page changed from 242 to 243]

Cl 120E SC 120E.3.1 P 244 L 1 # 183
 Nicholl, Gary Cisco Systems
 Comment Type T Comment Status A
 How do you measure the BER of the individual PAM4 eyes ? Isn't the only think you can measure the BER of the aggregate PAM4 signal ?
 SuggestedRemedy
 Please provide some clarification as to how this shsould be measured.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 The notes apply to Eye width and Eye height in Table 120E-1. There is considerable detail provided on the measurement method in the referenced 120E.4.2.
 However they are not measured by BER but by probability, so change "at 10-6 BER" to at 10-6 probability" in the two footnotes.

Cl 120E SC 120E.3.1.3 P 244 L 42 # 200
 Dawe, Piers Mellanox
 Comment Type T Comment Status R
 As PAM4 is affected (Tilde)3x as much by reflections as NRZ, we should see if there is an opportunity to improve the return loss specs. Both product and compliance boards may have improved since 802.3bj.
 SuggestedRemedy
 Consider tightening the return loss specs by a couple of dB, closer to CEI-28G-VSR. Possibly the module can do this easier than the host. Including 120E.3.3.1
 Response Response Status C
 REJECT.
 No specific remedy provided.
 [Editor's note: Tilde character replaced by (Tilde) in Comment text.]

Cl 120E SC 120E.3.1.5 P 244 L 50 # 201
 Dawe, Piers Mellanox
 Comment Type T Comment Status A Transition time
 Need to say what transition time we are talking about, or change PAM4 to NRZ ;)
 SuggestedRemedy
 Say that we are specifying isolated edges from 0 to 3 and from 3 to 0. Say where they are found in our preferred medium-length pattern (QPRBS13 or similar).
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 Bring a copy of 86A.5.3.3 into the Annex.
 Update with editorial license for PAM4 signalling. Replace references to 86A.5.3.3 with references to this new sub-clause.

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Cl 120E SC 120E.3.1.6 P 245 L 8 # 202
 Dawe, Piers Mellanox

Comment Type T Comment Status A
 QPRBS13 isn't described in 92.2.9.3. 94.2.9.3 points to 94.3.10.8, which describes a PRBS13 with termination bits, Gray coded, precoded, PAM4 coded. In this project we don't have termination bits or precoding.

SuggestedRemedy
 Use a PRBS13 with just Gray coding and PAM4 coding. This could be defined in 120.5.10 or e.g. 123.8.1. Similarly in 120E.3.3.2, 120E.3.4.1.1.

Response Response Status C
 ACCEPT IN PRINCIPLE.
 Change reference to 120.5.10.2.3.

Cl 120E SC 120E.3.1.6 P 245 L 10 # 242
 Dawe, Piers Mellanox

Comment Type T Comment Status R Transition time
 We can't easily change the target transition time (see another comment) and what actually matters for crosstalk is slew rate, so if 900 mV/12 ps isn't enough, we can do something we couldn't do for CAUI-4 without breaking faith with existing designs:

SuggestedRemedy
 Increase the crosstalk amplitude to e.g. magenta 1.1 V TBC. BUT also add a footnote to Table 120E-3, CDAUI-8 host input, saying that the host should withstand (e.g. 1.1 V) in host output testing, although the input doesn't have to work correctly in that situation. Similarly in 120E.3.3.2.1, but the amplitude may be different depending on the host and module minimum transition times. Similarly in 120E.3.4.1.1.

Response Response Status C
 REJECT.
 Without consensus on transition time such a change is premature

Cl 120E SC 120E.3.1.6 P 245 L 11 # 241
 Dawe, Piers Mellanox

Comment Type T Comment Status A Transition time
 As we are using the same transition boards as for C2M CAUI-4, unless we use a crosstalk generator with much more sophisticated emphasis, the target transition time will be the same. If we want more crosstalk we should adjust the amplitude (see another comment).

SuggestedRemedy
 Change target transition time from TBD ps to 12 ps, here, in 120E.3.2.1 and 120E.3.4.1.1.

Response Response Status C
 ACCEPT IN PRINCIPLE.
 See also comment #18
 Replace TBD with 12 ps in Magenta in 120E.3.1.6, 120E.3.2.1 and 120E.3.4.1.1.

Cl 120E SC 120E.3.1.6 P 245 L 11 # 18
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A Transition time
 Transition time is TBD

SuggestedRemedy
 Replace TBD with 12 ps

Response Response Status C
 ACCEPT IN PRINCIPLE.
 There appears to be consensus to set the crosstalk generator transition time TBD to 12ps.

See also comment #241
 [Editor's note: Subclause changed from 12E.3.1.6 to 120E.3.1.6]

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Cl 120E SC 120E.3.1.6 P 245 L 13 # 20
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

Add sub section on the CRU requiriements

SuggestedRemedy

The clock recovery unit (CRU) for the eye measurement has a corner frequency of 4 MHz and a slope of 20 dB/decade. When using a clock recovery unit as a clock for BER measurements, passing of low- frequency jitter from the data to the clock removes this low-frequency jitter from the measurement.

Response Response Status C

REJECT.
 There is no consensus yet on changing of CRU BW frequency.

[Editor's note: Subclause changed from 12E.3.1.5 to 120E.3.1.6]

Cl 120E SC 120E.3.1.6 P 246 L 18 # 203
 Dawe, Piers Mellanox

Comment Type TR Comment Status R Transition time

The minimum module output transition time in CEI-28G-VSR is 9.5 ps. Here for C2M CDAUI-8, the transmitter should be a little faster and may be using some FFE to get a reasonable opening of a multilevel eye, so a lower limit should apply. C2M CAUI-4 set the limit slower to match the signal through pair of mated compliance boards; as the loss in a module can be much less than the HCB loss, this constrains the module to be slower (=worse, usually) than it need be. See another comment for what to do about the crosstalk calibration.

SuggestedRemedy

Change magenta TBD to magenta 7.5 ps.

Response Response Status C

REJECT.
 Comments #19 & #203 propose different module output transition time values.
 Commenters need to come to consensus on an agreed value to replace the TBD

Cl 120E SC 120E.3.2 P 246 L 18 # 19
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R Transition time

Transition time is TBD

SuggestedRemedy

Replace TBD with 12 ps

Response Response Status C

REJECT.
 Comments #19 & #203 propose different module output transition time values.
 Commenters need to come to consensus on an agreed value to replace the TBD

[Editor's note: Subclause changed from 12E.3.2.1 to 120E.3.2]

Cl 120E SC 120E.3.2.1 P 245 L 34 # 21
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

Add sub section on the CRU requiriements

SuggestedRemedy

The clock recovery unit (CRU) for the eye measurement has a corner frequency of 4 MHz and a slope of 20 dB/decade. When using a clock recovery unit as a clock for BER measurements, passing of low- frequency jitter from the data to the clock removes this low-frequency jitter from the measurement.

Response Response Status C

REJECT.
 There is no consensus yet on changing of CRU BW frequency.

Cl 120E SC 120E.3.3.2.1 P 247 L 53 # 215
 Dawe, Piers Mellanox

Comment Type ER Comment Status A Bucket

stress signal

SuggestedRemedy

stressed signal, as in 83E.3.3.2.1.
 Bring the draft into line with the corrections and improvements made in P802.3bx. All clauses and annexes as needed.

Response Response Status C

ACCEPT IN PRINCIPLE.
 In 120E.3.3.2.1 (2 instances) and 120E.3.4.1.1 (2 instances), change "stress signal" to "stressed signal"

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CI 120E SC 120E.3.3.2.1 P 247 L 54 # 22
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

10 MHz CRU adds extra burden to the host SerDes see
http://www.ieee802.org/3/bs/public/15_09/ghiasi_3bs_01b_0915.pdf

SuggestedRemedy

Replace 10 Mhz with 4 MHz
 Also change Table 120E-4 reference to Table 88-13 with Table 87-13

Response Response Status C

REJECT.
 There is no consensus yet on changing of CRU BW frequency. However as this is an area of debate, as suggested by comments #204 & #209, make "10 MHz" magenta.

[Editor's note: Subclause changed from 12E.3.3.2.1 to 120E.3.3.2.1]

CI 120E SC 120E.3.3.2.1 P 247 L 54 # 204
 Dawe, Piers Mellanox

Comment Type T Comment Status A CDR BW

Not sure what the reference CDR bandwidth for PAM4 should be.

SuggestedRemedy

For now, make the "10 MHz" magenta (3 places in 120E, 1 in 121.3.2, 1 in 123.3.2).
 For now, make the references to Table 88-13 magenta (Table 120E-4, Table 120E-7).

Response Response Status C

ACCEPT.

CI 120E SC 120E.3.3.2.1 P 249 L 11 # 205
 Dawe, Piers Mellanox

Comment Type T Comment Status A

Even-odd jitter as defined in 92.8.3.8.1 uses PRBS9. It would be convenient to be able to use QPRBS13, as for eye height, eye width measurements. It looks like it should work. Measuring just the zero crossings (ignoring upper and lower eyes) should be enough.

SuggestedRemedy

Allow use of QPRBS13, measuring just the zero crossings, for even-odd jitter.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Use QPRBS13 for even-odd jitter measurements using just the zero crossings.
 Bring in a copy in of 92.8.3.8.1 and modify to use QPRBS13 (or whatever it is renamed to) with editorial license.
 Change the footnote "c" of Table 120E-5 to reference this new sub-clause

CI 120E SC 120E.3.3.2.1 P 249 L 16 # 63
 Dudek, Mike QLogic

Comment Type E Comment Status A Bucket

Typo

SuggestedRemedy

replace QPRB13 with QPRBS13

Response Response Status C

ACCEPT.

CI 120E SC 120E.3.3.2.1 P 249 L 28 # 206
 Dawe, Piers Mellanox

Comment Type T Comment Status A VEC

Test vertical eye closure should be revised to align with Table 120E-2 CDAUI-8 module output, max 5.8 dB, as was done in CEI-56G-VSR-PAM4.

