

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

Cl 1 SC 1.4 P30 L3 # 208  
 Ran, Adeo Intel  
 Comment Type E Comment Status D bucket  
 1.4.24 is not "100GBASE-X"  
 SuggestedRemedy  
 Change to "100BASE-X" (without G)  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 69 SC 69.1.2 P61 L14 # 210  
 Ran, Adeo Intel  
 Comment Type E Comment Status D bucket  
 In item l) there are now two MDIs.  
 SuggestedRemedy  
 Change "MDI" to "MDIs".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 45 SC 45.2.1.111.8 P40 L30 # 209  
 Ran, Adeo Intel  
 Comment Type E Comment Status D bucket  
 References to subclauses of new clause 161 are inserted out of order. Here and in other places in clause 45.  
 SuggestedRemedy  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve in the same way as comment #108

Cl 69 SC 69.2.3 P62 L4 # 211  
 Ran, Adeo Intel  
 Comment Type E Comment Status D bucket  
 The comma after Table 69-3a and the "Table69-3c" are new text.  
 SuggestedRemedy  
 Apply underline.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 45 SC 45.2.1.111.8 P40 L30 # 108  
 Slavick, Jeff Broadcom  
 Comment Type E Comment Status D bucket  
 Shouldn't 161 show up as the last entry in the list (listing clauses to look at in numerical order)  
 SuggestedRemedy  
 Update 45.2.1.111.8, 45.2.1.111.9, 45.2.1.112, 45.2.1.113, 45.2.1.115 lists that insert Cl161 to have Cl161 added at the end of the list.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 69 SC 69.2.3 P62 L10 # 212  
 Ran, Adeo Intel  
 Comment Type E Comment Status D bucket  
 Underscores in editorial instruction should be spaces.  
 SuggestedRemedy  
 Change to spaces.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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Cl 69 SC 69.2.3 P62 L18 # 213

Ran, Adeel Intel

Comment Type T Comment Status D bucket

There is no column for AN in this table. AN is included in table 69.3 (the original 100G backplane table). It seems that 802.3cd omitted this column in the new tables (3a and 3b) it added here, although it is included in the tables that were added in clause 116.

May require maintenance approval but I assume it will be done in this project.

*SuggestedRemedy*

Add AN column and populate it - mandatory for all rows.

Also in tables 69-3b and 69-3c.

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 69 SC 69.2.3 P63 L10 # 214

Ran, Adeel Intel

Comment Type T Comment Status D bucket

The column for clause 78 is not required since EEE is not defined at all for 400GBASE-KR4 (clause 78 is not mentioned in the new PMD clauses, and EEE is not in scope...) and there is no other PHY in this table.

Clause 116 also leaves this column blank (not even optional) for the new 200G and 400G PMDs.

*SuggestedRemedy*

Delete this column.

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 73 SC 73.2 P64 L18 # 215

Ran, Adeel Intel

Comment Type E Comment Status D bucket

In the new figure 73-1, The label on the right of the arrow looks like two separate labels.

Also, in the label below "Medium", there is no space after "50 Gb/s", and there is no bottom-pointing brace above the list of PHYs (compare to Figure 69-5).

*SuggestedRemedy*

Add comma after XLGMII, and reduce line spacing (or delete the extra line break).

Add brace and add space after "50 Gb/s".

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For this figure, there is no brace in the base standard or any approved amendments thereof.

Implement the suggested remedy, except do not add the brace.

Cl 73 SC 73.6.4 P65 L10 # 77

Gustlin, Mark Cisco Systems

Comment Type T Comment Status D FEC AN

Adopt the details of AN for 100GBASE-CR1/KR1

*SuggestedRemedy*

I will present the options to choose from, adopt if we have task force consensus.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Implement whichever slides are adopted with editorial license.

For task force discussion.

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CI 73 SC 73.10.2 P67 L25 # 216

Ran, Adee Intel  
 Comment Type E Comment Status D bucket

Table 73-7 is shown with all rows, most of which are not changed, and is spread across two pages. Only one new row is inserted.

Using "some unchanged rows are not shown" here and keeping only the "link\_fail\_inhibit\_timer" rows would make this change easier to understand.

*SuggestedRemedy*

Change table per comment with editorial license.

Proposed Response Response Status W  
 PROPOSED ACCEPT.

CI 80 SC 80.4 P72 L20 # 217

Ran, Adee Intel  
 Comment Type T Comment Status D

There should be a new row in Table 80-5 for the delay constraints of the RS-FEC-Int sublayer.

*SuggestedRemedy*

Add a row based on the constraints in 161.4 (subject of another comment).

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

161.4 specifies that the maximum delay is the same as that specified for the Clause 91 RS-FEC which is 80 pause quanta or 409.6 ns.

Add a new row in Table 80-5 for the RS-FEC-Int and include values consistent with 161.4.

See comment #116.

CI 80 SC 80.5 P73 L36 # 112

Nicholl, Shawn Xilinx  
 Comment Type TR Comment Status D bucket

Since 161.5.2.2 says that it's identical to 91.5.2.2, then "Table 80-6 -- Summary of Skew constraints" should contain a reference to 161.5.2.2

*SuggestedRemedy*

Propose to update Table 80-6 such that the Notes column for the "At RS-FEC transmit" row contains a reference to Clause 161. Proposed text for the table cell is:  
 See 91.5.2.2, 161.5.2.2

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

Resolve using the response to comment #107.

CI 80 SC 80.5 P73 L36 # 107

Slavick, Jeff Broadcom  
 Comment Type TR Comment Status D bucket

New FEC needs to be referenced

*SuggestedRemedy*

Add 161.5.2.2 to FEC transmit row and 161.5.3.1 to the FEC receive row into both Table 80-6 and 80-7

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

Implement the suggested remedy.

Also, for both tables in the first column.  
 Change "At RS-FEC transmit" to "At RS-FEC or RS-FEC-Int transmit"  
 Change "At RS-FEC receive" to "At RS-FEC or RS-FEC-Int receive"

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**Cl 80 SC 80.5 P73 L38 # 113**  
 Nicholl, Shawn Xilinx  
**Comment Type TR Comment Status D bucket**  
 Since 161.5.3.1 specifies the Rx deskew capabilities, then "Table 80-6 -- Summary of Skew constraints" should contain a reference to 161.5.3.1  
**SuggestedRemedy**  
 Propose to update Table 80-6 such that the Notes column for the "At RS-FEC receive" row contains a reference to Clause 161. Proposed text for the table cell is:  
 See 91.5.3.1, 161.5.3.1  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve using the response to comment #107.

**Cl 80 SC 80.5 P74 L32 # 114**  
 Nicholl, Shawn Xilinx  
**Comment Type TR Comment Status D bucket**  
 Since 161.5.2.2 says that it's identical to 91.5.2.2, then "Table 80-7 -- Summary of Skew Variation constraints" should contain a reference to 161.5.2.2  
**SuggestedRemedy**  
 Propose to update Table 80-7 such that the Notes column for the "At RS-FEC transmit" row contains a reference to Clause 161. Proposed text for the table cell is:  
 See 91.5.2.2, 161.5.2.2  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve using the response to comment #107.

**Cl 80 SC 80.5 P74 L34 # 115**  
 Nicholl, Shawn Xilinx  
**Comment Type TR Comment Status D bucket**  
 Since 161.5.3.1 specifies the Rx deskew capabilities, then "Table 80-7 -- Summary of Skew Variation constraints" should contain a reference to 161.5.3.1  
**SuggestedRemedy**  
 Propose to update Table 80-7 such that the Notes column for the "At RS-FEC receive" row contains a reference to Clause 161. Proposed text for the table cell is:  
 See 91.5.3.1, 161.5.3.1  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve using the response to comment #107.

**Cl 82 SC 82.2.13 P152 L0 # 132**  
 Brown, Matt Huawei Technologies Canada  
**Comment Type T Comment Status D bucket**  
 Table 82-7 "Skew tolerance parameters" has an entry "100GBASE-R with RS-FEC". To be complete this should also include "RS-FEC-Int" per Clause 161.  
**SuggestedRemedy**  
 Import Table 82-7, and show change of "100GBASE-R with RS-FEC" to "100GBASE-R with RS-FEC or RS-FEC-Int".  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT.

**Cl 93A SC 93A.1 P186 L36 # 47**  
 Dudek, Mike Marvell  
**Comment Type E Comment Status D bucket**  
 For style consistency the other parameters that some clauses don't use should be in a footnote.  
**SuggestedRemedy**  
 Add a footnote c stating "Some clauses that invoke this method do not provide a value for Nbg, Nbf, Nf, bgmax, sigmax, Nts. See 93A.1.6  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT.

**Cl 93a SC 93a.1.6 P189 L21 # 1**  
 Mellitz, Richard Samtec  
**Comment Type TR Comment Status D bucket**  
 If floating taps are not specified, for compatibility with older clauses, Nf should be Nb.  
**SuggestedRemedy**  
 Change:  
 ..are not specified then no floating taps are used.  
 to  
 ...are not specified then no floating taps are used and Nf takes the value of Nb from referring clauses.  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT.

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Cl 93A SC 93A.1.6.1 P190 L12 # 159  
 Kasapi, Athos Cadence  
 Comment Type TR Comment Status D bucket  
 Likely typo; existing text refers to number of taps in bank, N\_{bf}, as N\_b  
 SuggestedRemedy  
 Change N\_f - N\_b + 1 to N\_f - N\_{bf} + 1  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 120 SC 120.1 P91 L4 # 110  
 Slavick, Jeff Broadcom  
 Comment Type E Comment Status D bucket  
 The w is missing from Overview  
 SuggestedRemedy  
 Add the w  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 93a SC 93a.1.6.1 P190 L24 # 2  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D  
 This works better as its own clause. In future drafts we may want to apply to any tail tap starting location.  
 SuggestedRemedy  
 Bifurcate 93a.1.6.1 to 93a.1.6.1 and 93a.1.2. Title 93a.1.6.2 "limiting power in tail DFE taps". If N\_ts is defined in the reference clause further limit the DFE tap as specified in 93a.1.6.2. Adjust wording to accommodate if Nf is not defined.  
 Proposed Response Response Status W  
 PROPOSED REJECT.

Cl 120 SC 120.1 P91 L6 # 218  
 Ran, Adee Intel  
 Comment Type E Comment Status D bucket  
 Label is "Overvie"  
 SuggestedRemedy  
 Change to "Overview".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Constraining the floating taps is part of a series of steps to set the floating coefficients, not an independent measurement or constraint.

Cl 118 SC 118.1.3 P0 L0 # 109  
 Slavick, Jeff Broadcom  
 Comment Type TR Comment Status D bucket  
 Clause 118.1.3 lists the AUI that a 200/400GXS may use. The new 100G serial ones should be included in that list.  
 SuggestedRemedy  
 Bring in 118.1.3 and add 120G and 120F to both of the 200G and 400G lists of supported physically instantiated AUIs  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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CI 120 SC 120.5.1 P92 L43 # 219

Ran, Adee

Intel

Comment Type T Comment Status D

In the original text, the list of annexes had "or" which made it clear that only one of the annexes is appropriate. The new "Annex 120B through Annex 120G" reads as if all specifications in all of the annexes should be met "as appropriate". It is not quite clear what is appropriate.

Note that the corresponding transmitter specification appears in 120.5.6 with a full list of annexes and their corresponding AUIs.

To make this more readable and maintainable, I suggest adding a new table mapping annexes to AUIs (this can be done in 120.1.1) and referring to this table in both places and everywhere else where it can be used, instead of the current text.