SuggestedRemedy

Change "4.8 dB to 5.8 dB with a target value of 5.3 dB" to "5.3 dB to 6.3 dB with a target value of 5.8 dB".

Response Response Status C

ACCEPT.

CI 120E SC 120E.3.3.2.1 P 249 L 31 # 64
 Dudek, Mike QLogic

Comment Type TR Comment Status A QPRBS13

QPRBS13 is too short a pattern for this test. The receiver could have significant low frequency issues, pass the test with this pattern and not work in a real system.

SuggestedRemedy

Change QPRBS13 to QPRBS31 Here and also on page 252 line 4.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #207

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CI 120E SC 120E.3.3.2.1 P 249 L 31 # 207
 Dawe, Piers Mellanox

Comment Type T Comment Status A QPRBS13

We wouldn't use a medium-length pattern like QPRBS13 for a sensitivity test if we don't have to. We should use a long pattern: CAUI-4 uses Pattern 5 (with or without FEC encoding), Pattern 3, or a valid 100GBASE-R signal, CEI-56G-VSR-PAM4 uses QPRBS31. We should allow the use of existing test equipment (which test binary signals and can handle PRBS31) and/or a PCS for checking.

SuggestedRemedy

Change "QPRBS13, or a valid 400GBASE-R signal" to "Pattern 5 (with or without FEC encoding), Pattern 3, or a valid 400GBASE-R signal".
 (Pattern 5 is scrambled idles. Pattern 3 is PRBS31, which if generated on the /16 lanes will be converted by the PMA(s) to QPRBS31 on the /8 lanes.)
 Similarly in 120E.3.4.1.1.

Response Response Status C

ACCEPT IN PRINCIPLE.

Change "QPRBS13, or a valid 400GBASE-R signal" to "Pattern 5, Pattern 3, or a valid 400GBASE-R signal". After this sentence add: "Patterns 3 and 5 are described in Table 122-9."
 Similarly in 120E.3.4.1.1. page 252, line 4.
 See also comment #64

CI 120E SC 120E.3.4 P 249 L 37 # 191
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A Adaptive Equalizer

There is no text describing Adaptive CDAUI-8 receiver equalization.

SuggestedRemedy

Similar to what was adopted in P802.3by for Clause 109B.3.4, add to end of first paragraph "Channel equalization is provided by an adaptive equalizer in the module."

Response Response Status C

ACCEPT.
 See also comment #185

CI 120E SC 120E.3.4 P 250 L 6 # 23
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A SEOV

Single ended output voltage TBD

SuggestedRemedy

Single output V=VCM + Diff pp Amp/4=2850+900/4=3075 mV

Response Response Status C

ACCEPT IN PRINCIPLE.
 See Comment #208.

CI 120E SC 120E.3.4 P 250 L 6 # 208
 Dawe, Piers Mellanox

Comment Type T Comment Status A SEOV

Single-ended voltage tolerance range should be either -0.4 to 3.3 V, as in Table 83E-7 CAUI-4 module input, or possibly -0.45 to 3.35 V (Table 120E-1+/- 50 mV) if we think Table 83E-7 is wrong. If the 50 mV is for large module or card supply currents, they won't be seen in calibration at TP1a: the module can create them at its own risk.

SuggestedRemedy

Change TBD to -0.4 to 3.3 V.

Response Response Status C

ACCEPT.

CI 120E SC 120E.3.4.1 P 250 L 50 # 24
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

10 MHz CRU adds extra burden to the host SerDes see
http://www.ieee802.org/3/bs/public/15_09/ghiasi_3bs_01b_0915.pdf

SuggestedRemedy

Replace 10 Mhz with 4 MHz
 Also change Table 120E-4 reference to Table 88-13 with Table 87-13

Response Response Status C

REJECT.
 There is no consensus yet on changing of CRU BW frequency. Note, Comment #204 turns "Table 88-13" in Table 120E-7 magenta

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CI 120E SC 120E.3.4.1.1 P 251 L 20 # 209
 Dawe, Piers Mellanox

Comment Type T Comment Status R Transition time

The target pattern generator 20% to 80% transition time in the module stressed input test should be just the same as for C2M CAUI-4 if we allow a similar pattern generator and define transition time the same way. Although the PAM4 product might be faster than CAUI-4, we don't need the pattern generator to be faster. Also, we should say where this is measured. A convenient place which seems in line with 802.3bj practice would be at an equivalent TP0a, ~1.35 dB at 12.89 GHz after the output of the patten generator, as described in 93.8.1.1 Transmitter test fixture. (for test equipment, this loss would be SMA cables between pattern generator and scope, rather than a PCB). Our choice of measurement point would affect the target pattern generator transition time.

SuggestedRemedy

Change magenta TBD ps to magenta 9.5 ps. Alternatively, use the limit for the host output (8 ps). Also, we should say where this is measured. A convenient place would be at an equivalent TP0a, (Tilde)1.35 dB at 12.89 GHz after the output of the patten generator, as described in 93.8.1.1 Transmitter test fixture (for test equipment, this loss would be SMA cables between pattern generator and scope, rather than a PCB). Our choice of measurement point would affect the target pattern generator transition time.

Response Response Status C

REJECT.
 Need consensus on transition time values, 2 different values have been proposed.
 [Editor's note: Tilde character replaced by (Tilde) in Suggested Remedy text.]

CI 120E SC 120E.3.4.1.1 P 251 L 49 # 65
 Dudek, Mike QLogic

Comment Type T Comment Status D

The channel attenuation number is the same as for CAUI4, but the host channel loss is 0.2dB higher and the module compliance board will also have a slightly higher loss.

SuggestedRemedy

Change the 13.8dB to 14.1dB (two places) and change the 10.25dB to 10.5dB. (This is making the assumption that the allowance for the host transmitter package loss should be 0.05dB higher at the higher frequency.)

Proposed Response Response Status Z

REJECT.
 This comment was WITHDRAWN by the commenter.

CI 120E SC 120E.3.4.1.1 P 252 L 5 # 217
 Dawe, Piers Mellanox

Comment Type ER Comment Status R

Don't use inconsistent terminology.

SuggestedRemedy

Change "The module CDAUI-8 receiver under test" to "The module under test"

Response Response Status C

REJECT.
 This wording follows 83E wording.
 It makes it clear that the errors in question are coming from the CDAUI-8 receiver and not the module's optical receiver.

CI 120E SC 120E.4.2 P 252 L 31 # 210
 Dawe, Piers Mellanox

Comment Type T Comment Status A

In NRZ there are 2 levels, in PAM4 there are 4. So we have only half as many samples for each. Also, a change in the spec BER in 120E.1.1 would affect the number of samples we need.

SuggestedRemedy

Change "at least 4 million bits" to "at least 8 million bits".

Response Response Status C

ACCEPT IN PRINCIPLE.
 Change "at least 4 million bits" to "at least 4 million PAM4 symbols".

CI 120E SC 120E.4.2 P 252 L 34 # 184
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A

"For modules, any single CTLE setting as described in 120E.3.2.1.1.."

SuggestedRemedy

Replace "modules" with "module compliace" so that the sentence now reads "For module compliance, any single CTLE setting as described in 120E.3.2.1.1. This makes it consistent with the host compliance sentence on line 36.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Change:"For modules, any single CTLE setting as described in 120E.3.2.1.1 that meets both eye width and eye height requirements is acceptable." to:
 "For module compliance, either of the CTLE settings as described in 120E.3.2.1.1 that meets both eye width and eye height requirements is acceptable."
 See also comment #66

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CI 120E SC 120E.4.2 P 252 L 35 # 66
 Dudek, Mike QLogic

Comment Type E Comment Status A

There are only two CTLE settings available for the module "any" is not appropriate.

SuggestedRemedy

Change "any single" to "either"

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #184.

CI 120E SC 120E.4.2 P 252 L 48 # 216
 Dawe, Piers Mellanox

Comment Type ER Comment Status A

"construct the CDF of the signal voltage of the middle eye at time TCmid" could take a very long time with an equivalent-time scope that samples evenly across the eye, and doesn't represent a realistic receiver with tolerances. Use a 5% window as for CAUI-4.

SuggestedRemedy

Change to "construct the CDF of the signal voltage of the middle eye within 0.025 UI of time TCmid"

Response Response Status C

ACCEPT.

CI 120E SC 120E.4.2 P 253 L 10 # 67
 Dudek, Mike QLogic

Comment Type T Comment Status A

Duplication of information in the wrong bullet.

SuggestedRemedy

Delete "Apply a 0.25 UI-wide mask centered on TCmid. The 10-6 horizontal opening of the upper eye at VCupp, and the lower eye at VClow must both extend beyond this mask." in bullet 9 as it is properly included in bullet 10

Response Response Status C

ACCEPT IN PRINCIPLE.
 Give editorial license to remove the duplicated text.

CI 120E SC 120E.4.2 P 253 L 13 # 213
 Dawe, Piers Mellanox

Comment Type T Comment Status R

Figure 120E-12 makes Figure 120E-11 redundant.

SuggestedRemedy

Use just one figure.

Response Response Status C

REJECT.
 Figure 120E-11 does not show the 0.25UI window used to check alignment between eyes, Figure 120E-12 does. Putting everything onto one diagram would make that diagram difficult to understand.

CI 120E SC 120E.4.2 P 254 L 1 # 211
 Dawe, Piers Mellanox

Comment Type T Comment Status A

The eye width spec is not always 0.25 UI.

SuggestedRemedy

Replace the fixed 0.25 UI with a reference to the appropriate table.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Add the eye asymmetry width value of 0.25UI as a parameter (naming left to editorial license) in Tables 120E-1, 120E-2, 120e-4, & 120E-7.
 The value to be in magenta in Module output and host stressed input tables.

Use this parameter in 120E-4.2 bullet 10 rather than calling out a value of 0.25UI.

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CI 120E SC 120E.4.2 P 254 L 2 # 212
 Dawe, Piers Mellanox

Comment Type T Comment Status A

The 10⁻⁶ horizontal opening of the upper eye at VCupp, and the lower eye at VClow must both extend beyond this mask. But according to the baseline, this applies to the middle eye too, and I didn't see that.
 Editorial: openings plural, extra "of"s.

SuggestedRemedy

Change to "The 10⁻⁶ horizontal openings of the upper eye at VCupp, of the middle eye at zero and of the lower eye at VClow must all extend beyond this mask.
 Update Figure 120E-12.

Response Response Status C

ACCEPT IN PRINCIPLE.
 By definition the middle eye will always pass the test, therefore there is no need for such a test.
 Correct editorial issues: openings plural, extra "of"s.

CI 120E SC 120E.4.2.1 P 254 L 50 # 214
 Dawe, Piers Mellanox

Comment Type T Comment Status A VEC

"VEC=10.log10(min(AV/V...))" for an output spec this should be max.
 It would be more useful to define VEC=10.log10(sum(AV)/3*min(V)), to protect the receiver from unequal eyes.
 Notice that sum(AV) is simply the mean 3 in the central 5% of the eye minus the mean 0 in the central 5%.
 For an input test we want all three VECs to be right (adjust what to do this?)

SuggestedRemedy

Define VEC=10.log10(sum(AV)/3*min(V)). Consider how to control the stressed signal to get the three eyes right.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Min should be Max - see Comment #1
 More debate is needed before changing the definition of VEC

CI 120E SC 120E.4.2.1 P 254 L 50 # 1
 Hidaka, Yasuo Fujitsu Laboratories of

Comment Type TR Comment Status A VEC

The min function in Equation (120E-2) will choose the best value among the upper, the middle, and the lower eyes, because the argument values such as AVupp/Vupp take a lower value for a better eye.

To choose the worst value among three eyes, the max function should be used.

Note: The referenced OIF draft has the same error.

SuggestedRemedy

Change min function in equation (120E-2) with max function.

Response Response Status C

ACCEPT.

CI 120E SC 120E.5.3 P 257 L # 192
 Maki, Jeffery Juniper Networks

Comment Type TR Comment Status A Adaptive Equalizer

There is no item to cover the major capability of Adaptive Equalizer, which is mandatory.

SuggestedRemedy

Add the following.

Item: ADE
 Feature: Adaptive equalizer
 Subclause: 120E.3.4
 Value/Comment: See 120E.3.4.
 Status: M
 Support: Yes [] No []

Response Response Status C

ACCEPT IN PRINCIPLE.
 Comment #191 adds text on the adaptive equalizer to 120E.3.4.
 In 120E.5.3, add the following.
 Item: ADE
 Feature: Adaptive equalizer
 Subclause: 120E.3.4
 Value/Comment: See 120E.3.4
 Status: M
 Support: Yes []

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Cl 121 SC 121.5.4 P 149 L 35 # 68
 Dudek, Mike QLogic

Comment Type T Comment Status A

This global signal detect section is more applicable to a single lane system than a multi lane system.

SuggestedRemedy

Borrow from 100BASE-SR4 changing 4 to 16 lanes where appropriate change Table 121-4 adding "for any lane" to the 1st row, and "for all lanes" to the 2nd row. (as was done in Table 95-4) On line 9 change "optical signal" to "optical signals" on line 36 change "optical signal" to "optical signals"

Response Response Status C

ACCEPT IN PRINCIPLE.

In Table 121-4

Add "For any lane;" to first row below header.

Add "For all lanes;" to second row below header, and insert ", for each lane" after "average receive power".

In the second paragraph of 121.5.4, change "SIGNAL_DETECT shall be an indicator of the presence of the optical signal." to

"SIGNAL_DETECT shall be an indicator of the presence of the optical signals on all 16 lanes.

In the last paragraph of 121.5.4, change each occurrence of "optical signal" to "optical signals"

Cl 121 SC 121.5.10 P 150 L 30 # 176
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status R

"If the PMD has detected a local fault on the transmitter, the PMD shall set PMD_transmit_fault to one"

SuggestedRemedy

Provide some additional calification on "local fault" ? Does it mean a 64B66B PCS ordered set definiton of local fault or something else ? Given that the PMD does not process 64B66B codewords I suspect it is something else.

Response Response Status C

REJECT.

This is the same wording as is used in:

53.4.10, 54.5.10, 86.5.10, 87.5.10, 88.5.10, 89.5.8, 95.5.10, 112.5.8.

The faults being referred to are specific to the transmitter implementation in question.

Cl 121 SC 121.8.2 P 151 L 49 # 71
 Dudek, Mike QLogic

Comment Type T Comment Status A

Pattern 5 has been modified by 121.8.1 and therefore references to Table 95-10 can cause the use of the wrong pattern.

SuggestedRemedy

Replace "Table 95-10" with "Table 95-10 as modified by 121.8.1" in this subclause and all other subclauses where it is used.

Response Response Status C

ACCEPT IN PRINCIPLE.

Replace "Table 95-10" with "Table 95-10 as modified by 121.8.1" in this subclause and all other subclauses where pattern 5 can be used.

Cl 121 SC 121.8.5 P 152 L 15 # 69
 Dudek, Mike QLogic

Comment Type TR Comment Status A

The TDEC test should be adjusted for the different BER for this clause relative to clause 95.

SuggestedRemedy

after 95.8.5.2 add "with the exception that 2×10^{-4} replaces 5×10^{-5} and 2.8782R replaces 3.8906R in equation 95-6". It may be worth putting TBC (to be confirmed by these numbers as the target BER may change.

Response Response Status C

ACCEPT IN PRINCIPLE.

Comment #30 changed the BER requirement to 2.4×10^{-4} . Add "with the exception that in Equation 95-6, 3.8906R is replaced by 3.4917R, for consistency with the BER of 2.4×10^{-4} given in 121.1.1"

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CI 121 SC 121.8.8 P 152 L 35 # 70
 Dudek, Mike QLogic

Comment Type TR Comment Status A

The stressed receiver sensitivity test needs to be modified due to the different BER target.

SuggestedRemedy

- Add after 95.8.8 with the following exceptions. Add the following bullets.
- The signaling rate of the test pattern generator is set to the rate defined in 121.7.2
 - When using 95.8.5 to measure the SEC of the stressed receiver conformance test signal a BER of 2e-4 is used in place of 5e-5 and 2.8782R replaces 3.8906R in equation 95-6
 - The Hit ratio for the stressed receiver eye mask definition is changed from 5e-5 to 2e-4

Response Response Status C

ACCEPT IN PRINCIPLE.
 Comment #30 has changed the BER requirement to 2.4×10^{-4} .

- Add after 95.8.8: "with the following exceptions"
 and also add the following bullets:
- The signaling rate of the test pattern generator is set to the rate defined in 121.7.2
 - When using 95.8.5 to measure the SEC of the stressed receiver conformance test signal, the BER requirement is as specified in 121.1.1 and 3.4917R replaces 3.8906R in Equation 95-6
 - The Hit ratio for the stressed receiver eye mask definition is changed from 5×10^{-5} to 2.4×10^{-4}

CI 121 SC 121.11.3.2 P 156 L 26 # 179
 Nicholl, Gary Cisco Systems

Comment Type E Comment Status A

The note for description for Figure 121-5 mentions a MPO-16 connector. I believe this is incorrect and it should be an MPO-32 connector.

SuggestedRemedy

Change MPO-16 to MPO-32 in the description of Figure 121-5.

Response Response Status C

ACCEPT IN PRINCIPLE.

ANSI/TIA-604-18 Fiber Optic Connector Intermateability Standard Type MPO-16 (FOCIS 18) defines the mechanical aspects of the MPO-16 connector for 1-row and 2-row variants.

Change the title of Figure 121-5 from
 "MPO-16 female plug connector with flat interface, and an MDI"
 to
 "MPO-16 female two-row plug with flat interface, and an MDI"

In Figure 121-5 , change the caption
 "MPO female plug connector flat interface"
 to
 "MPO-16 female two-row plug with flat interface"

CI 121 SC 121.12.4.5 P 160 L 42 # 72
 Dudek, Mike QLogic

Comment Type T Comment Status A

Is this 16 lane interface compliant to Hazard Level 1? The PICs doesn't match the TBD in 121.9.2

SuggestedRemedy

Make them match. (Change to TBD unless this 16 lane interface has been shown to be compliant to Hazard Level 1, which seems highly unlikely as 100GBASE-SR4 states level 1M.

Response Response Status C

ACCEPT IN PRINCIPLE.
 In PICS item ES2, change "Hazard Level 1" to "Hazard Level TBD" in two places.

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Cl 122 SC 122.7.1 P 169 L 16 # 219
 Dawe, Piers Mellanox

Comment Type TR Comment Status A

SMSR isn't in the baseline so should not be in the draft, except possibly as an editor's suggestion in magenta or in an editor's note.
 SMSR might be a spec that one would buy lasers to but this is an interface level spec, and the effects of SMSR are captured in TDP (or TDEC). Of the many SMF optical clauses, only 87, 88, 89 have this spec. Measuring SMSR would require a high-grade optical spectrum analyser that is not otherwise needed, and this is supposed to be a cost-effective relatively short-range PMD.
 We don't know what value would be appropriate; the common value is for NRZ PHYs with no FEC.

SuggestedRemedy

Delete the SMSR spec.

Response Response Status C

ACCEPT IN PRINCIPLE.

Based on the SMSR parameter being specified for similar IEEE 802.3 PMDs such as 100GBASE-ER4, the editors inserted it in draft 0.9 into the tables for the 400GbE SMF PMDs with a tentative value of 30 dB indicated by a magenta font. Draft 0.9 was reviewed and then adopted by the Task Force by motion #3 at the September 2015 meeting.