Alternatively: change this sentence to "the PMA shall meet the electrical and timing specifications in the corresponding Annex (120B through 120G).

Also applies to 135.5 and possibly other places.

This comment is about existing clauses 120 and 135. Since these clauses are being changed anyway I assume this change is within the scope of the project.

*SuggestedRemedy*

Add a new table mapping AUIs to Annexes and refer to it in this paragraph and elsewhere (if in scope), with editorial license.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

The text should not imply that more than one of the Annexes is relevant. However, it is not necessary to add a table to map each of the AUIs to an annex and such a table would make future amendments more onerous. When reviewing each of the annexes it is unambiguous which AUI it is defining.

Change the text to "Annex 120B, Annex 120C, Annex 120D, Annex 120E, Annex 120F, or Annex 120G" in two places.

CI 120 SC 120.5.7.2 P94 L44 # 221

Ran, Adee

Intel

Comment Type T Comment Status D

In the text describing the precoding control for PMDs, the case where training is supported but is disabled by management is not covered. In this case the variables should be "set as required by implementation" similar to C2C.

Repeating the list of PMDs twice would make the text cumbersome. The change in the suggested remedy attempts a more general definition that should make the text easier to read and maintain.

Also applies to similar text in 135.5.7.2.

This comment is about existing clauses 120 and 135. Since these clauses are being changed anyway I assume this change is within the scope of the project.

*SuggestedRemedy*

Replace the 4th paragraph and the one inserted below it with the following:

"If the PMA is connected to the service interface of a PMD that uses the PMD control function (136.8.11), then precoder\_tx\_out\_enable\_i and precoder\_rx\_in\_enable\_i shall be set as determined by the PMD control function on lane i. The method by which the PMD control function affects these variables is implementation dependent.

If the PMA is connected to the service interface of a PMD that supports the PMD control function but training is disabled by the management variable mr\_training\_enable (see 136.7), or if the PMA is part of a 200GAUI-2 C2C or a 400GAUI-4 link, then precoder\_tx\_out\_enable\_i, precoder\_rx\_in\_enable\_i, precoder\_tx\_in\_enable\_i, and precoder\_rx\_out\_enable\_i are set as required by the implementation. The method described in 135F.3.2.1 may be used for 200GAUI-2 C2C or 400GAUI-4 links."

Apply a similar change in 135.5.7.2 with changes as necessary.

Implement with editorial license.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

It is reasonable to provide guidance for the case where one of the listed PMDs does not have training enabled.

It is out of scope to the change text to the extent suggested by the commenter. Also, the suggested new text eliminates some important and relevant terminology (e.g., reference to input and output lanes).

In 135.5.7.2, with appropriate editorial instructions...

Change "For PMA input and output lanes connected to the PMD service interface of a

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50GBASE-CR PMD, 50GBASE-KR PMD, 100GBASE-CR2 PMD, or 100GBASE-KR2 PMD,"  
 To "For PMA input and output lanes connected to the PMD service interface of a 50GBASE-CR PMD, 50GBASE-KR PMD, 100GBASE-CR2 PMD, or 100GBASE-KR2 PMD, with training enabled by the management variable mr\_training\_enable (see 136.7),"

Change "For PMA input and output lanes that are part of a 50GAUI-1 C2C or a 100GAUI-2 C2C link"  
 To "For PMA input and output lanes that are part of a 50GBASE-CR PMD, 50GBASE-KR PMD, 100GBASE-CR2 PMD, or 100GBASE-KR2 PMD, with training disabled by the management variable mr\_training\_enable (see 136.7), a 50GAUI-1 C2C link, or a 100GAUI-2 C2C link"

In 120.5.7.2, with appropriate editorial instructions.

Change "The variables precoder\_tx\_out\_enable\_i and precoder\_rx\_in\_enable\_i shall be set as determined by the PMD control function on lane i (see 136.8.11.7.5)."  
 To "For a PMD with training enabled by the management variable mr\_training\_enable (see 136.7), precoder\_tx\_out\_enable\_i and precoder\_rx\_in\_enable\_i shall be set as determined by the PMD control function on lane i (see 136.8.11.7.5)."

Add the following paragraph:  
 "For a PMD with training disabled by the management variable mr\_training\_enable (see 136.7), precoder\_tx\_out\_enable\_i, precoder\_rx\_in\_enable\_i, precoder\_tx\_in\_enable\_i, and precoder\_rx\_out\_enable\_i are set as required by the implementation. The implementation may use the method described in 135F.3.2.1."

CI 120	SC 120.5.11.2.4	P95	L32	# 148
Dawe, Piers		Mellanox		
Comment Type	TR	Comment Status	D	bucket

This editor's note says "the assumption that the square wave test pattern will continue to be required for 200GAUI-2 and 400GAUI-4 testing". But the square wave is not used for AUI testing at all, nor is it required for anything except measuring the RIN of an optical transmitter (which is typically done on the optical module alone, not in a complete system, anyway). The text at line 21 says it's optional, not required. This project does not add or alter optical PMDs.

*SuggestedRemedy*

Delete this editor's note, and the first part of the editor's note in 135.5.10.2.4.

*Proposed Response*      *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

The commenter has clarified that the reason for supporting the square wave in the PMA is not for testing of an AUI transmitter but rather for testing of currently specified PMD transmitters.

Regardless, the editor's notes were intended to be deleted in D1.1, per the included text.

Remove the editor notes on page 95 and page 102.

CI 120	SC 120.7.3	P97	L3	# 222
Ran, Adee		Intel		
Comment Type	E	Comment Status	D	bucket

Font size is inconsistent in this table (existing and new text).

*SuggestedRemedy*

use consistent font size

*Proposed Response*      *Response Status* **W**

PROPOSED ACCEPT.

CI 120	SC 120.5.7.2	P94	L47	# 220
Ran, Adee		Intel		
Comment Type	E	Comment Status	D	

136.8.11.7.5 is an incorrect cross-reference - it points to the state diagrams subclause which which does not address precoding in any way.

It should be corrected to 136.8.11, here and also in clause 136 (possibly with maintenance approval).

*SuggestedRemedy*

Per comment.

*Proposed Response*      *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Although this is making a change to existing text in 802.3cd-2018, it is nevertheless and obvious error.

With appropriate editorial instructions, change "136.8.11.7.5" to "136.8.11" at the following locations:  
 page 94, line 47 (120.5.7.2)  
 page 101, line 49 (135 5.7.2)

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CI 120A SC 120A P0 L0 # 136

Brown, Matt Huawei Technologies Canada

Comment Type T Comment Status D layer diagrams

Some layer diagrams in Annex 120A should show the new 200GAUI-2 and 400GAUI-4 in addition to 200GAUI-4/8 and 400GAUI-8/16.

*SuggestedRemedy*

Import portions of Annex 120A and add 200GAUI-2 and 400GAUI-4 or alternately add new diagrams to include these.

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 120F SC 120F.1 P192 L22 # 48

Dudek, Mike Marvell

Comment Type T Comment Status D bucket

The 100G Phys using RS544,514 are 100GBASE-P not 100GBASE-R

*SuggestedRemedy*

Chage 100GBASE-R to 100GBASE-P in figure 120F-1

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 120F SC 120F.1 P192 L39 # 49

Dudek, Mike Marvell

Comment Type T Comment Status D layer diagrams

There are no examples of these C2C interfaces in 120A or 135A

*SuggestedRemedy*

Either delete the references to these annexes or bring these Annexes into 80.3ck and add examples (e.g. add n=1 to Figure 135A-8

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

See comments #135, #136, and #139.

CI 120F SC 120F.1 P193 L22 # 266

Ran, Adeo Intel

Comment Type T Comment Status D

In some applications AC coupled is required to be inside the receiver. This can result from routing limitations and can provide signal integrity improvements.

C2C is an engineered link so the channel can be designed with knowledge of the Rx capability.

It would be good to mention that the receiver may implement internal AC coupling and in that case the channel is not required to have additional AC coupling.

*SuggestedRemedy*

Add a NOTE where convenient:

NOTE: Some devices include internal AC-coupling. Applications that use such devices may choose not to include AC-coupling in the channel if the devices are compatible with this design choice.

Proposed Response Response Status W

PROPOSED REJECT.

Alternate to AC coupling being provided in the receiver as suggested by the commenter, the transmitter and receiver might be designed such that no AC-coupling is required (DC-coupled).

There may thus be various solutions slightly different than specified that might be practical. In any of these cases, the implementer is responsible for ensuring that the transceivers are compatible. This is outside the scope of this specification.

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Cl 120F SC 120F.1 P193 L26 # 267

Ran, Adeo Intel

Comment Type E Comment Status D

The text for three AUIs (100G, 200G, 400G) is repetitive and the figures are almost identical.

Merging to a single figure and text would help the readers.

SuggestedRemedy

Per comment, Implement with editorial license.

Proposed Response Response Status W

PROPOSED REJECT.

It is recognized that there is much similarity between the different Ethernet rates. The same concern was addressed when specifying Annex 135D/E/F/G in IEEE Std 802.3cd-2018. In the end, separate text and diagrams for each Ethernet rate were used.

Providing separate diagrams and text avoids having to list out multiple entities, parameters in the text and diagram to allow for the different lane widths, etc. The text and diagrams read much easier to follow this way.

Cl 120F SC 120F.1 P194 L33 # 268

Ran, Adeo Intel

Comment Type T Comment Status D

"If implemented, the transmitter equalization feedback mechanism described in 120D.3.2.3 may be used to identify an appropriate setting"

That mechanism supports the equalizer that was specified in the original CAUI-4 C2M (Annex 83D), which has only 3 taps with 5% coefficient resolution. The PAM4 AUIs defined in 802.3.bs (120D.3.1.5) and re-used in 802.3cd have kept this structure.

However, in we now have a 5-tap equalizer with 2% resolution. Even if pre-cursor tap c(-3) is removed as suggested in 120F.3.1.4 it would not be identical to the FFE in Annex 83D.

Re-using this method for 100GAUI-1 is impossible if the specified Tx equalizer is different from what it was in Annex 83D. A new method should be defined.

Also applies to 45.2.1.129.

SuggestedRemedy

I am planning a presentation with some possible solutions.

Proposed Response Response Status Z

PROPOSED REJECT.

This comment was WITHDRAWN by the commenter.

Cl 120F SC 120F.1 P194 L38 # 177

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D bucket

Missing informative channel loss

SuggestedRemedy

Add informative channel loss

Insertion\_Loss(f)=1.083+1.25V??+0.47?? 0.01=??=50 ??????

Proposed Response Response Status W

PROPOSED REJECT.

The informative channel insertion loss is specified in 120F.4.2.

Cl 120F SC 120F.2 P194 L6 # 270

Ran, Adeo Intel

Comment Type T Comment Status D

This subclause's title is "Transmitter electrical characteristics". The first paragraph is about 1/(1+D) precoding, but precoding does not affect electrical characteristics.

Also, the "shall" here is not required from the electrical interface, but from the PMA above it.

SuggestedRemedy

Delete this paragraph. Maybe add instead some text to the introduction about the option to use precoding in the PMA client.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

In 120F.3.1, delete the first paragraph.

Replace the last paragraph in In 120F.1 with the following:

The 100GAUI-1 C2C, 200GAUI-2 C2C, and 400GAUI-4 C2C transmitter shall support 1/(1+D) mod 4 precoding, as specified in 135.5.7.2 and 120.5.7.2, that may be enabled or disabled as required. The 100GAUI-1 C2C, 200GAUI-2 C2C, and 400GAUI-4 C2C receiver may support 1/(1+D) mod 4 precoding, as specified in 135.5.7.2 and 120.5.7.2. Precoding may be enabled and disabled using the precoder request mechanism specified in 135F.3.2.1.