Measuring SMSR is not required - it must pass if it is measured. The background of this spec is related to unstable laser performance, probably being very temperature sensitive.

30 dB value for SMSR is considered to be an appropriate value for this interface.
 Change "30" to black font.

Cl 122 SC 122.7.1 P 169 L 24 # 73
 Dudek, Mike QLogic

Comment Type T Comment Status A

There are three different OMA inner values and any differences between them will result in a degraded TDP (TDP is an overall measure of the 4 level eye). We should also align the specification method between clause 122 and 123.

SuggestedRemedy

Delete the row for inner modulation amplitude min. Change the "Launch power in OMAinner minus TDP" to "Launch power in OMAouter minus TDP and increase the value to -0.8dBm. In table 122-7 change the stressed receiver sensitivity to OMA(outer). The informative Receiver sensitivity can stay as OMA inner as it is probably more infomative for comparison with NRZ.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Bring the parameters in Table 122-6 in line with those in Table 123-7.
 Also, account for comment #180, since it seems unlikely that the minimum TDP for 400GBASE-DR4 (53 GBd) will be smaller than that for 400GBASE-FR4 (26 GBd).
 In Table 122-6:
 Delete the row for "Inner Optical Modulation Amplitude (OMAinner), each lane (min)"
 In footnote b change "0.8 dB" to "1 dB"
 Change:
 "Launch power in OMAinner minus TDP, each lane (min)" to:
 "Launch power in OMAouter minus TDP, each lane (min)" and change value to -0.8
 Because of the change to min TDP:
 Change the value for "Average launch power, each lane (min)" from -2.1 to -1.9
 Change the value for "Outer Optical Modulation Amplitude (OMAouter), each lane (min)" from 0 to 0.2
 In Table 122-7, change:
 "Average receive power, each lane (min)" from -5.1 to -4.9
 For the stressed receiver sensitivity, some idea of how the stressed sensitivity test will be done is needed before agreeing on whether this is inner or outer OMA.

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Cl 122 SC 122.7.1 P 169 L 34 # 218
 Dawe, Piers Mellanox

Comment Type TR Comment Status R

As 38.6.4 said in 1998, and 52.9.6, "This procedure describes a component test which may not be appropriate for a system level test depending on the implementation", which is why some clauses have made it informative or omitted it altogether. If RIN is bad enough to matter, it will contribute to TDP or TDEC, which is going to be a required spec anyway and with FEC, is practical to measure. Measuring RIN is just repeating most of the same work for no clear benefit except for diagnostics, which is not what an 802.3 spec is for. We can't set a RIN limit well until we have an idea of the reference receiver.

SuggestedRemedy

Turn all the row magenta for now.

Response Response Status C

REJECT.
 Parameter and value were in adopted baseline specification. Insufficient evidence provided why this parameter would not be relevant for DR4 and why -142 dB/Hz would not be the right value. At this point the TDP test is not defined, so how well it accounts for RIN is not known.

Cl 122 SC 122.7.1 P 169 L 36 # 141
 Palkert, Thomas Molex

Comment Type T Comment Status A

Optical return loss TBD

SuggestedRemedy

See presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "7.1" to "122.7.1"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.
 As noted on pages 10 and 11 of:
http://www.ieee802.org/3/ballots/p802d3_comment_entry_tutorial_v1p0.pdf, the comment and suggested remedy should be specific, identify the issue to be resolved, and provide the changes that are proposed to be made to the draft. Without the presentation being attached, this comment (and other similar comments) has failed to do this.

The presentation
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=2 contains:
 Table 122-6:
 RIN20OMA (max) -142 dB/Hz
 Optical return loss tolerance (max) 20 dB

See response to comment #177

Cl 122 SC 122.7.1 P 169 L 40 # 142
 Palkert, Thomas Molex

Comment Type T Comment Status D

TX eye mask TBD

SuggestedRemedy

See presentation

Proposed Response Response Status Z

REJECT.

This comment was WITHDRAWN by the commenter.

[Editor's note: Subclause changed from "7.1" to "122.7.1", Page changed from 40 to 169, Line set to 40]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation referred to is:
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=2

Cl 122 SC 122.7.2 P 170 L 22 # 143
 Palkert, Thomas Molex

Comment Type T Comment Status A

Rx 3 dB cutoff frequency

SuggestedRemedy

See presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "7.1" to "122.7.2"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=3 contains:
 Table 122-7:
 Receiver 3 dB electrical upper cutoff frequency, each lane (max) Remove

See response to comment #32

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

Cl 122 SC 122.7.2 P 170 L 22 # 32
 Anslow, Pete Ciena

Comment Type T Comment Status A

Table 122-7 contains a row for "Receiver 3 dB electrical upper cutoff frequency, each lane (max)" with value "TBD".
 Table 123-8 contains a row for the same parameter with a value of 21 GHz, whereas in Table 88-8 it has a value of 31 GHz (for a 25.8 GBd PMD).
 This was discussed on the SMF Ad Hoc call on 6 October with a consensus to remove the parameter from both tables.

SuggestedRemedy

Remove the row for "Receiver 3 dB electrical upper cutoff frequency" from Table 122-7, Table 122-10, Table 123-8, and Table 123-11.
 Also, delete subclauses 122.8.11 and 123.8.11.

Response Response Status C

ACCEPT.
 See also comments #143, 3, 231, 9.
 As per consensus from SMF Ad Hoc on 6 October 2015

Cl 122 SC 122.7.2 P 170 L 24 # 144
 Palkert, Thomas Molex

Comment Type T Comment Status A

Stressed receiver sensitivity (oma inner)

SuggestedRemedy

See presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "7.3" to "122.7.2"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

Should be fixed by agreeing first on a general specification methodology for PAM4 signals, not by individual modifications.
 So, first how to specify a PAM4 signal at the Ttransmitter (will we need an eye mask spec?), what will be the TDP definition? Then at the Receiver, how will the stress be applied to the signal and how will the level of stress be calibrated? Using the TDP test?

The presentation referred to is:
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=3

See also comments #132 and 133.

Cl 122 SC 122.7.2 P 170 L 27 # 132
 Palkert, Thomas Molex

Comment Type T Comment Status A

Condition 1 for Stressed RX sensitivity

SuggestedRemedy

See Presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "7.3" to "122.7.2"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation referred to is:
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=3

See response to comment #144

Cl 122 SC 122.7.2 P 170 L 29 # 133
 Palkert, Thomas Molex

Comment Type T Comment Status A

Condition 2 for Stressed Receiver sensitivity

SuggestedRemedy

See Presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "7.3" to "122.7.2"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation referred to is:
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=3
 See response to comment #144

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Cl 122 SC 122.7.3 P 170 L 44 # 75
 Dudek, Mike QLogic

Comment Type T Comment Status A

The Power budget (for max TDP) has to equal the launch power in OMA min inner -TDP + max TDP - Receiver sensitivity (OMA inner). It also has to equal the allocation for penalties (for max TDP) + unallocated loss + channel insertion loss. These numbers don't equate properly and the power budget is listed as TBD.

SuggestedRemedy

Replace the TBD for the power budget with 6.15dB. Increase the allocation for penalties for max TDP to 3.15dB. (line 51)

Response Response Status C

ACCEPT IN PRINCIPLE.

As no evidence has been presented that the max TDP value is not adequate, it is more appropriate to fix the discrepancy by changing the informative Receiver sensitivity. In Table 122-7, change "Receiver sensitivity (OMAIinner), each lane (max)" from -9.25 to -9.1 dBm. In Table 122-8, change "Power budget (for max TDP)" from "TBD" to "6" dB.

Cl 122 SC 122.7.3 P 171 L 2 # 33
 Anslow, Pete Ciena

Comment Type T Comment Status A

In Table 122-8 and Table 122-13, there are references to the cabled optical fiber attenuation in dB/km that are TBD. Also, in 122.11.2.1, the loss allocated to connectors is 2 dB in magenta. This was discussed on the SMF Ad Hoc call on 6 October with a consensus to set the fiber loss to 0.5 dB/km and the connector loss to 2.75 dB (to give a total of 3 dB for the channel insertion loss).

SuggestedRemedy

In Table 122-8 footnote a, change "TBD dB/km" to "0.5 dB/km" (in black font). In Table 122-13, change "TBD or 0.5" to "0.5" and delete footnote a. In 122.11.2.1, change "2 dB" to "2.75 dB" (in black font) and change "four connections" to "five connections" (in black font).

Response Response Status C

ACCEPT.

As per consensus from SMF Ad Hoc on 6 October 2015. See also comments #140, 80, 81.

Cl 122 SC 122.7.3 P 171 L 3 # 177
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

The 'allocation for penalties' in Table 122-8 includes a 0.5dB penalty for MPI. In the FR8/LR8 PMD specifications the MPI penalty is not called out separately but I believe included in the TDP.

SuggestedRemedy

I am not sure what the right solution is here (either calling out MPI separately or including it in TDP), but whatever solution we agree to should be common across DR4, FR8 and LR8.

Response Response Status C

ACCEPT IN PRINCIPLE.

As per consensus from SMF Ad Hoc on 6 October 2015: "There was agreement that the various reflection specifications should be dealt with as a group in association with a study of the penalty they cause."

Cl 122 SC 122.8.1 P 171 L 24 # 76
 Dudek, Mike QLogic

Comment Type T Comment Status R

The tests normally performed for NRZ with a square wave pattern are better performed with the "Transmitter linearity test pattern" defined in 120.5.10.2.4

SuggestedRemedy

Replace Square wave pattern with "Transmitter linearity test pattern." with the definition in 120.5.10.2.4

Make the same change to Table 123-10

Response Response Status C

REJECT.

See response to comment #78

IEEE P802.3bs D1.0 400 Gb/s Ethernet 1st Task Force review comments

CI 122 SC 122.8.1 P 171 L 24 # 134
 Palkert, Thomas Molex
 Comment Type T Comment Status A
 Test pattern TBD
 SuggestedRemedy
 See Presentation
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "8.1" to "122.8.1"]
 Insufficient information in comment to allow the creation of a proposed response, so
 comment treated as late.
 The presentation http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf does
 not contain any discussion or proposal for test patterns.

CI 122 SC 122.8.1 P 171 L 28 # 77
 Dudek, Mike QLogic
 Comment Type T Comment Status A
 A quaternary PRBS13 test pattern has been defined in 120.5.10.2.3 for use as a short
 repeating pattern in place of PRB9.
 SuggestedRemedy
 For pattern 4 put Quaternary PRBS13 (QPRBS13) defined in 120.5.10.2.3
 Make the same change to Table 123-10.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 In Table 122-9 change:
 "4", "TBD to replace "PRBS9", "TBD" to:
 "4", "PRBS13Q", "120.5.10.2.3" in black
 Make the same change to Table 123-10.

CI 122 SC 122.8.1 P 171 L 43 # 78
 Dudek, Mike QLogic
 Comment Type T Comment Status R
 The best pattern to measure OMA and RINxxOMA is the Tx linearity test pattern. defined in
 120.5.10.2.4
 SuggestedRemedy
 Replace Square wave or 4 with Transmitter linearity test pattern on rows, 43, 45, and 50.
 Also replace the TBD's on page 172 line 9 with the same pattern.
 Make the equivalent changes to Table 123-11
 Response Response Status C
 REJECT.
 Lines 43, 45, and 50 are Table 122-10 rows for:
 Optical modulation amplitude (OMAouter)
 Optical modulation amplitude (OMAIinner)
 RINxxOMA
 Since the methods for measuring these parameters for a PAM4 signal are still TBD it is not
 appropriate to decide which is the best pattern for the measurements at this point.
 See also comment #76
 [Editor's note: Line changed from "24" to "43"]

CI 122 SC 122.8.4 P 172 L 28 # 135
 Palkert, Thomas Molex
 Comment Type T Comment Status A
 Definition of oma inner/outer
 SuggestedRemedy
 See presentation
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "8.4" to "122.8.4"]
 Insufficient information in comment to allow the creation of a proposed response, so
 comment treated as late.
 The presentation http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf does
 not contain any discussion or proposal for the definition of OMAinner or OMAouter.

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Cl 122 SC 122.8.5 P 173 L 8 # 74
 Dudek, Mike QLogic

Comment Type TR Comment Status R

For a TDP test a well specified reference receiver is required.

SuggestedRemedy

Add another subsection. 122.8.5.2 Reference Receiver. Section to say "The reference receiver has the following properties.

- Bandwidth TBD
- Equalization TBD
- Sampling time each eye TBD
- Threshold levels set procedure TBD.

Add a similar subsection as 123.8.5.2

Response Response Status C

REJECT.

No decision has been made as to whether the "TDP" test will use a reference receiver or operate on a captured waveform. Adding this section would imply this decision had been taken. Presentations defining the method to be used for the "TDP" test are invited.

Cl 122 SC 122.8.5.1 P 172 L 44 # 136
 Palkert, Thomas Molex

Comment Type T Comment Status A

Optical return loss TBD

SuggestedRemedy

See presentation

Response Response Status C

ACCEPT IN PRINCIPLE.

[Editor's note: Subclause changed from "8.5.1" to "122.8.5.1"]

Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation

http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=2 contains:

Table 122-6:

Optical return loss tolerance (max) 20 dB

See response to comment #177

Cl 122 SC 122.8.6 P 173 L 10 # 79
 Dudek, Mike QLogic

Comment Type TR Comment Status A

It has always been unfortunate that the test patterns used for extinction ratio and OMA are different for NRZ systems. However history created the issue. Now that we need a new definition for extinction ratio we should take the opportunity to align them.

SuggestedRemedy

Replace "if measured using the methods specified in TBD." with "when calculated using equation new." Equation new to say "Extinction ratio = 10log((OMA level 3)/(OMA level 0))" In table 122-10 replace the pattern for extinction ratio with "Tx linearity test pattern."

Make the equivalent changes to section 123.8.6 and table 123-11

Response Response Status C

ACCEPT IN PRINCIPLE.

The extinction ratio measurement method for NRZ optical signals is defined in IEC 61280-2-2. This is defined as the average of the "one" level for the central 20% of the eye divided by the average of the "zero" level for the central 20% of the eye.

Presentations fully defining an equivalent measurement method for a four level eye are invited.

In the Suggested remedy, it is not clear what the meaning of "OMA level 3" or "OMA level 0" is.

The transmitter linearity test pattern has 3 x 10 UI blocks at level three and 3 x 10 UI blocks at level zero for each 160 UI repeat of the pattern. If this pattern is to be used, then the ER definition needs to define whether level three is measured over the central 20% of all 30 "three" symbols (this would be difficult as the "eye" for this pattern is 10 UI in width) or over all of a subset of these symbols (say the inner 8).

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Cl 122 SC 122.8.8 P 173 L 27 # 137
 Palkert, Thomas Molex

Comment Type T Comment Status D
 TX eye definition

SuggestedRemedy
 See presentation

Proposed Response Response Status Z
 REJECT.

This comment was WITHDRAWN by the commenter.

[Editor's note: Subclause changed from "8.8" to "122.8.8"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation referred to is:
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=2

Cl 122 SC 122.8.8 P 173 L 27 # 4
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW
 Transmitter optical waveform need to be measured with a CRU

SuggestedRemedy

The clock recovery unit (CRU) used in the optical waveform measurement has a corner frequency of 4 MHz and a slope of 20 dB/decade. When using a clock recovery unit as a clock for BER measurements, passing of low- frequency jitter from the data to the clock removes this low-frequency jitter from the measurement.

Response Response Status C

REJECT.
 There is currently no agreement as to whether or not a requirement for the transmitter optical waveform will be included.
 Also, there is no consensus as yet on CRU corner frequency.

Cl 122 SC 122.8.10 P 173 L 38 # 5
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW
 Stress receiver sensitivity must tolerate low frequency jitter propagating from the transmitter downstream

SuggestedRemedy

Sinusoidal jitter componnet of stress receiver sensitivity is as following The sinusoidal jitter is used to test receiver jitter tolerance.

The amplitude of the applied sinusoidal jitter is dependent on frequency as specified in Table 87-13 and is illustrated in Figure 87-5.

Response Response Status C

REJECT.
 There is no consensus as yet on CRU corner frequency.
 See also comment 4

Cl 122 SC 122.8.10 P 173 L 41 # 138
 Palkert, Thomas Molex

Comment Type T Comment Status A
 TBD for test conditions for RX stressed receiver sensitivity tests

SuggestedRemedy
 See Presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "8.10" to "122.8.10"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation referred to is:
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=3

See response to comment #144

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Cl 122 SC 122.8.11 P 173 L 46 # 3
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A

Laser with strong relaxation will not pass PAM4 eye requirement so there is no need to implicitly measure receiver upper BW

SuggestedRemedy

Remove receiver 3 dB electrical BW

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #32

Cl 122 SC 122.10 P 175 L 47 # 139
 Palkert, Thomas Molex

Comment Type T Comment Status A

Optical return loss TBD

SuggestedRemedy

See Presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "10" to "122.10"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=2 contains:
 Table 122-6:
 Optical return loss tolerance (max) 20 dB

The optical return loss value in Table 122-12 (as indicated by the page and line for this comment) is for the cable plant alone and is generally not the same as the optical return loss tolerance value in Table 122-6.

See response to comment #177

Cl 122 SC 122.11.1 P 176 L 20 # 140
 Palkert, Thomas Molex

Comment Type T Comment Status A

Attenuation at 1304.5nm TBD

SuggestedRemedy

See Presentation

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: Subclause changed from "11.1" to "122.11.1"]
 Insufficient information in comment to allow the creation of a proposed response, so comment treated as late.

The presentation
http://www.ieee802.org/3/bs/public/15_11/palkert_3bs_01_1115.pdf#page=4 contains:
 Table 122-13
 Attenuation at 1304.5nm per ITU-T G.695 appendix I:
 - Propose: .43dB/km or delete TBD (Use 0.5dB/km)

See response to comment #33.

Cl 122 SC 122.11.1 P 176 L 20 # 80
 Dudek, Mike QLogic

Comment Type T Comment Status A

With such a short optical link the fiber attenuation/km max is not critical enough to provide two different values with sources for the numbers.

SuggestedRemedy

Just put 0.5 (dB/km) and delete the two footnotes.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #33

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Cl 122 SC 122.11.1 P 176 L 36 # 81
 Dudek, Mike QLogic

Comment Type T Comment Status A

The 2dB connection and splice loss doesn't match the insertion loss budget.

SuggestedRemedy

Change 2dB to 2.75dB. Change four connections to 6 connections and reduce the average insertion loss per connector to 0.459dB

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #33

Cl 122 SC 122.11.3 P 176 L 45 # 178
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

Need to add a diagram to show the optical lane mapping to the MPO-12 connector, similar to Figure 121-4 in Clause 121 for the SR16 PMD.

SuggestedRemedy

Add a figure to show the optical lane mapping to the MPO-12 connector.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Use 95.11.3.1 as the basis for a modifying this subclause with editorial licence

Cl 123 SC 123.1.1 P 183 L 47 # 222
 Dawe, Piers Mellanox

Comment Type T Comment Status A

If PMD service interface is symbol based, there is no BER at that point. Need to rephrase as the BER that would be found after PAM4 decoding and Gray (de-)mapping. This is more practical than using or symbol error ratio because we can use existing pattern checkers on the /16 lanes after a PMA function.