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CI 120F SC 120F.2 P194 L43 # 269

Ran, Adeel Intel  
 Comment Type E Comment Status D

The content of this subclause is

"The electrical characteristics for the 100GAUI-1 C2C, 200GAUI-2 C2C, and 400GAUI-4 C2C interfaces are as defined in 163.9.1"

This sentence is not about compliance points; it should be in 120F.3 (electrical characteristics) and it can replace the existing content there.

Where are the compliance points defined? The editor's note should be replaced by definitive text.

*Suggested Remedy*

Move the sentence to 120F.3.

Add a description of the compliance points or refer to the correct place in the backplane clause.

*Proposed Response* Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

"163.9.1 Compliance Points" specifies the transmitter and receiver compliance measurement points for 100GBASE-KR, 200GBASE-KR2, and 400GBASE-KR4 PMDs. The intent of the of the paragraph referenced by the commenter was to use these test points for the C2C measurements.

Change the text in 120F.2 to:

The electrical characteristics for the 100GAUI-1 C2C, 200GAUI-2 C2C, and 400GAUI-4 C2C interfaces are measured at test points as defined in 163.9.1.

CI 120F SC 120F.3.1 P195 L22 # 271

Ran, Adeel Intel  
 Comment Type T Comment Status D

The current Tx specs in 93.8.1.3 allow common mode voltage up to 1.9 V. This precludes internal AC coupling when the Rx operates on lower voltages, since EMI diodes will cause nonlinear effects.

Many devices will have lower common mode voltages in the Tx which will enable using internal AC coupling in the Rx, which can help routing and signal integrity.

Since C2C is an engineered link, the integrator may benefit from knowing if the Tx has lower CM voltage and if the Rx has internal AC coupling. If both are true, then the integrator does not need to add AC caps on the channel.

I suggest defining the following as optional features:

1. Tx common mode voltage between 0 and 900 mV.
2. Rx includes internal AC coupling

Both are to be included in the PICS and AC coupling is required only if either of them is not supported.

*Suggested Remedy*

Discuss this idea; if it is plausible, we should think about possible ways to write it down.

*Proposed Response* Response Status W

PROPOSED REJECT.

The commenter is proposing an additional mode of operation that was not part of the adopted baseline nor has been the subject of any presentation in this project. This seems to be a problem for interoperability due to mismatches in transmitter and receiver technology.

The suggested remedy provides no guidance for implementing the specifications suggested to in the comment.

For task force discussion.

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Cl 120F SC 120F.3.1 P195 L33 # 26

Mellitz, Richard Samtec

Comment Type TR Comment Status D

The dependence of Vf on Nv is has proved to be confusing. The result is that a single device with a C2C and KR transmitter may have two specification which is confusing for performing tests. Since we specify that ratio of Pmax to Vf there really is no good reason no to make Nv more like a real steady state voltage. See Mellitz\_3ck\_01b\_0919 for reference.

SuggestedRemedy

Add a subsection detailing "Transmitter output waveform" similar to 163.9.3.1. Add exception and exception list for this subclause setting Nv to 200 for the determination of Vf. Refer to clause "136.9.3.1 Transmitter output waveform" : Change k = -2 to 1 to k = -3 to 1 Refer to clause "120D.3.1.3 Linear fit to the measured waveform": Change Dp= 3 to Dp= 4 See Mellitz\_3ck\_01b\_0919 for reference.

Proposed Response Response Status W

PROPOSED REJECT.

It seems that that the commenter is proposing that the Clause 163 PMD and Annex 120F AUI should have a similar set of specifications for the transmitter output waveform since the same IP will be used for both.

The suggested remedy is requesting the a new subclause within 136.9.3.1, which specifies transmitter output waveform including methodology for linear fit to measured waveform, steady-state voltage, linear fit pulse peak, coefficient initialization values, coefficient step size, and coefficient range. However, the guidance provided in the suggested remedy is unclear and sparse.

Before making such a substantive change, a more complete and clear proposal with some consensus is required.

Cl 120F SC 120F.3.1 P195 L40 # 27

Mellitz, Richard Samtec

Comment Type TR Comment Status D

If Nv is set to 200 UI then and packages in Table 120F-5 are the same as KR, then Signal-to-noise-and-distortion ratio SNDR (min) should be the same as for KR

SuggestedRemedy

Change Signal-to-noise-and-distortion ratio SNDR (min)from TBD to 33 dB. This matches SNR\_Tx in 120F-5

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 120F SC 120F.3.1.1 P196 L6 # 176

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D ERL

Transmitter differential output return loss is redundant given that ERL will be used

SuggestedRemedy

Remove section and reference 163.9.2.1

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 120F SC 120F.3.1.1 P196 L14 # 272

Ran, Adeo Intel

Comment Type T Comment Status D ERL

This return loss mask can allow unacceptable reflections with most of the BW allowed to be worse than 4 dB. It is more relaxed than the 50G RL specs in 120D.3.1.1 and even the old 25G RL specs in 93.8.1.4.

We should use ERL for this annex, with similar specs to the PMDs.

SuggestedRemedy

Refer to the ERL specs in 163.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

The commenter is referring to the subclause on transmitter output differential return loss.

Another subclause (120F.3.1.2) specifies the effective return loss (ERL).

Since the same circuits used for KR will likely be used for C2C, it makes sense for ERL to be the same specification.

In 120F.3.1.2, specify that the transmitter output ERL specification is the same as in 163.9.2.1.

Note that Comment 176 proposes to delete subclause 120F.3.1.1.

See comment #176.

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CI 120F SC 120F.3.1.4 P197 L39 # 140

Dawe, Piers Mellanox

Comment Type T Comment Status D

The third precursor has only minor value for "28 dB" channels, so I don't expect it will be worthwhile for "20 dB" channels, yet it adds complexity to the silicon and the tuning.

*SuggestedRemedy*

Remove the third precursor.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has provided no evidence that the third precursor can be removed without adversely affecting channel performance.

CI 120F SC 120F.3.2.3 P199 L51 # 50

Dudek, Mike Marvell

Comment Type T Comment Status D

The sentence does not make sense. (missing reference equation).

*SuggestedRemedy*

Change to "The filtered voltage transfer function  $H(k)(f)$  calculated in Equation (93A-19) uses the filter  $H_t(f)$  defined by Equation (93A-46),"

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 120F SC 120F.4.1 P201 L46 # 202

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D COM burst penalty

COM table and analysis does not include penalty due to burst error, current COM code on some weird channel

*SuggestedRemedy*

[http://www.ieee802.org/3/ck/public/19\\_03/anslow\\_3ck\\_01\\_0319.pdf](http://www.ieee802.org/3/ck/public/19_03/anslow_3ck_01_0319.pdf) page has 2 dB of SNR penalty with pre-coding on for tap weights [0.85, 0.05, 0.25, -0.05, 0.15], the Anslow analysis showed that non of the 115 channels would be as bad but how can we gurantee some weird channel will not in the mix that passes 3 dB COM but would fail due to burst error? Assuming there is interest we can bring a proposal in future task force meeting for an analytical burst error estimator that can be added to COM.

Proposed Response Response Status W

PROPOSED REJECT.

[Editor's note: The clause/subclause were changed from 120/120.4.1 to 120F/120F.4.1]

The issue described here has been raised in previous amendments and was resolved by accounting for possible degradation due to correlated errors in the PAM4 electrical interface (AUI-C2C) in PHYs which use these interfaces. The requirements of all PMDs in these PHYs are defined to result in somewhat lower frame loss ratio than the requirement for a full PHY. See 136.1, 137.1, 138.1.1, 139.1.1, 140.1.1. Similar derated requirements are used for the new PMDs defined in clauses 162 and 163.

See also [http://www.ieee802.org/3/cd/public/July16/anslow\\_3cd\\_01\\_0716.pdf](http://www.ieee802.org/3/cd/public/July16/anslow_3cd_01_0716.pdf).

Also, see the response for comment 200.

CI 120F SC 120F.4.1 P202 L36 # 51

Dudek, Mike Marvell

Comment Type T Comment Status D

The step size for C(1) in table 120F-5 (0.05) does not match the max value in Table 120F-1.

*SuggestedRemedy*

Either change the step size in table 120F-5 to 0.02  
Or change Table 120F-1 to indicate that the max step size for C(1) is 0.05. (Be consistent with the step size for 162 and 163 which has similar comments).

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

One of the two options must be chosen.

For task force discussion.

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Cl 120F SC 120F.4.1 P203 L11 # 178  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 DFE tap length missing  
 SuggestedRemedy  
 Replace TBD with Nb=5 and see ghiasi\_3ck\_02\_0120  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 A presentation related to this comment is anticipated for the January meeting.  
 For task force discussion.

Cl 120F SC 120F.4.1 P203 L15 # 141  
 Dawe, Piers Mellanox  
 Comment Type T Comment Status D  
 C2C should have a DFE floating tap tail root-sum-of-squares limit as CR and KR do, although the limit might differ.  
 SuggestedRemedy  
 Add a DFE floating tap tail root-sum-of-squares limit.  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 Presumably, the commenter is referring to the methodology in 93A.1.6.1. This methodology calculates the tail root-sum-of-squares limit for the purpose of scaling the magnitudes of the floating taps. Floating taps were not intended to be specified for C2C.  
 See comment 70.

Cl 120F SC 120F.4.1 P203 L15 # 179  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type T Comment Status D  
 C2M doesn't have floating taps  
 SuggestedRemedy  
 Remove the floating taps  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See comment #70.

Cl 120F SC 120F.4.1 P203 L15 # 52  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D  
 If there are floating taps then multiple additional rows are required to describe them. If not then Bmaxg should not be in the table.  
 SuggestedRemedy  
 Either delete Bmaxg row or add the other rows (see table in Annex 93A). Values TBD.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See comment #70.

Cl 120F SC 120F.4.1 P203 L15 # 70  
 Wu, Mau-Lin MediaTek  
 Comment Type T Comment Status D  
 In Table 120F-5, the parameter of "Max DFE value for floating taps" shall be removed since we don't have consensus on applying DFE floating taps to C2C.  
 SuggestedRemedy  
 Remove the row of "Max DFE value for floating taps" from Table 120F-5.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 In Table 120F-5, remove the row for "Max DFE value for floating taps" from Table 120F-5.  
 For task force discussion.

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**Cl 120F SC 120F.4.1 P203 L19 # 142**  
 Dawe, Piers Mellanox  
**Comment Type TR Comment Status D**  
 One-sided noise spectral density of 8.2e-9 V<sup>2</sup>/GHz is extremely aggressive and optimistic and was chosen to make 28 dB backplane channels pass COM. It is not appropriate for this 20 dB spec.  
**SuggestedRemedy**  
 Change to 1.64e-8, same as 50GBASE-CR. (For info, 50G/lane C2C (120C) has 2.6e-8.)  
**Proposed Response Response Status W**  
 PROPOSED REJECT.  
 The justification for the proposed change is not convincing. It makes sense for specifications to be the same as for KR since it is likely going to be the same IP. Also, if specification is practical for KR then it should be practical for C2C. A lower noise specification for C2C presumably results in a simpler equalization architecture.  
 For task force discussion.

**Cl 120G SC 120G.1 P209 L43 # 53**  
 Dudek, Mike Marvell  
**Comment Type T Comment Status D bucket**  
 The 100G Phys using RS544,514 are 100GBASE-P not 100GBASE-R  
**SuggestedRemedy**  
 Chage 100GBASE-R to 100GBASE-P in figure 120G-1  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT.