SuggestedRemedy

For this and similar clauses and annexes, define BER as the BER that would be found after PAM4 decoding and Gray (de-)mapping.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #198

Cl 123 SC 123.2 P 184 L 49 # 223
 Dawe, Piers Mellanox

Comment Type T Comment Status A

"data streams" is more vague than "bit streams" used in NRZ clauses, and falls foul of the way the MAC divides the signal into data and not-data portions and the PCS divides it into data blocks or control blocks. 116.3 says "independent streams of data units", so does 80.3.1. 94.3.1.1 has "four parallel continuous streams of encoded symbols, tx_symbol, one stream for each lane. Each of the tx_symbol parameters can take one of four values: -1, -1/3, +1/3, or +1... four parallel symbol streams... four streams of data units... four parallel continuous streams of encoded symbols, one stream for each lane. Each of the rx_symbol parameters can take one of four values: -1, -1/3, +1/3, or +1... four parallel encoded symbol streams.

SuggestedRemedy

At lines 49 and 53 and in 123.5.2 and 123.5.3, change "data streams" to "streams of PAM4 symbols" to be consistent with all those NRZ clauses. At line 47, change "data streams" either to "streams of PAM4 symbols" or to "streams of data units". Similarly in Clause 122.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Change "data stream" to "symbol stream" throughout Clauses 122 and 123 (4 instances in Clause 122 and 5 instances in Clause 123).
 Also, in 122.5.3 change "bit streams" to "symbol streams"

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Cl 123 SC 123.5.4 P 188 L 23 # 224
 Dawe, Piers Mellanox

Comment Type T Comment Status A

"Optical power at TP3 >= receiver sensitivity (OMAinner)" is ambiguous: what measure of optical power on the LHS if the RHS is in OMA? Monitoring OMA for a PAM4 signal seems too onerous.

SuggestedRemedy

Consider changing to match the last optical clause we signed off, after much review, which has:

Optical power at TP3 >= average receive power, each lane (min) in Table 95-7

So,

Optical power at TP3 >= average receive power, each lane (min) in Table 123-8

Response Response Status C

ACCEPT IN PRINCIPLE.

In Table 122-4, change:

">= receiver sensitivity (OMAinner), each lane (max) Table 122-7" to:

">= average receive power, each lane (min) in Table 122-7"

In Table 123-4, change:

">= receiver sensitivity (OMAinner), each lane (max) in Table 123-8" to:

">= average receive power, each lane (min) in Table 123-8"

[Editor's note Subclause changed from 123.2 to 123.5.4]

Cl 123 SC 123.5.8 P 189 L 12 # 82
 Dudek, Mike QLogic

Comment Type T Comment Status A

The transmit disable function is optional. There should not be a mandatory method of controlling it. Clause 95 uses "may" in the equivalent section.

SuggestedRemedy

Replace "shall" with "may"

Response Response Status C

ACCEPT IN PRINCIPLE.

Clause 95 has a separate fiber per lane, whereas this clause uses WDM.

The intent for this function in a WDM PMD is that it is mandatory to be able to turn off the transmitters, but optional as to whether this is done via MDIO.

Change:

"The PMD_transmit_disable_i (where i represents the lane number in the range 0:7) function is optional and allows ..."

to:

"The PMD_transmit_disable_i (where i represents the lane number in the range 0:7) function allows ..."

Also, change:

"If the optional PMD_transmit_disable_i function is not implemented in MDIO, ..."

to:

"If the PMD_transmit_disable_i function is not implemented in MDIO, ..."

In 123.12.4.2, item M3 change:

"Disables the optical transmitter on ..."

to:

"Disables the optical transmitter via MDIO on ."

Cl 123 SC 123.6 P 189 L 41 # 6
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type ER Comment Status R

Does not read right "The center frequencies are members of the frequency grid for 100 GHz spacing and above defined in ITU-T G.694.1 and are spaced at 800 GHz."

SuggestedRemedy

Alternate text "The center frequencies grid spacing is 800 GHz, the center frquencies are member of ITU-T G.694.1 defined 100 GHz frequency grid."

Response Response Status C

REJECT.

Sentence is OK from grammar point of view and same sentence has been used in 88.6.

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CI 123 SC 123.7.1 P 191 L 16 # 221
 Dawe, Piers Mellanox

Comment Type TR Comment Status A

SMSR isn't in the baseline so should not be in the draft, except possibly as an editor's suggestion in magenta or in an editor's note.
 SMSR might be a spec that one would buy lasers to but this is an interface level spec, and the effects of SMSR are captured in TDP (or TDEC). Of the many SMF optical clauses, only 87, 88, 89 have this spec. Measuring SMSR would require a high-grade optical spectrum analyser that is not otherwise needed.
 It's difficult to do an SMSR measurement with the WDM multiplexer in place. We don't know what value would be appropriate; the common value is for NRZ PHYs with no FEC.

SuggestedRemedy

Delete the SMSR spec.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Based on the SMSR parameter being specified for similar IEEE 802.3 PMDs such as 100GBASE-ER4, the editors inserted it in draft 0.9 into the tables for the 400GbE SMF PMDs with a tentative value of 30 dB indicated by a magenta font. Draft 0.9 was reviewed and then adopted by the Task Force by motion #3 at the September 2015 meeting.

Measuring SMSR is not required - it must pass if it is measured. The background of this spec is related to unstable laser performance, probably being very temperature sensitive.

Even though measuring SMSR in a DWDM environment is less straightforward than in Clause 122, it is believed that this parameter should be specified.

30 dB value for SMSR is considered to be an appropriate value for this interface.
 Change "30" to black font.

CI 123 SC 123.7.1 P 191 L 21 # 34
 Anslow, Pete Ciena

Comment Type T Comment Status A

In Table 123-7, the values for "Average launch power, each lane (min)" are magenta. The values of -3 dBm and -2.5 dBm are equivalent to the OMAouter (min) values with infinite ER.
 This was discussed on the SMF Ad Hoc call on 6 October with no objection to changing these values to black font.

SuggestedRemedy

In Table 123-7, change the values of -3 and -2.5 for "Average launch power, each lane (min)" from magenta to black.

Response Response Status C

ACCEPT.
 As per consensus from SMF Ad Hoc on 6 October 2015.

CI 123 SC 123.7.1 P 191 L 23 # 225
 Dawe, Piers Mellanox

Comment Type T Comment Status R

Outer Optical Modulation Amplitude (OMAouter), each lane (max)

SuggestedRemedy

Might be more follow useful to specify the peak-to-peak amplitude, as in the eye mask test (without an equalizer).

Response Response Status C

REJECT.
 It is good to use the same metric for OMAouter max as for min, so that the true range is evident. If the transmitted waveform has significant overshoot, then the peak-to-peak amplitude is not as good a measure of the useful signal power as OMAouter is likely to be. Consequently, if a peak-to-peak limit is required to protect equalising receivers against overshoot, it should be an additional limit.

A complete proposal for the definition of OMAouter and information on the need to protect the receiver from overshoot is invited. See also comment #73

CI 123 SC 123.7.1 P 191 L 33 # 226
 Dawe, Piers Mellanox

Comment Type T Comment Status A

TDP needs a reference transmitter and a reference receiver. This looks like it needs an equalizing reference receiver. Getting an accurate equalizing reference receiver looks difficult. This is a good topic for an ad hoc!

SuggestedRemedy

Use TDEC so that the equalizing reference receiver can be in software. We may then need a subsidiary spec, or admonishments, about baseline wander.

Response Response Status C

ACCEPT IN PRINCIPLE.
 TDEC is defined for a two level NRZ eye. A complete proposal for the definition of TDEC appropriate for a PAM4 eye is requested so that the correlation between this proposed parameter and measured optical penalties can be made.
 See also comment #251

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Cl 123 SC 123.7.1 P 191 L 38 # 220
 Dawe, Piers Mellanox

Comment Type T Comment Status R

As 38.6.4 said in 1998, and 52.9.6, "This procedure describes a component test which may not be appropriate for a system level test depending on the implementation", which is why some clauses have made it informative or omitted it altogether. If RIN is bad enough to matter, it will contribute to TDP or TDEC, which is going to be a required spec anyway and with FEC, is practical to measure. Measuring RIN is just repeating most of the same work for no clear benefit except for diagnostics, which is not what an 802.3 spec is for. We can't assess this proposed RIN limit until we have an idea of the reference receiver.

SuggestedRemedy

Delete the row, or turn all of it magenta for now.

Response Response Status C

REJECT.
 The value and "xx" are already magenta.
 A complete proposal for how the quality of the transmitter should be controlled is invited.
 Once the TDP test or its replacement is agreed, whether or not a separate RIN test is needed can be decided on.

Cl 123 SC 123.7.1 P 191 L 43 # 227
 Dawe, Piers Mellanox

Comment Type T Comment Status A

Looking at the TDP limits for 100GBASE-LR4 and 100GBASE-ER4, there is hope that the middle of the three PAM4 eyes will be somewhat open.

SuggestedRemedy

Consider specifying a conventional eye mask as if NRZ (middle eye only), without a reference equalizer. This allows the receiver and particularly its CDR to get started. We could also consider an equalized multilevel eye mask like CDAUI-8.

Response Response Status C

ACCEPT IN PRINCIPLE.
 While this is input to the discussion on the transmitter eye mask definition, it does not provide a clear proposal.

Cl 123 SC 123.7.1 P 191 L 47 # 180
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

Is there a reason why the min TDP specification is different between FR8/LR8 (1dB) and DR4 (0.8dB) ?

SuggestedRemedy

If there is no technical reason for the values being different I suggest being consistent across DR4, FR8 and LR8.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #73

Cl 123 SC 123.7.2 P 192 L 23 # 35
 Anslow, Pete Ciena

Comment Type T Comment Status A

In Table 123-8, the value for "Damage threshold" is magenta. The value of 5.2 dBm is 1 dB above the value for "Average receive power, each lane (max)". This was discussed on the SMF Ad Hoc call on 6 October with no objection to changing this value to black font.

SuggestedRemedy

In Table 123-8, change the values of 5.2 for "Damage threshold" from magenta to black.

Response Response Status C

ACCEPT IN PRINCIPLE.
 As per consensus from SMF Ad Hoc on 6 October 2015.