**Cl 120G SC 120G.1 P210 L5 # 54**  
 Dudek, Mike Marvell  
**Comment Type T Comment Status D layer diagrams**  
 There are no examples of these C2M interfaces in 120A or 135A  
**SuggestedRemedy**  
 Either delete the references to these annexes or bring these Annexes into 80.3ck and add examples (e.g. add n=1 to Figure 135A-8)  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See comments 135, 136, and 139.

**Cl 120G SC 120G.1.1 P212 L27 # 55**  
 Dudek, Mike Marvell  
**Comment Type T Comment Status D bucket**  
 Clause 120 does not apply to 100GAUI-1  
**SuggestedRemedy**  
 Add "or clause 135 for 100GAUI-1"  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Replace the paragraph in 120G.1.1 to the following...  
 "The bit error ratio (BER) when processed according to Clause 135 for 100GAUI-1 C2M or Clause 120 for 200GAUI-2 or 400GAUI-4 C2M for shall be less than 10<sup>-5</sup>."

**Cl 120G SC 120G.3.1 P213 L30 # 180**  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
**Comment Type TR Comment Status D measurement filter**  
 Transmitter 4th order BT4 filter BW is TBD  
**SuggestedRemedy**  
 Replace TBD with 39.8 GHz  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 The commenter is referring the transmitter measurement bandwidth.  
 For task for discussion.

**Cl 120G SC 120G.3.1 P213 L34 # 72**  
 Wu, Mau-Lin MediaTek  
**Comment Type T Comment Status D**  
 There are a lot of TBD values in Table 120G-1 - Host output characteristics at TP1a. I prepared one contribution, wu\_3ck\_02\_0120, to address how to settle down on these.  
**SuggestedRemedy**  
 Proposed to change values in Table 120G-1 according to the contribution, wu\_3ck\_02\_0120.  
**Proposed Response Response Status W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 A presentation relating to this comment is anticipated at the January meeting.  
 For task force discussion.

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CI 120G SC 120G.3.1 P213 L52 # 189  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D C2M eye opening  
 Eye height min is TBD  
 SuggestedRemedy  
 per [http://www.ieee802.org/3/ck/public/19\\_11/sun\\_3ck\\_01b\\_1119.pdf](http://www.ieee802.org/3/ck/public/19_11/sun_3ck_01b_1119.pdf) should be 15 mV  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See comment #72.

CI 120G SC 120G.3.1 P213 L52 # 190  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D C2M VEC  
 VEC is TBD  
 SuggestedRemedy  
 per [http://www.ieee802.org/3/ck/public/19\\_11/sun\\_3ck\\_01b\\_1119.pdf](http://www.ieee802.org/3/ck/public/19_11/sun_3ck_01b_1119.pdf) should be 8.5 dB if  
 EH <15 mV  
 ?????? - 0.1667\* ??? -15, i????????????????????????????????15????????30??  
 ??????-2.5???? ,????????>30????  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 The text in the suggested remedy did not render properly. It is assumed that the commenter is referring to the specification on slide 9 of the referenced presentation.  
 See comment #190, which proposes an alternate specification for VEC.  
 For task force discussion.

CI 120G SC 120G.3.1 P213 L53 # 56  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D C2M eye opening  
 The vertical eye height is TBD  
 SuggestedRemedy  
 Adopt the value proposed in Dudek\_3ck\_01\_1119 (7.5dB). A presentation will be made providing more information.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 It is anticipated that there will be a presentation regarding this comment at the January meeting.  
 For task force discussion.  
 See comment #190, which proposes an alternate specification for VEC.

CI 120G SC 120G.3.1.3 P215 L25 # 59  
 Dudek, Mike Marvell  
 Comment Type E Comment Status D C2M ERL  
 This section labelled Host output effective return loss is referenced by the Module output test, the Host input test and the module input test.  
 SuggestedRemedy  
 Either add separate sections for the module output ERL test or broaden the title and text of this section to include the other points. I think it may be better to have two sections one for the Host tests (using the HCB) and one for the Module tests (using the MCB).  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Create a new subclause each for host input, module output, and module input written in the context of the test point, but with the same specifications as in 120G.3.1.3.

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CI 120G SC 120G.3.1.3 P215 L28 # 71

Wu, Mau-Lin

MediaTek

Comment Type T Comment Status D ERL

In the paragraph of "Host output effective return loss", the sentence of "The value of T\_fx is twice the delay associated with the TP1a test fixture being used" is NOT appropriate because the section of 120G.3.1.3 is used not only for Host output ERL, but also Module output ERL, Module input ERL, and Host input ERL. Based on this, the current description is not appropriate.

*SuggestedRemedy*

The sentence of "The value of T\_fx is twice the delay associated with the TP1a test fixture being used" shall be changed as "The value of T\_fx is twice the delay associated with the specific test fixture being used."

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation relating to this comment is anticipated at the January meeting.

For task force discussion.

See comment 57.

CI 120G SC 120G.3.1.3 P215 L29 # 57

Dudek, Mike

Marvell

Comment Type T Comment Status D C2M ERL

The test fixture delay should be clarified so that the connector is not included in the delay that is removed

*SuggestedRemedy*

Change "associated with the TP1a test fixture" to from the measurement point TP1a to the beginning of the TP1a test fixture MDI connector".

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

There is no MDI for C2M.

See comment 71.

CI 120G SC 120G.3.1.5 P216 L30 # 181

Ghiasi, Ali

Ghiasi Quantum/Inphi

Comment Type TR Comment Status D measurement filter

Transmitter 4th order BT4 filter BW is TBD

*SuggestedRemedy*

Replace TBD with 39.8 GHz

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

The commenter is referring the transmitter measurement bandwidth.

For task force discussion.

CI 120G SC 120G.3.1.6 P216 L30 # 58

Dudek, Mike

Marvell

Comment Type T Comment Status D C2M eye opening

The counter-propagating signals should be asynchronous so that crosstalk is properly evaluated. (in the system the counter-propagating signals will be asynchronous).

*SuggestedRemedy*

Change "synchronous" to "asynchronous".

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 120G SC 120G.3.2 P217 L28 # 193

Ghiasi, Ali

Ghiasi Quantum/Inphi

Comment Type TR Comment Status D C2M vec

Module output VEC is TBDs and need values

*SuggestedRemedy*

See ghiasi\_3ck\_03\_0120 and  
Near end TP4 VEC = 7.0 dB  
Far end TP5-L1 VEC = 7.5 dB  
Far end TP5-L2 VEC = 7.5 dB

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation relating to this comment is anticipated for the January meeting.

For task force discussion.

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CI 120G SC 120G.3.2 P217 L28 # 191  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 Need improve test methodology for mould output compliance  
 SuggestedRemedy  
 See ghiasi\_3ck\_03\_0120  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 The comment does not identify how the methodology is deficient nor does it provide a remedy.  
 A presentation relating to this comment is anticipated for the January meeting.  
 For task force discussion.

CI 120G SC 120G.3.2 P217 L28 # 192  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D C2M eye opening  
 Module output EH is TBDs and need values  
 SuggestedRemedy  
 See ghiasi\_3ck\_03\_0120 and  
 Near end TP4 EH = 50 mV  
 Far end TP5-L1 EH = 32 mV  
 Far end TP5-L2 EH= 20 mV  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 A presentation relating to this comment is anticipated for the January meeting.  
 For task force discussion.

CI 120G SC 120G.3.2 P217 L30 # 182  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D measurement filter  
 Transmitter 4th order BT4 filter BW is TBD  
 SuggestedRemedy  
 Replace TBD with 39.8 GHz  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 For task force discussion.

CI 120G SC 120G.3.2 P217 L50 # 144  
 Dawe, Piers Mellanox  
 Comment Type TR Comment Status D  
 Far-end pre-cursor ISI ratio has not been justified and doesn't fit well with the other C2M specs. Better to choose the reference receiver tap limits wisely.  
 SuggestedRemedy  
 Remove the row for far-end pre-cursor ISI ratio from the table.  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 The commenter has not provided sufficient evidence for the proposed change. However, there was no evidence provided to justify inclusion of this parameter. Given that the specification includes EH and VEC, this might be redundant.  
 For task force discussion.

CI 120G SC 120G.3.3 P219 L43 # 60  
 Dudek, Mike Marvell  
 Comment Type E Comment Status D C2M ERL  
 The reference to ERL in table 120G-4 is directly to 120G.3.1.3 but there is a separate section 120G.3.3.1 (but it points directly to 120G.3.1.3 see other comment)  
 SuggestedRemedy  
 Either delete section 120G.3.3.1 or change the reference in table 120G-4 to 120G.3.3.1  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 In Table 120G-4, change the reference for ERL to 120G.3.3.1.

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Cl 120G SC 120G.3.3.2 P220 L6 # 194  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D C2M eye opening  
 Far end eye height is TBD  
 SuggestedRemedy  
 Replace TBD with 50 mV  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See ghiasi\_3ck\_03\_0120.  
 For task force discussion.

Cl 120G SC 120G.3.3.2.1 P221 L39 # 63  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D  
 The draft is missing the information for how to set up the stressed receiver input signal.  
 SuggestedRemedy  
 Insert the following (modified from 120E.3.3.2.1 ) " Random jitter and the pattern generator output levels are adjusted (without exceeding the differential pk-pk input voltage tolerance specification as shown in Table 120G-4) to result in the eye height for all three eyes and eye width for the smallest eye given in Table 120G-5 with the setting of the CTLE that maximizes the product of eye height and eye width.  
 The far-end pre-cursor ISI ratio is measured using the method defined in 120E.3.2.1.2 and it shall meet the specification in Table 120G-3. Pre-emphasis capability is likely to be required in the pattern generator to meet this requirement". However consider whether the product of eye height and eye width is the best criteria or whether it would be better to replace "that maximizes the product of eye height and eye width" with "that minimizes the value of vertical eye closure."  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Insert the following, with the selected optimization <optimization criteria>:  
 "Random jitter and the pattern generator output levels are adjusted (without exceeding the differential peak-to-peak input voltage tolerance specification as shown in Table 120G-4) to result in the eye height for all three eyes and eye width for the smallest eye given in Table 120G-5 with the setting of the CTLE that <optimization criteria>.  
 The far-end pre-cursor ISI ratio is measured using the method defined in 120E.3.2.1.2 and it meets the specification in Table 120G-3. Pre-emphasis capability is likely to be required in the pattern generator to meet this requirement".  
 For <optimization criteria> select from one of the following:  
 (a) "maximizes the product of eye height and eye width"  
 (b) "minimizes the value of vertical eye closure"  
 For task force discussion.

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CI 120G SC 120G.3.4.1 P222 L32 # 195  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D C2M eye opening  
 Module stress input eye height is TBD  
 SuggestedRemedy  
 Replace TBD with 15 mV @ nominal VEC of 8.5 dB  
 Add 2nd test condition 30 mV @ nominal VEC of 11 dB  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See comment #61.

CI 120G SC 120G.3.4.1.1 P224 L12 # 61  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D C2M eye opening  
 The sections referenced for measuring Eye height and VEC don't have the correct reference receiver and section 4.2 has more details about how to measure these.  
 SuggestedRemedy  
 Change "Eye height and VEC are then measured at TP1a based on the measurement methodology given in 120E.4.2 and vertical eye closure is measured according to 120E.4.3." to Eye height and VEC are then measured at TP1a as described in 120G.4.2 "  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

CI 120G SC 120G.3.4.1.1 P224 L22 # 62  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D C2M VEC  
 Multiple presentations have shown that the VEC at TP1a is more critical for end to end performance than just the eye opening.  
 SuggestedRemedy  
 Add a VEC min specification to Table 120G-8. Value TBD. Move the sentence on line 22 beginnin with "In both cases" to a separate paragraph (to emphasis that it applies to both the high and low loss cases) and change it to "In both cases, the input VEC is less than TBD dB and greater than the value in table 120G-8  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Move the sentence to a new paragraph and change to the following:  
 "In both the low-loss and high-loss cases, the input VEC is less than TBD dB and greater than the value in table 120G-8."  
 The TBD value might be chosen if the value in Table 120G-8 is also chosen.  
 For task force discussion.

CI 120G SC 120G.4.1 P224 L51 # 64  
 Dudek, Mike Marvell  
 Comment Type E Comment Status D bucket  
 This section appears to be a direct copy of 120E.3.1 except that it only applies to the module and host Tx (not calibration of the stressed inputs)  
 SuggestedRemedy  
 Replace the text in the section with "The signal levels are as defined in 120E.3.1"  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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Cl 120G SC 120G.4.2 P225 L28 # 273

Hidaka, Yasuo

Credo Semiconductor

Comment Type TR Comment Status D C2M VEC

Our study showed that VEC (vertical eye closure) is not a good performance metric of whole link performance, if we take account of receiver impairments. This is partly because VEC is not a function of channel insertion loss. EVEC (effective vertical eye closure) as proposed in sun\_3ck\_02\_1119.pdf (page 3) is a better alternative, because it takes account of EH (eye height) as an indicator of channel insertion loss.

*SuggestedRemedy*

Replace "Vertical eye closure (max)" in Table 120G-1 with "Effective vertical eye closure (max)".

Add a sub section to define effective vertical eye closure.

A presentation of a detail proposal will be given at the January meeting.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation relating to this comment is anticipated at the January meeting.

For task force discussion.

Cl 120G SC 120G.4.2 P225 L29 # 65

Dudek, Mike

Marvell

Comment Type T Comment Status D measurement filter

In the capture of the signals to be analyzed there is a BT filter with TBD bandwidth. This section is including a Butterworth noise filter in addition.

*SuggestedRemedy*

Consider whether both filters should be used. I hope to have information on the effect of the two filters on VEO and VEC for the next meeting.

Proposed Response Response Status W

PROPOSED REJECT.

There is no issue stated in the comment nor any changes proposed in the suggested remedy.

However, a presentation relating to this comment is anticipated at the January meeting.

See comment #275.

Cl 120G SC 120G.4.2 P225 L31 # 275

Hidaka, Yasuo

Credo Semiconductor

Comment Type T Comment Status D measurement filter

The reference receiver has a receiver noise filter as defined in 93A.1.4.1. Hence, we should not apply the 4th-order BT filter.

On the other hand, 120G.3.1 and 120G.3.2 specify that a 4th-order BT filter is to be used for all output signal measurements, unless otherwise specified.

However, this otherwise condition is not clearly stated in 120G.4.2

*SuggestedRemedy*

Add the following statement to 120G.4.2 prior to Table 120G-9.

When this eye opening measurement method is used, do not use the fourth-order Bessel-Thomson low-pass response in the output signal measurements.

Proposed Response Response Status W

PROPOSED REJECT.

The two filters are specified for different purposes. The Bessel-Thomson (BT) filter is specified for measurement of signals while the Butterworth is specified as part of the reference receiver (RR) for parameters. The BT filter is necessary for some measurements that don't involve the RR.

Cl 120G SC 120G.4.2 P225 L38 # 160

Li, Mike

Intel

Comment Type E Comment Status D bucket

3/4 is not a normal numerical representation

*SuggestedRemedy*

change it to 0.75

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For consistency with Clause 162 and Clause 163 set the value to "0.75 x fb".

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CI 120G SC 120G.4.2 P225 L40 # 158

Dawe, Piers Mellanox

Comment Type TR Comment Status D

These look like the CTLE limits for TP1a and TP4 far end.

SuggestedRemedy

Where are the limits for TP4 near end?

Proposed Response Response Status W

PROPOSED REJECT.

It is assumed that the commenter is referring to the continuous-time filter (CTF) parameters in Table 120G-9.

There is no issue stated in the comment nor any proposed changes in the suggested remedy.

The CTF parameters specified in this Table 120G-9 are for either case.

CI 120G SC 120G.4.2 P225 L44 # 157

Dawe, Piers Mellanox

Comment Type TR Comment Status D

This allows combinations such as gDC=-3, gDC2=-3 that should not happen, receivers don't need to design for, and waste time in the "for each valid combination of gDC and gDC2" measurement procedure.

SuggestedRemedy

Limit the combinations:

gDC2	gDC
0 or 1	3 to 14
2	6 to 14
3	9 to 14

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

CI 120G SC 120G.4.2 P225 L46 # 143

Dawe, Piers Mellanox

Comment Type T Comment Status D

Are 1 dB steps for gDC2 fine enough?

SuggestedRemedy

Change to 1/2 dB?

Proposed Response Response Status W

PROPOSED REJECT.

There is no justification provided for the proposed changed.

CI 120G SC 120G.4.2 P226 L9 # 196

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D

Bmax values are TBDs

SuggestedRemedy

Limit B1(max)<=0.3 and B[2,3,4](max)<=0.1 see ghiasi\_3ck\_03\_0120 for justification.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation relating to this comment is anticipated at the January meeting.

For task force discussion.

CI 120G SC 120G.4.2 P226 L9 # 154

Dawe, Piers Mellanox

Comment Type TR Comment Status D

The C2M normalized DFE coefficient magnitude limits need to be chosen carefully so that the reference receiver is not better than a range of real receiver implementations. Although this may not be a particularly good way of ensuring the spec has margin - see another comment about noise loading.

SuggestedRemedy

Start with bmax(1)=0.25, bmax(2:4)=0.1?

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

See comment #196.

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CI 120G SC 120G.4.2 P226 L10 # 145

Dawe, Piers Mellanox

Comment Type TR Comment Status D

We need minimum limits for the C2M normalized DFE coefficient magnitudes. We saw for backplane that the minimum limits should be very different to the maximum limits.

SuggestedRemedy

Add bmin limits.

Proposed Response Response Status W

PROPOSED REJECT.

The parameter b\_max(n) defines the "magnitude" of the coefficient and thus the minimum value is already specified has -b\_max(n). See Equation 93A-26.

CI 120G SC 120G.4.2 P226 L11 # 155

Dawe, Piers Mellanox

Comment Type TR Comment Status D

In the same way that COM has eta0, this measurement should have a standardised "added" noise to represent noise that a product might have but the measurement doesn't, so that the reference receiver is not better than a range of real receiver implementations. This can be a constant in mV or V<sup>2</sup>/GHz.

Further, it needs a second noise term to account for reflections that a product might have but the measurement doesn't. This is proportional to the signal, so can be a set ratio to sum(AVupp + AVmid + AVlow).

SuggestedRemedy

Include two noise items in the measurement, one a constant in mV or V<sup>2</sup>/GHz, the other a set ratio to sum(AVupp + AVmid + AVlow). To be RSSd with the measured, equalised signal. Allow RSSing out the scope noise (as done in TDECQ) if it's significant.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has not provided justification for the proposed specification methodology, e.g., improvement in accuracy, actual expected values, etc. relating to the proposed methodology.

CI 120G SC 120G.4.2 P226 L13 # 156

Dawe, Piers Mellanox

Comment Type TR Comment Status D

This recipe is a weird combination of the existing C2M measurement method and COM, which is a simulation not a measurement method, for channels not signals, and for backplanes with transmitter training not low power C2M.

SuggestedRemedy

Unless someone can show that it works, change to the CTLE/FFE method as in OIF CEI-112G-VSR.

Proposed Response Response Status W

PROPOSED REJECT.

The methodology specified is consistent with the adopted baseline (DFE not FFE).

The commenter does not provide evidence that the method is insufficient such that the alternate method in the suggested remedy is required.

CI 120G SC 120G.4.2 P226 L14 # 161

Li, Mike Intel

Comment Type TR Comment Status D

136.9.3.1.1 is a wrong reference

SuggestedRemedy

change it to 162.9.3.1.1 to be correct

Proposed Response Response Status W

PROPOSED ACCEPT.

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Cl 120G SC 120G.4.2 P226 L14 # 162

Li, Mike Intel

Comment Type ER Comment Status D

"with an effective sampling period of Tb/M with parameter M greater than or equal to 32" had been defined in 162.9.3.1.1 and references therein, there is not need to repeat.

SuggestedRemedy

delete "with an effective sampling period of Tb/M with parameter M greater than or equal to 32"

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

[Editor's note: Add page and line number to comment details.]

The reference is to 136.9.3.1.1, not 162.9.3.1.1. However, comment 61 proposes to change the reference to 162.9.3.1.1; if Comment 61 comment is accepted then this comment should be accepted.

See comment 61.

Cl 120G SC 120G.4.2 P226 L23 # 164

Li, Mike Intel

Comment Type TR Comment Status D

"136.9.3.1.1" is not the right reference.

SuggestedRemedy

Change it to "85.8.3.3.5 and 85.8.3.3.6"

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

The proposed references would not be correct as they do not specify an appropriate test pattern. However, it might be better to point to 162.8.3.1.1.

For task force discussion.

Cl 120G SC 120G.4.2 P226 L23 # 163

Li, Mike Intel

Comment Type E Comment Status D bucket

"of p2(k)" does not read right

SuggestedRemedy

delete "of"

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 120G SC 120G.4.2 P226 L24 # 166

Li, Mike Intel

Comment Type TR Comment Status D

"Np equal to 200" is not appropriate as UI becomes half in second.

SuggestedRemedy

"Np equal to 200" to "Np equal to 400"

Proposed Response Response Status W

PROPOSED REJECT.

The linear pulse fit is intended for determining the DFE sampling phase position. As such, the extra precision potentially gained by the larger Np value likely is not necessary. In fact, it may be possible to reduce the value without impact.

Further evidence is required to determine if any changes are needed.

For task force discussion.

See comment 165.

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<i>Cl</i> <b>120G</b>	<i>SC</i> <b>120G.4.2</b>	<i>P</i> <b>226</b>	<i>L</i> <b>24</b>	# <b>165</b>
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Li, Mike Intel

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

"Dp equal to 3" is not right as there are 3 pre-taps for the host

*SuggestedRemedy*  
change "Dp equal to 3" to ""Dp equal to 4".

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

Host and module transmitter equalization architecture is not specified so there is no need to match the parameters in that regard.

The linear fit pulse response is intended only for determining the DFE sampling phase position. As such, the extra precision potentially gained by the larger Dp value may not be necessary.

On the other hand, since the measured data is filtered with any of the compliant CTLE settings applied, a larger value may be required for some CTLE settings.

Further evidence is required to determine if any changes are needed.

For task force discussion.

See comment 166.

<i>Cl</i> <b>120G</b>	<i>SC</i> <b>120G.4.2</b>	<i>P</i> <b>226</b>	<i>L</i> <b>28</b>	# <b>274</b>
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Hidaka, Yasuo Credo Semiconductor

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

In the performance study at TP1a in sun\_3ck\_02\_1119.pdf, eta\_0 noise of 8.20E-9 V<sup>2</sup>/GHz was added at the CTLE input. However, eta\_0 noise is not added in the reference receiver described in 120G.4.2. If we do not add the eta\_0 noise in the reference receiver in the scope, measurd eye opening will be larger than the performance study. This will creat a hole in the specification.