Also, change "Damage threshold" to "Damage threshold, each lane"

Make the same change in Table 122-7.

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CI 123 SC 123.7.2 P 192 L 29 # 258
 Dawe, Piers Mellanox

Comment Type T Comment Status A

It seems that 400GBASE-FR8 and 400GBASE-LR8 would be interoperable if it were not that the maximum output from 400GBASE-LR8 (5.7 dBm) could overload a 400GBASE-FR8 receiver (5.5 dBm).

SuggestedRemedy

Please explain if they are meant to be interoperable. If so, tweak the maxima and overload specs to support it.

Response Response Status C

ACCEPT IN PRINCIPLE.

[Editor's note: This comment was sent after the close of the comment period.]

123.7 already includes: "The 400GBASE-LR8 PMD interoperates with the 400GBASE-FR8 PMD provided that the channel requirements for 400GBASE-FR8 are met."

In Table 123-8, change the "Receive power, each lane (OMAouter) (max)" for 400GBASE-FR8 from 5.5 to 5.7.

CI 123 SC 123.7.2 P 192 L 31 # 228
 Dawe, Piers Mellanox

Comment Type T Comment Status A

I'm not convinced that we ever need OMAinner.

SuggestedRemedy

For the difference in receive power between any two lanes we can use OMAouter.

Response Response Status C

ACCEPT IN PRINCIPLE.

Since the reason for controlling the difference between lanes is to limit crosstalk, In Table 123-7, change:

"Difference in launch power between any two lanes (OMA) (max)" to:

"Difference in launch power between any two lanes (OMAouter) (max)"

In Table 123-8, change:

"Difference in receive power between any two lanes (OMAinner) (max)" to:

"Difference in receive power between any two lanes (OMAouter) (max)"

CI 123 SC 123.7.2 P 192 L 35 # 230
 Dawe, Piers Mellanox

Comment Type T Comment Status R

if receiver sensitivity isn't normative,

SuggestedRemedy

It would be better not in this table. in fact, better not mentioned.

Response Response Status C

REJECT.

Is consistent with other Clauses like 88 to mention an informative receiver sensitivity

CI 123 SC 123.7.2 P 192 L 35 # 229
 Dawe, Piers Mellanox

Comment Type T Comment Status R

We don't usually consider receiver sensitivity for a different modulation format to what it's meant for.

SuggestedRemedy

If we keep receiver sensitivity as an item, define it the usual way, which in this case would be OMAouter with the numbers increased by 5 (or 4.8?) dB.

Response Response Status C

REJECT.

There is no consensus on this. See comment #83

CI 123 SC 123.7.2 P 192 L 35 # 83
 Dudek, Mike QLogic

Comment Type T Comment Status R

The stressed receiver sensitivity test is unlikely to be testing each inner eye individually and therefore it is more appropriate to be using the OMAouter as the measure for this test. (It is also the OMAouter(min) that is being used as the key parameter for the Tx tests.)

SuggestedRemedy

Change Stressed receiver sensitivity from OMAinner to OMAouter. It is good to leave the informative receiver sensitivity as OMA inner as this is potentially more informative.

Response Response Status C

REJECT.

Some idea of how the stressed sensitivity test will be done is needed before agreeing on whether this is inner or outer OMA.

See also comments #73 and #232

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Cl 123 SC 123.7.2 P 192 L 37 # 231
 Dawe, Piers Mellanox

Comment Type T Comment Status A

Receiver 3 dB electrical upper cutoff frequency, each lane, 21 GHz, looks like a value for design purposes not specification. Hard to specify or measure with an equalizing receiver.

SuggestedRemedy

Delete the table row, here and in Table 123-11 and in 123.12.4.5. Delete 123.8.11. Similarly in Clause 122.

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #32

Cl 123 SC 123.7.2 P 192 L 39 # 232
 Dawe, Piers Mellanox

Comment Type T Comment Status R

"Stressed receiver sensitivity (OMAIinner)": eventually there will be lots of detail in the stressed receiver sensitivity section, so we can make this more convenient for a top-down reader who isn't involved with the modulation format. It would be too unrealistic to test the receiver with an NRZ signal.

SuggestedRemedy

Define stressed receiver sensitivity here by OMAouter.

Response Response Status C

REJECT.
 Some idea of how the stressed sensitivity test will be done is needed before agreeing on whether this is inner or outer OMA.
 See also comments #73 and #83

Cl 123 SC 123.7.2 P 193 L 20 # 233
 Dawe, Piers Mellanox

Comment Type T Comment Status A

Editor's note: Do we maintain the "Allocation for modulation penalties" as shown in the agreed baseline to define this "fixed" difference or would we prefer to make a difference between OMAinner and OMAouter?

First, why is it 5 dB rather than 4.8? We don't usually consider receiver sensitivity for a different modulation format to what it's meant for.

SuggestedRemedy

Define an implied unstressed receiver sensitivity by OMAouter. Delete the "allocation for modulation penalties" row. Put PAM4 issues like nonlinearity penalty in the "allocation for penalties". Then the budget will be understandable by those who read some of the many NRZ budget tables.

Response Response Status C

ACCEPT IN PRINCIPLE.
 There is no consensus on whether the receiver sensitivity should be OMA inner or outer. For Allocation for modulation penalties, see response to comment #84

Cl 123 SC 123.7.3 P 193 L 18 # 181
 Nicholl, Gary Cisco Systems

Comment Type T Comment Status A

The 'allocation for penalties' in Table 123-9 is identical to the max TDP penalty specified in Table 123-7. I believe this is because the TDP is assumed to include the MPI penalty. This is different from the DR4 specification in Clause 122, where the MPI penalty is called out separately from the TDP.

SuggestedRemedy

Suggest that we come up with a consistent method for addressing MPI across all of the SMF PMDs.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Contributions addressing MPI penalty allocation and reflection specifications are invited.
 See also comment #177

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Cl 123 SC 123.7.3 P 193 L 20 # 84
 Dudek, Mike QLogic

Comment Type T Comment Status A

When comparing NRZ and PAM4 (or other modulation formats) it is useful to include the modulation penalty as an item in the comparisons but for a power budget in the standard it is more helpful to not include them in the budget as they are inherent. The inaccuracies in the thresholds of the Tx will be captured as part of TDP. Also in this budget there is no allocation for penalties in the Rx as the total allocation for penalties is equal to the TDP value.

We should also make the power budget methodology the same for clauses 122 and 123

SuggestedRemedy

Delete the "allocation for modulation penalties row. Reduce the power budgets from 11, 13.5 to 6.2,8.7. Increase the allocation for penalties to 2.2, 2.4

Whatever is done from a methodology standpoint make it the same in both clauses.

Response Response Status C

ACCEPT IN PRINCIPLE.
 Bring the parameters in Table 123-9 in line with those in Table 122-8.
 In Table 123-9:
 Change the "Power budget (for maximum TDP)" values to 6.2 and 8.7 dB
 Change the "Allocation for penalties (for maximum TDP)" to 2.2 and 2.4 dB
 Delete the row for "Allocation for modulation penalties"
 Delete the Editor's note below Table 123-9.
 In Table 123-7:
 Change the "Transmitter and dispersion penalty (TDP), each lane (max)" to 2.2 and 2.4 dB
 Because the assumed difference between inner and outer has changed, in Table 123-8:
 Change the "Receiver sensitivity (OMAinner), each lane (max)" to -9.8 and -11.6 dBm

See also comment 233

Cl 123 SC 123.8.1 P 194 L 5 # 245
 Dawe, Piers Mellanox

Comment Type T Comment Status A

I don't think we can use square wave for PAM4; a transmitter with a linearity control circuit would not behave normally if there were no ones and twos. We can find runs of each level in QPRBS13, and for an optical link without too much memory, probably QPRBS9 will be usable too.

SuggestedRemedy

Consider removing square wave from 122 and 123, and modifying 120 so that it isn't an option for a PAM4 PMA output.

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 There is general agreement that a square wave is not an appropriate test pattern for an optical PAM4 signal. Since the methods for measuring the parameters for a PAM4 signal are still TBD it is not appropriate to decide which is the best pattern to replace it with for the measurements at this point.
 See also comment #76

Cl 123 SC 123.8.1 P 194 L 7 # 246
 Dawe, Piers Mellanox

Comment Type T Comment Status R

TBD to replace PRBS31

SuggestedRemedy

QPRBS31 - see other comments.

Response Response Status C

REJECT.
 [Editor's note: This comment was sent after the close of the comment period.]
 There is no agreement yet for this test pattern and no evidence has been provided that QPRBS31 is adequate

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Cl 123 SC 123.8.1 P 194 L 9 # 247
 Dawe, Piers Mellanox
 Comment Type T Comment Status A
 TBD to replace PRBS9
 SuggestedRemedy
 QPRBS13 (not the KP4 one - see another comment). Not sure if QPRBS9 is long enough to be useful.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 See response to comment #77

Cl 123 SC 123.8.1 P 194 L 25 # 248
 Dawe, Piers Mellanox
 Comment Type T Comment Status A
 I think we can avoid using OMAinner. And we can't measure it for a PAM4 transmitter with the square wave in Table 123-10.
 SuggestedRemedy
 If we don't need OMAinner, delete the row. If we do, delete "Square wave or"
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 There is currently no consensus as to whether a definition for OMAinner is needed or not. If it is, then when a measurement method is agreed, the test pattern can be defined.

Cl 123 SC 123.8.1 P 194 L 27 # 249
 Dawe, Piers Mellanox
 Comment Type T Comment Status A
 In P802.3bm, we determined that any valid 100GBASE-SR4 signal is well enough scrambled to be equivalent to Pattern 5 (RS-FEC encoded scrambled idle). The same is true here (even more so as the pre-FEC spec BER is higher).
 SuggestedRemedy
 Change "3 or 5" to "3, 5 or valid 400GBASE-R signal", twice in this table.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 No decision has been made as to whether the "TDP" test will use a reference receiver or operate on a captured waveform. It is not appropriate to agree on test patterns to be used until this decision is made.