An easy fix is to add eta\_0 noise in the reference receiver.

Another option is to re-do the performance study without eta\_0 noise in the reference receiver in order to estimate the performance accurately, but it will take time. I recommend to add eta\_0 noise in the reference receiver for now. We can remove it later, after we finish re-doing the performance study without eta\_0 noise in the reference receiver.

*SuggestedRemedy*  
Add eta\_0 noise of 8.20E-9 V<sup>2</sup>/GHz to table 120G-9.  
Add a step to add eta\_0 noise after step b in page 226.  
Here, eta\_0 noise is a gaussian noise consistent with the third term of (93A-41).

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

For task force discussion.

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CI 120G SC 120G.4.2 P226 L33 # 167

Li, Mike Intel

Comment Type TR Comment Status D

"Within the set of combinations of gDC and gDC2 with eye height meeting the target requirement, for the combination resulting in the smallest vertical eye closure, the eye height, eye width, and vertical eye closure are used as the measured values.", VEC alone will not be a good FOM for optimization, it needs to be the combination of VEC and EH, which is EVEC. Further, the clarity of the whole sentences is not good.

SuggestedRemedy

change the whole sentence to: "Within the set of combinations of gDC and gDC2, the eye height, eye width, and vertical eye closure, resulting in the smallest effective vertical eye closure, are used as the measured values."

Proposed Response Response Status W

PROPOSED REJECT.

The criteria as written is intended to result in a single (e.g., greater than 0, less than 2) candidates.

The commenter makes reference to a parameter EVEC but does not define it.

CI 120G SC 120G.4.2 P226 L33 # 66

Dudek, Mike Marvell

Comment Type E Comment Status D

The paragraph describing what the measured values of Eye height, Eye width and VEC are is difficult to follow.

SuggestedRemedy

Consider replacing this paragraph with "The measured values of eye height, eye width and vertical eye closure are the values obtained with the combination of gDC and gDC2 that produces an eye height above the target value and the minimum value of vertical eye closure.

Proposed Response Response Status W

PROPOSED REJECT.

The criteria at the end of the proposed text might result in candidates for multiple parameter combinations. The criteria as written is intended to result in a single (i.e., greater than 0, less than 2) candidates.

CI 120G SC 120G.4.2 P226 L40 # 198

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D

gDC max gian of 14 dB is unnecessary with a DFE receiver and channel <=16 dB

SuggestedRemedy

12 dB would be more than adequate and with further study we can even further reduce the gDC.

Proposed Response Response Status Z

PROPOSED REJECT.

This comment was WITHDRAWN by the commenter.

CI 120G SC 120G.4.2 P226 L40 # 197

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D

gDC max gian of 14 dB is unnecessary with a DFE receiver and channel <=16 dB

SuggestedRemedy

12 dB would be more than adequate and with further study we can even further reduce the gDC.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter provides no evidence that the current specification is incorrect.

For task force discussion.

CI 120G SC 120G.4.2 P226 L40 # 199

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D

To speed up testing and eliminating weird cases one should gDC/gDC2 combinations

SuggestedRemedy

See ghiasi\_3ck\_03\_0120 for table of allowed CTLE combinations.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation relating to this comment is anticipated at the January meeting.

For task force discussion.

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CI 135 SC 135.1.4 P98 L42 # 223

Ran, Adeel Intel

Comment Type E Comment Status D bucket

This phrasing "53.GbD by one-lane" is unnatural. It should be either by-1 or one-lane.

Preferably the latter.

This phrasing is used existing text, and is also awkward there. It should be changed.

*SuggestedRemedy*

Remove "by" in items 2-4 (the result would be simply four-lane, two-lane, and one-lane).

Proposed Response Response Status W

PROPOSED REJECT.

Although the referenced text is not perfect, it communicates the intent correctly.

The text of the first 3 bullets is established text in an approved amendment (IEEE Std 802.3-2018). Changes to this text is out of scope for this project.

The new bullet (#4) was written in the same form as the first three bullets.

CI 135 SC 135.1.4 P99 L15 # 30

Dudek, Mike Marvell

Comment Type T Comment Status D bucket

There are errors in the MMD8 and MMD1 100G PMA's in figure 135-2

*SuggestedRemedy*

Change the MMD8 100G PMA between 100GAUI-4 and 100GAUI-P from PMA(4:2) to PMA(4:p) and change the PMA (2:n) to PMA (p:n).

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 135 SC 135.1.4 P99 L15 # 224

Ran, Adeel Intel

Comment Type T Comment Status D bucket

In Figure 135-2, with the new variable p, PMAs above and below the 100GAUI-p should be PMA(4:p) and PMA(p:n) respectively.

*SuggestedRemedy*

Change labels per comment.

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 135 SC 135.5.7.2 P101 L29 # 225

Ran, Adeel Intel

Comment Type E Comment Status D bucket

The bottom brace below the "MEDIUM" and the text "50GBASE-R or 100GBASE-P" don't seem to serve any purpose in this diagram. These are families of PHYs, not specific PMDs or media. Also these are all the families in which this clause is used, so it goes without saying.

*SuggestedRemedy*

Delete the brace and the label.

Proposed Response Response Status W

PROPOSED REJECT.

These braces are consistent with the original diagram in IEEE Std 802.3cd-2018 and thus removing them would be out of scope for this project.

This diagram has been updated only as required regarding addition of the new interfaces in P802.3ck.

CI 135A SC 135A P0 L0 # 135

Brown, Matt Huawei Technologies Canada

Comment Type T Comment Status D layer diagrams

Some layer diagrams in Annex 135A should show the new 100GAUI-1 C2C and C2M in addition to 100GAUI-2 and 100GAUI-1.

*SuggestedRemedy*

Import portions of Annex 135A and include 100GAUI-1 where 100GAUI-2 and 100GAUI-4 are shown.

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 135A SC 135A P0 L0 # 139

Brown, Matt Huawei Technologies Canada

Comment Type T Comment Status D layer diagrams

Some layer diagrams in Annex 135A should include the RS-FEC (Clause 91), Inverse RS-FEC (Clause 152), and RS-FEC-Int (Clause 161).

*SuggestedRemedy*

Add layer diagram showing RS-FEC, Inverse RS-FEC, and RS-FEC-Int.

Proposed Response Response Status W

PROPOSED ACCEPT.

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Cl 135A SC 135A.2 P0 L0 # 111  
 Slavick, Jeff Broadcom  
 Comment Type TR Comment Status D bucket  
 We've added 100GAUI-1 so need to update Figure 135A-8 to indicate that  
 SuggestedRemedy  
 Change n = 2 or 4 to n = 1 or 2 or 4  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Change "n = 2 or 4" to "n = 1, 2, or 4".

Cl 161 SC 161.3 P107 L3 # 226  
 Ran, Adeo Intel  
 Comment Type E Comment Status D Bucket  
 Missing period after the sentence  
 SuggestedRemedy  
 Add a period.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.4 P107 L7 # 227  
 Ran, Adeo Intel  
 Comment Type T Comment Status D  
 Delay constraint of an interleaved FEC are likely not the same as those of clause 91.  
 Interleaved FEC is defined in the PCS of clause 119. The delay constraint there is 313 pause\_quanta, compared to 80 pause\_quanta in clause 91.  
 I would expect that the delay constraint is mainly affected by the buffering and decoding, and for interleaved FEC it should be twice the delay constraint of clause 91. But even if I add the delay of the 100GBASE-R PCS (69 pause\_quanta), the numbers don't match -  $2*80+69=229$ , far from 313.

The proposed change is based on the smaller number (doubling the constraint of clause 91) but if there is a reason behind the larger number of bit times in clause 119 it should be considered.  
 SuggestedRemedy  
 Replace the content of this subclause with the following (taken from clause 91, doubling all numbers):  
 The maximum delay contributed by the RS-FEC-Int sublayer (sum of transmit and receive delays at one end of the link) shall be no more than 81920 bit times (160 pause\_quanta or 819.2 ns). A description of overall system delay constraints and the definitions for bit times and pause\_quanta can be found in 80.4 and its references.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See response to comment #116.

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Cl 161 SC 161.4 P107 L7 # 116

Nicholl, Shawn

Xilinx

Comment Type TR Comment Status D

Since CL161 sublayer delay is larger than CL91 due to the interleaving of two codewords, the maximum delay constraint needs to be updated accordingly.

*SuggestedRemedy*

Proposed to update text in 161.4 to following:

The maximum delay contributed by the RS-FEC-Int sublayer (sum of transmit and receive delays at one end of the link) shall be no more than 51200 bit times (100 pause\_quanta or 512 ns). A description of overall system delay constraints and the definitions for bit times and pause\_quanta can be found in 80.4 and its references.

Propose to update Table 80-5 to contain a new row after 100G-BASE-R RS-FEC entry.

The new row to contain following cell values:

- \* 100GBASE-R RS-FEC-Int
- \* 51200
- \* 100
- \* 512
- \* 161.4

Proposed Response Response Status W

PROPOSED ACCEPT.

Expecting a presentation in the task force to cover this change.

Cl 161 SC 161.5.2.4 P107 L35 # 228

Ran, Adeo

Intel

Comment Type E Comment Status D Bucket

"EEE is unsupported" is only used here, similar text elsewhere in this draft uses "not supported".

*SuggestedRemedy*

Change to "not supported".

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 161 SC 161.5.2.6 P108 L53 # 103

Slavick, Jeff

Broadcom

Comment Type TR Comment Status D

The same alignment marker scheme is used for both Cl91 and Cl161. So if one direction sends the opposite format from expected, then the FEC engine will Alignment lock but will only get uncorrectable FEC codewords.

*SuggestedRemedy*

Change steps a) through e) to be either:

Option 1 (Flip-flop AM4-19 M0,1,2 and M4,5,6):

- a) if  $x \leq 3$  amp\_tx\_x<23:0> is set to M0, M1, and M2 as shown in Figure 82-9 (bits 25 to 2) using the values in Table 82-2 for PCS lane number 0. if  $x \geq 4$  amp\_tx\_x<23:0> is set to M4, M5, and M6 as shown in Figure 82-9 (bits 57 to 34) using the values in Table 82-2 for PCS lane number x.
- b) amp\_tx\_x<31:24> = am\_tx\_x<33:26>
- c) if  $x \leq 3$  amp\_tx\_x<55:32> is set to M4, M5, and M6 as shown in Figure 82-9 (bits 57 to 34) using the values in Table 82-2 for PCS lane number 0. if  $x \geq 4$  amp\_tx\_x<55:32> is set to M0, M1, and M2 as shown in Figure 82-9 (bits 25 to 2) using the values in Table 82-2 for PCS lane number x.
- d) amp\_tx\_x<63:56> = am\_tx\_x<65:58>

Option 2 (Use Cl119 Common Marker instead of Cl82 AM0):

- a) if  $x \leq 3$  amp\_tx\_x<23:0> is set to CM0, CM1, and CM2 as shown in Figure 119-4 (bits 23 to 0) using the values in Table 119-1 for PLCS lane number x. if  $x \geq 4$  amp\_tx\_x<23:0> is set to M0, M1, and M2 as shown in Figure 82-9 (bits 25 to 2) using the values in Table 82-2 for PCS lane number x.
- b) amp\_tx\_x<31:24> = am\_tx\_x<33:26>
- c) if  $x \leq 3$  amp\_tx\_x<55:32> is set to CM0, CM1, and CM2 as shown in Figure 119-4 (bits 55 to 32) using the values in Table 119-1 for PCS lane number x. if  $x \geq 4$  amp\_tx\_x<55:32> is set to M4, M5, and M6 as shown in Figure 82-9 (bits 57 to 34) using the values in Table 82-2 for PCS lane number x.
- d) amp\_tx\_x<63:56> = am\_tx\_x<65:58>

And update the paragraph that follows to align with the chosen Option.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation related to this comment is anticipated at the January meeting. For task force discussion.

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CI 161 SC 161.5.2.6 P109 L20 # 105  
 Slavick, Jeff Broadcom  
 Comment Type T Comment Status D Bucket  
 The process of creating am\_txmapped is not optional  
 SuggestedRemedy  
 Change "may then be" to "is"  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

CI 161 SC 161.5.2.6 P109 L46 # 229  
 Ran, Adeo Intel  
 Comment Type E Comment Status D  
 The phrase "every 20 x 16 384 66-bit blocks" is hard to read with the space in the number 16384 (and possibly misleading, it can be interpreted as the number 1638466).  
 This space does not appear in the similar text in clause 91. The separator convection is not helpful here, and it is not mandatory outside of tables.  
 Also applies in some other similar phrases in this subclause and in 161.5.4.3.  
 SuggestedRemedy  
 Change "16 384" to "16384".  
 Apply for other large numbers within the text in this clause.  
 Proposed Response Response Status Z  
 PROPOSED REJECT.  
 This comment was WITHDRAWN by the commenter.

CI 161 SC 161.5.2.6 P109 L47 # 230  
 Ran, Adeo Intel  
 Comment Type E Comment Status D  
 The "x" in "81 920 x 257-bit blocks" is out of place - "257-bit" is not a number. This is also inconsistent with the text in the previous line, which does not have an "x" before "66-bit blocks".  
 Also in the next sentence and in 161.5.3.5.  
 SuggestedRemedy  
 Delete the "x" occurrences listed.  
 Proposed Response Response Status Z  
 PROPOSED REJECT.  
 This comment was WITHDRAWN by the commenter.

CI 161 SC 161.5.2.6 P109 L48 # 231  
 Ran, Adeo Intel  
 Comment Type E Comment Status D  
 The paratraph starting in line 46 seems to be unfinished. The next paragraph starts by repeating what was already stated in this one.  
 Perhaps this paragraph should be  
 "One group of aligned and reordered alignment markers are mapped every 20 x 16384 66-bit blocks. This group of aligned and reordered alignment markers is called the "alignment marker group" and is labeled am\_txmapped<1284:0>. An alognment marker group shall be inserted so it appears in the output stream every 81920 257-bit blocks."  
 And then the first line in the next paragraph can be removed.  
 SuggestedRemedy  
 Modify per comment.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Implement the suggested remedy but correct the spelling of alignment.

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Cl 161 SC 161.5.2.6 P110 L16 # 232

Ran, Adees Intel

Comment Type T Comment Status D Bucket

In figure 161-3, the labels A and B appear within the amp\_tx blocks, but these blocks are not taken \_from\_ the codewords as the legend states - according to figure 161-5 they are inserted \_into\_ the stream of symbols that creates the codewords.

Also, the labels do not appear in the tx\_scrambled area which contains the real traffic.

*SuggestedRemedy*

Change the legend to have "to FEC codeword A" and "to FEC codeword B" .

Continue the labeling into symbol in columns 32 and 33.

*Proposed Response* Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

The current wording is confusing.

Change to "FEC codeword A" and "FEC codeword B"

Also add A/B into the 32/33 column.

Cl 161 SC 161.5.2.9 P111 L16 # 233

Ran, Adees Intel

Comment Type T Comment Status D

If we create four FEC lanes then a PMA(4:1) will be required to create a single-lane PMD interface. This PMA will bit-mux symbols from the four lanes.

Bit muxing of four lanes significantly weakens the RS-FEC in case of error bursts, since bursts are always going to impact more than one symbol. 8 errors in a block of 16 bits (8-UI burst) can corrupt 4 FEC symbols in each of the codewords (A/B). Without bit-muxing, similar corruption would require a bursty block of more than 70 bits (35 UI). This burst length is much less likely, so the probability of uncorrected codewords (and FLR) will be dramatically lower for the same SNR. Alternatively, the same FLR can be achieved with lower SNR, enabling power reduction.

Assuming this new FEC is intended only for single-lane 100G PHYs and that there are no lower-rate AUIs \_below\_ it, using a single FEC lane (serial output) instead would prevent this degradation of the FEC coding gain. This can be done with the current definitions by simply changing the number of FEC lanes from 4 to 1.

Even if we do want to support bit-muxing below the FEC, e.g. for the near future devices that may not have 100G I/O, we should consider not imposing a large performance penalty for all future products.

We can consider having two modes of the FEC, with either 4 or 1 FEC lanes, in both directions, and choosing between them in auto-negotiation. The additional complexity should be much lower than having both clause 91 and clause 161.

We can also apply a similar choice for the clause 91 RS-FEC if desired.

*SuggestedRemedy*

Add a management variable to control the number of FEC lanes, either 4 or 1. Add a bit in the AN page for supporting 1 FEC lane - if both sides advertise it, then 1-lane mode will be used (symmetrically).

*Proposed Response* Response Status W

PROPOSED REJECT.

These modes are not in the adopted baseline for this clause. It was shown that the penalty for the bit muxing is relatively small and the proposed modes are a significant departure from the baseline. In addition this adds complexity to supporting lower rate AUI interfaces.

Also for 400/200GE we have 4:1 bit muxing and that performance is deemed good enough. 16 lanes for 400GE and 8 lanes for 200GE. 100GE, would be at least as good as those. Since they will be sharing the same channel, the current performance is sufficient.

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Cl 161 SC 161.5.2.9 P111 L16 # 234  
 Ran, Adeel Intel  
 Comment Type E Comment Status D Bucket  
 Per style manual, in general text, isolated numbers less than 10 should be spelled out.  
 Applies here and in several other places in this clause (where numbers are isolated, i.e. with no units following).  
 SuggestedRemedy  
 Change "4" to to "four". Apply in other places in this clause.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Style manual is not as specific as the commenter states.  
 The guideline is as follows:  
 "In general text, isolated numbers less than 10 should be spelled out. However, in equations, tables, figures, and other display elements, Arabic numerals should be used. Numbers applicable to the same category should be treated alike throughout a paragraph; numerals should not be used in some cases and spelled out in others."  
 Update numbers less than 10 to be consistent with the style manual.

Cl 161 SC 161.5.2.10 P112 L13 # 235  
 Ran, Adeel Intel  
 Comment Type E Comment Status D Bucket  
 The number "256" appears on the boundary of the block "tx\_scrambled",  
 SuggestedRemedy  
 Move the number to the interior of the box.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.5.3.1 P113 L7 # 106  
 Slavick, Jeff Broadcom  
 Comment Type TR Comment Status D Bucket  
 FEC synchronization FSM is not Figure 161-6  
 SuggestedRemedy  
 Change "161-6" to "91-8"  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.5.3.3 P113 L26 # 76  
 Gustlin, Mark Cisco Systems  
 Comment Type T Comment Status D  
 802.3cd added in subclause 91.5.3.3.1 FEC degraded SER (optional) to allow monitoring of the FEC performance. Add this into clause 161.  
 SuggestedRemedy  
 Add in the equivalent of 91.5.3.3.1 and its related text (variables etc), either by reference or directly.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.5.3.3 P113 L34 # 236  
 Ran, Adeel Intel  
 Comment Type E Comment Status D Bucket  
 A cross-reference to the subclause which defines "bypass error indication" would be helpful.  
 SuggestedRemedy  
 Insert "(see 161.5.3.3.1)" between "If bypass error indication" and "is not supported".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.5.3.3 P113 L36 # 81  
 Koehler, Daniel MorethanIP  
 Comment Type TR Comment Status D Bucket  
 Does not reflect that there are 2 codewords to perform error indication for.  
 SuggestedRemedy  
 replace 'the codeword' with 'the two associated codewords'  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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Cl 161 SC 161.5.3.3 P113 L38 # 104

Slavick, Jeff Broadcom

Comment Type TR Comment Status D

There are 40 257b blocks that go into the FEC engine per pair of FEC codewords. So when an uncorrectable codeword occurs, it needs to mark across 40 257b blocks.

SuggestedRemedy

Change "20th" to "40th"

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

See the response to comment #82.

Cl 161 SC 161.5.3.3 P113 L39 # 82

Koehler, Daniel MorethanIP

Comment Type TR Comment Status D

As it is two codewords the last 257-bit is the 40th not 20th. Also needs to reflect that there are 2 codewords.

SuggestedRemedy

replace 'last ... 11.' with 'last (40th) 257-bit block in the two associated codewords are set to 11.'

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 161 SC 161.5.3.3.1 P113 L42 # 237

Ran, Adeo Intel

Comment Type T Comment Status D

802.3cd added the FEC Degraded SER as an optional feature in 91.5.3.3.1. Do we intend to add it in this draft too?

I am not sure this feature is useful, so I am fine with not having it in this clause. It can be more useful to monitor codewords instead (classify based on number of errors corrected, as was proposed in ran\_083017\_3cd\_adhoc) and this method is being used in practice. This task force may want to reconsider adding it as a standard feature.

SuggestedRemedy

If degraded SER is to be supported, the description (based on 91.5.3.3.1) should be placed here, and the corresponding variables and MDI mappings should be added.

If codeword monitoring is desired, the proposal in ran\_083017\_3cd\_adhoc slides 8-14 can be used as baseline (editorial changes such in clause numbers, etc., will be required).

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

See the response to comment #76.

Cl 161 SC 161.5.3.3.1 P113 L53 # 83

Koehler, Daniel MorethanIP

Comment Type T Comment Status D

The reaction of hi\_ser should cause error indication as described in 91.5.3.3 to trigger PCS hi\_ber instead using it in Fig. 161-6.

SuggestedRemedy

Keep text of line 53 but add new sentence like:

While hi\_ser is asserted, 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. As a result, the PCS sets hi\_ber=true, which inhibits the processing of received packets. When Auto-Negotiation is supported and enabled, assertion of hi\_ber causes Auto-Negotiation to restart.

Proposed Response Response Status W

PROPOSED ACCEPT.

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Cl 161 SC 161.5.4.1 P115 L10 # 238  
 Ran, Adee Intel  
 Comment Type E Comment Status D Bucket  
 "Comprised on" is arguable language. 802.3bs used "composed of", other projects used "contains" or omitted this paragraph altogether (since 21.5 already states that state diagrams take precedence over text).  
 I suggest "composed of".  
 SuggestedRemedy  
 Change "comprised" to "composed".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.5.4.2.1 P115 L25 # 117  
 Nicholl, Shawn Xilinx  
 Comment Type ER Comment Status D Bucket  
 Need to remove some editorial text related to cw\_bad  
 SuggestedRemedy  
 Remove the text:  
 No cw\_bad variable, instead we have:  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Change: "No cw\_bad variable, instead we have:"  
 To: "cw\_bad -- This variable is not defined"

Cl 161 SC 161.5.4.2.3 P116 L3 # 78  
 Gustlin, Mark Cisco Systems  
 Comment Type T Comment Status D Bucket  
 Remove redundancy from counters, make references instead.  
 SuggestedRemedy  
 amp\_bad\_count - refer to 91.5.4.2.3, cwA\_bad\_count and cwB\_bad\_count, refer to 119.2.6.2.4  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.5.4.3 P117 L1 # 75  
 Gustlin, Mark Cisco Systems  
 Comment Type T Comment Status D  
 Replace figure 161-6 with a reference to figure 119-13.  
 SuggestedRemedy  
 Add that some signals change name: align\_status -> fec\_align\_status, pcs\_enable\_status -> fec\_enable\_status. If this change is not made, then there is one correction to be made in 161-6, one instance of pcs\_enable\_deskew s/b fec\_enable\_deskew.  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 With the proposed resolution of comment #84, the SM changes enough that we should leave it in the specification.