Cl 123 SC 123.8.1 P 194 L 37 # 250
 Dawe, Piers Mellanox
 Comment Type T Comment Status A
 Pattern for calibration of OMA for receiver tests would be the same as for OMA in general.
 SuggestedRemedy
 Change TBD to 4, or delete the row.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 There is currently no definition for OMA for a PAM4 signal. Once this is defined, appropriate test patterns can be agreed.

Cl 123 SC 123.8.5 P 194 L 53 # 251
 Dawe, Piers Mellanox
 Comment Type T Comment Status A
 TDP would need a hardware reference receiver as well as a reference transmitter; this spec expects an equalizing reference receiver and I don't see how an accurate one can be obtained.
 SuggestedRemedy
 Use TDEC. Keep the dispersive channel as in 123.8.5.1. For a reference receiver, consider the traditional 19 GHz BT4 filter, but with a CTLE as in CAUI-4 or CDAUI-8. Maybe peaking settings 1, 2, 3 and a no-CTLE setting. The pattern would have to be something that a scope could process e.g. QPRBS13 or QPRBS15. Consider if a separate spec to control baseline wander is needed.
 Response Response Status C
 ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 There is currently no consensus as to whether the "TDP" test will use a hardware reference receiver or operate on a captured waveform. Further contributions are needed to generate some consensus on this.
 TDEC is defined for a two level NRZ eye. A complete proposal for the definition of TDEC appropriate for a PAM4 eye is requested so that the correlation between this proposed parameter and measured optical penalties can be made.
 See also comment #226

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Cl 123 SC 123.8.6 P 195 L 35 # 252
 Dawe, Piers Mellanox

Comment Type T Comment Status A

In this clause the purpose of an extinction ratio spec is to contain reflection noise (MPI, multi path interference). So it should be measured on a representative signal, or even use a spec such as min(EH6)/(peak signal)

SuggestedRemedy

Use min(EH6)/(peak signal) as seen by the equalising receiver or min(EH6)/(mean three) as seen by the equalising receiver or (mean three)/(mean zero) as seen by the equalising receiver.

Response Response Status C

ACCEPT IN PRINCIPLE.

[Editor's note: This comment was sent after the close of the comment period.]
 See response to comment #79

Cl 123 SC 123.8.7 P 195 L 39 # 253
 Dawe, Piers Mellanox

Comment Type T Comment Status R

This RIN method has problems:
 It requires a measurement when the transmitter isn't modulated, which is not realistic and there is no guarantee that the noise would be the same when it's modulated;
 It would need modification because we are using PAM4 modulation (we cannot expect a transmitter designed for to even set its output levels the same if modulated with NRZ);
 The measurement bandwidth would have to be adjusted for the receiver equalization, which is expected to be a function of something else about the transmitter.

SuggestedRemedy

As we don't need it - delete the section and the RIN spec row.
 Similarly in Clause 122.

Response Response Status C

REJECT.

[Editor's note: This comment was sent after the close of the comment period.]
 Insufficient evidence provided that RIN spec is not necessary

Cl 123 SC 123.8.7 P 195 L 43 # 254
 Dawe, Piers Mellanox

Comment Type E Comment Status R

The optical return loss is TBD dB.

SuggestedRemedy

The optical return loss is set to the value for optical return loss tolerance (max) given in Table 123-7.

Response Response Status C

REJECT.

[Editor's note: This comment was sent after the close of the comment period.]
 Since the value for the optical return loss to be used is also encoded into the name of the parameter (RINxxOMA) there is little value in making this a cross-reference. Also, another comment proposes to remove this subclause entirely (see comment #253).

Cl 123 SC 123.8.8 P 195 L 50 # 7
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

Transmitter optical waveform need to be measured with a CRU

SuggestedRemedy

The clock recovery unit (CRU) used in the optical waveform measurement has a corner frequency of 4 MHz and a slope of 20 dB/decade. When using a clock recovery unit as a clock for BER measurements, passing of low- frequency jitter from the data to the clock removes this low-frequency jitter from the measurement.

Response Response Status C

REJECT.

There is currently no agreement as to whether or not a requirement for the transmitter optical waveform will be included.
 Also, there is no consensus as yet on CRU corner frequency.

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Cl 123 SC 123.8.8 P 195 L 52 # 255
 Dawe, Piers Mellanox

Comment Type T Comment Status A

"Transmit eye: we need new definition and test method for the PAM4 transmitter optical waveform".

SuggestedRemedy

Consider the standard NRZ eye algorithm with a very small region 1 and the usual 19 GHz BT4 filter.
 Also an eye spec with a 19 GHz BT4 filter plus CTLE like CAUI-4 or CDAUI-8: use an algorithm for PAM4 eye measurements similar to 120E.4.2 Eye width and eye height measurement method, but with "relative mask" limits not "absolute mask" limits.
 For both, the hit ratio would be approaching 1e-2, higher than for 100GBASE-SR4 because we are using stronger FEC.

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 While this is input to the discussion on the transmitter eye mask definition, it does not provide a clear proposal.

Cl 123 SC 123.8.9 P 196 L 1 # 257
 Dawe, Piers Mellanox

Comment Type T Comment Status R

(Unstressed) receiver sensitivity is not normative and we would need to define it for PAM4: we can't expect that a receiver designed for PAM4 will behave normally with an NRZ signal.

SuggestedRemedy

Easier to delete the section, and not mention receiver sensitivity.

Response Response Status C

REJECT.
 [Editor's note: This comment was sent after the close of the comment period. Subclause changed from 123.11.2.2 to 123.8.9]
 As for other Clauses like 88 an informative receiver sensitivity is very useful see also comment #230

Cl 123 SC 123.8.9 P 196 L 5 # 8
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status R CDR BW

Stress receiver sensitivity must tolerate low frequency jitter propagating from the transmitter downstream

SuggestedRemedy

Sinusoidal jitter componnet of stress receiver sensitivity is as following The sinusoidal jitter is used to test receiver jitter tolerance.

The amplitude of the applied sinusoidal jitter is dependent on frequency as specified in Table 87-13 and is illustrated in Figure 87-5.

Response Response Status C

REJECT.
 There is no consensus as yet on CRU corner frequency.
 See also comment 5

Cl 123 SC 123.8.9 P 199 L 14 # 256
 Dawe, Piers Mellanox

Comment Type T Comment Status A

The baseline says Maximum Discrete Reflectance TBD, so does Table 123-9. This says -26 which appears to have been copied from 88.11.2.2 which is NRZ. Presumably this must be better: Clause 122 has -35.

SuggestedRemedy

Change to -35, or magenta TBD until we have a better understanding of the effects of reflection noise.

Response Response Status C

ACCEPT IN PRINCIPLE.
 [Editor's note: This comment was sent after the close of the comment period.]
 Change "-26" to magenta.

Cl 123 SC 123.8.11 P 196 L 16 # 9
 Ghiasi, Ali Ghiasi Quantum LLC

Comment Type TR Comment Status A

Laser with strong relaxation will not pass PAM4 eye requirement so there is no need to implicitly measure receiver upper BW

SuggestedRemedy

Remove receiver 3 dB electrical BW

Response Response Status C

ACCEPT IN PRINCIPLE.
 See response to comment #32

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Cl 123 SC 123.11.1 P 198 L 51 # 85
 Dudek, Mike QLogic

Comment Type T Comment Status A

At 2km the difference between these two loss numbers is only 0.08dB. I would have thought that at this reach "outside plant cable" is quite likely to be used and we should therefore find the 0.08dB from within the remaining channel insertion loss budget. There is also a problem in 123.11.2.1 which says the connection insertion loss is only 2dB when it was 3.08dB.

SuggestedRemedy

delete "at 2km for 400GBASE-FR8 or" On page 199 line 7 Change "The maximum link distance is based on an allocation of 2 dB total connection and splice loss. For example,this allocation supports four connections with an average insertion loss per connection of 0.5 dB." to "The maximum link distance for 400GBASE-LR8 is based on an allocation of 2 dB total connection and splice loss. For example,this allocation supports four connections with an average insertion loss per connection of 0.5 dB. The maximum link distance for 400GBASE-FR8 is based on an allocation of 3dB total connection and splice loss."

Response Response Status C

ACCEPT.

Cl A SC A P 205 L 13 # 86
 Dudek, Mike QLogic

Comment Type T Comment Status A

The specification name for the OIF development in the editor's note is incorrect and the MR specification is also relevant for chip to chip.

SuggestedRemedy

Change "The OIF CEI-28G-VSR-PAM4 specification is currently being developed by the OIF and is expected" to "The OIF CEI-56G-VSR-PAM4 and CEI-56G-MR specifications are currently being developed by the OIF and are expected" Also change the name on page 241 line 2.

Response Response Status C

ACCEPT IN PRINCIPLE.

The Bibliography entry Bx1 is only called out in 120E.1, so it is not appropriate to include CEI-56G-MR in the editor's note. Also, the name of the draft in the liaison from OIF was "CEI-56G-VSR-PAM". See:
http://www.ieee802.org/3/minutes/sep15/incoming/OIF_to_IEEE_P802d3bs_Sep_2015.pdf

Change:

"The OIF CEI-28G-VSR-PAM4 specification is currently being developed by the OIF and is expected to be published as part of an updated version of OIF-CEI-03.x" to:

"The OIF CEI-56G-VSR-PAM specification is currently being developed by the OIF and is expected to be published as part of OIF-CEI-04.0"

In 120E.1 (page 241, line 2), change:

"CEI-28G-VSR-PAM4 defined in OIF-CEI-03.x [Bx1]" to:

"CEI-56G-VSR-PAM defined in OIF-CEI-04.0 [Bx1]"

[Editor's note: Clause changed from "Annex" to "A", Subclause changed form "annex A" to "A"]