Cl 161 SC 161.5.4.3 P117 L2 # 84  
 Koehler, Daniel MorethanIP  
 Comment Type T Comment Status D  
 hi\_ser should be removed, not to cause LOSS\_OF\_ALIGNMENT. Its behavior is defined in 161.5.3.3.1 (see other comment) relying on the hi\_ber feature of the PCS same as the Clause 91 RSFEC does.  
 SuggestedRemedy  
 remove '+ hi\_ser' at top of figure.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 161 SC 161.7.3 P122 L6 # 239  
 Ran, Adee Intel  
 Comment Type T Comment Status D Bucket  
 Item "\*\*KR1" is marked "optional", but there is no another option (this sublayer is only used for CR1/KR1 PHYs), and no PICS item is defined as conditional on this feature. I don't see the purpose of this item.  
 SuggestedRemedy  
 Remove item "\*\*KR1".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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Cl 161 SC 161.7.4.2 P124 L19 # 240

Ran, Adee Intel  
 Comment Type T Comment Status D Bucket

The method of indicating errors has a "shall ensure" (161.5.3.3) but there is no corresponding PICS item.

Compare to item RF8 in clause 91 which states "Error indication function | 91.5.3.3 | Corrupts 66-bit block synchronization headers for uncorrected errored codewords (...)

*SuggestedRemedy*

Add PICS item based on the quoted RF8.

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

Change the feature name of RF4 to "Error indication function"

Cl 162 SC 162.1 P125 L27 # 241

Ran, Adee Intel  
 Comment Type T Comment Status D FEC AN

The PHY defined in this clause can use either RS-FEC or RS-FEC-int. This is the first time The difference between the two is not described and readers may find it hard to decide which one should be used. Compare with clause 110 (100.1 Overview) where the FEC choice affects the cable reach.

The differences between the FEC sublayers may seem obvious for participants of the task force but we are writing the standard for other people too.

In this clause we should indicate that the interleaved FEC provides better FEC protection but has a larger delay associated with it. It would be good to also relate the choice to the auto-negotiation.

Also applies to clause 163.

*SuggestedRemedy*

Add text in the overview that describes the differences between RS-FEC and RS-FEC-Int when forming a 100GBASE-CR1 PHY, and note that the choice between the two can be done in auto-negotiation.

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

See comment #133.

Cl 162 SC 162.1 P125 L35 # 242

Ran, Adee Intel  
 Comment Type E Comment Status D bucket

Table 162-1 is carried over into the next page, but the continuation is not marked as such, as required by the style manual.

Also in Table 162-3 and perhaps other tables will turn out to be broken in future drafts.

There is also a customary "thin line at bottom" rule. We can perhaps defer applying this one to the last draft or to publication (it is not required in the style manual).

*SuggestedRemedy*

Add the "continued table" option for all tables.

Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 162 SC 162.1 P125 L45 # 133

Brown, Matt Huawei Technologies Canada  
 Comment Type T Comment Status D FEC AN

Tables 162-1 list two FEC types (RS-FEC and RS-FEC-Int) that might be used by a 100GBASE-CR1 PHY, but never explains the criteria for selecting one or the other, how that selection is made, nor the implications (e.g., conversion from RS-FEC to RS-FEC-Int).

*SuggestedRemedy*

Add a subclause to explain the relationship of the two FEC types, how an FEC type is selected, and the implications of the selection.

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

A presentation related to this comment is anticipated at the January meeting.

Cl 162 SC 162.1 P125 L45 # 137

Brown, Matt Huawei Technologies Canada  
 Comment Type T Comment Status D FEC AN

In Table 162-1, the Clause 161 RS-FEC-Int is specified as TBD rather than Required or Optional in the second column.

*SuggestedRemedy*

Specify RS-FEC-Int as either "Optional" or "Required".

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

See comment #77.

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Cl 162 SC 162.1 P126 L15 # 31

Dudek, Mike

Marvell

Comment Type T Comment Status D

The inverse RS-FEC is also required to change between RS-FEC (528,514) and RS-FEC (544,514)

*SuggestedRemedy*

Add to footnote b. "and between RS-FEC (528,514) and RS-FEC (544,514)"

Proposed Response Response Status W

PROPOSED REJECT.

Clause 152 inverse FEC is included to convert from CL91 RS-FEC to the CL161 FEC. Any other application is outside the scope of this clause.

Cl 162 SC 162.2 P127 L53 # 32

Dudek, Mike

Marvell

Comment Type T Comment Status D bucket

FEC is also used in "FEC symbol error rate" etc. where it also refers to the FEC within the 200 and 400G PCS.

*SuggestedRemedy*

Add to the sentence "for 100GBASE-CR1 or the RS-FEC within the Clause 119 PCS for 200GBASE-CR2 and 400GBASE-CR4".

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 162 SC 162.5 P129 L45 # 243

Ran, Adeel

Intel

Comment Type T Comment Status D

The assumed maximum one way delay through the medium was 20 ns in clause 136, where the longest medium was a 3 meter cable. Now with 2 meters the number should be scaled down to 14 ns.

There is a motivation for decreasing the assumed cable medium delay - it would allow more delay in the PMD, which is currently left with only 20.96 ns. This can help with some PMD implementations, with no penalty to upper layers which still assume 40.96 ns as in previously defined PHYs.

This can also be applied to the specifications of backplane PMDs. Although the physical length of the backplane is not specified, the existing medium delay matches the delay for cable assemblies, and the same numbers were used in previous backplane/cable PMDs. So a similar change should be made in 163.5.

These changes should also be applied in the new rows in tables 80-5 and 116-5.

*SuggestedRemedy*

Change the maximum delay through the medium from "20 ns" to "14 ns" here, in 163.5, and in the new rows in tables 80-5 and 116-5.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

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Cl 162 SC 162.7 P134 L # 244

Ran, Adeel Intel  
 Comment Type T Comment Status D

802.3cd added management registers for the control/status fields. The LP (Link Partner) registers are mapped in tables 162-5 and 162-6 so the link partner's training messages can be observed.

However, The PAM4 PMD training LD (Local Device) control and PAM4 PMD training LD status registers, defined in 45.2.1.137a and 45.2.1.138a respectively (Register 1.1120 through 1.1123 and Register 1.1420 through 1.1423), do not appear in tables 162-5 and 162-6. These registers allow control and observation of the local messages (visibility is required for both sides of the protocol).

These registers should be R/W or RO as listed in clause 45.

The LD mappings are also missing from clause 136, this should be considered in maintenance.

*SuggestedRemedy*

Add rows corresponding to registers in subclauses 45.2.1.137a and 45.2.1.138a.

Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 162 SC 162.8.1 P136 L2 # 33

Dudek, Mike Marvell  
 Comment Type E Comment Status D bucket

The cable assembly specifications are in 162.11 not 162.10

*SuggestedRemedy*

Change the clause cross-reference from 162.10 to 162.11. Also on line 3 and line 19

Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 162 SC 162.8.7 P137 L33 # 245

Ran, Adeel Intel  
 Comment Type T Comment Status D

I wonder why lane-by-lane Tx disable is optional, when AN is mandatory and requires the ability to disable all but one lane. A PMD in a PHY that supports AN as specified must include implementation of LBLTD in some way.

Digging into history - LBLTD was mandatory in 10GBASE-KX4 but optional in all subsequent multi-lane PMDs... I don't know the reasoning. It seems to me that the MDIO implementation should be optional, but LBLTD should be mandatory, similar to the lane-by-lane signal detect in 162.8.5.

I am considering maintenance request for making it mandatory in existing PMD clauses that support AN. But I think this should better be initially discussed in 802.3ck.

Applies also to 163.8.9.

*SuggestedRemedy*

Remove the (optional) in the heading and change the text to make it mandatory.

Add a paragraph:

"If the MDIO interface is implemented, then PMD\_transmit\_disable\_i shall be mapped to the corresponding PMD transmit disable i bit as specified in 45.2.1.8."

Proposed Response Response Status W  
 PROPOSED REJECT.

AN does not specify how the Tx is disabled per the AN state machine. The intent of this register is for external management control.

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CI 162 SC 162.8.11 P138 L22 # 246

Ran, Adeel Intel

Comment Type T Comment Status D

The list of exceptions to the PMD control definition in 136.8.11 should include two more exceptions:

In clause 136, Table 136-9 and Table 136-10 define the encoding for coefficient selection, between c(-2) and c(+1), but don't have an encoding for c(-3) which is required in 162.

Also the text in 136.8.11.2.4 "Coefficient request" defines the effect of "no equalization" for c(-2) to c(+1) but does not mention c(-3).

*Suggested Remedy*

Add the following items:

d) The Coefficient select bits in the Control field (Table 136-9) and the Coefficient select echo bits in the Status field (Table 136-10) have an additional combination, 1 0 1, for selecting c(-3).

e) The "No equalization" value (see 136.8.11.2.4) of c(-3) is 0.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Implement with editorial license.

CI 162 SC 162.8.11 P138 L32 # 247

Ran, Adeel Intel

Comment Type T Comment Status D

The PMD control function as currently specified is only effective during start up.

Operation across a wide range of temperatures in some environments may cause slow changes in channel and device characteristics that may require occasional changes of the Tx equalization, preferably without link flaps. It would be good to enable doing it while the link is up.

In Data mode, the startup (training) protocol is inactive. We can specify that when `mr_training_en` set to 0, instead of exchanging the control and status fields through the protocol, these fields will be written to and read from management registers if MDIO is implemented. Management can relay the control and status fields to/from the link partner through higher level messaging (such as LLDP).

A detailed proposal is planned, but the requested addition in the PMD clauses is a subclause for behavior of the PMD control function when training is false (data mode).

*Suggested Remedy*

Add the following paragraphs:

When the training variable is set to false (see 136.8.11.7.1), the PMD control function may optionally continue using Equalization control as defined 136.8.11.4 in the SEND\_DATA state, using MDIO registers or alternative methods to exchange control and status fields with the link partner instead of the training frame specified in 136.8.11.1.

NOTE--When training is false, any update to variables corresponding to a change of the Modulation and precoding request bits or the Initial condition request bits, or to setting the Coefficient request bits to "No equalization", can be disruptive to a network.

Proposed Response Response Status W

PROPOSED REJECT.

Comment alludes to a future proposal. Propose deferring discussion of this topic until the proposal is presented. Request that commenter use the ad hoc for this purpose.

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CI 162 SC 162.9.3 P139 L6 # 168  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D measurement filter  
 Transmitter BW is TBD  
 SuggestedRemedy  
 Replace TBD with 39.8 GHz  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Commenter is referring to transmitter measurement bandwidth.  
 For task force discussion.

CI 162 SC 162.9.3 P139 L27 # 3  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D ERL  
 ERL of 11 dB seems to capture most of posted channel data.  
 SuggestedRemedy  
 In table 162-8 change ERL(min) to 11 dB as suggested on slide 5 of mellitz\_3ck\_04\_1119.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 For task for discussion.

CI 162 SC 162.9.3 P139 L31 # 6  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D CR Vf  
 TBD for Vf min may be determined since the baseline for device package was accepted. If Nv=200 is accepted for Vf then Vf min will be Av minus dc host and HCB losses.  
 SuggestedRemedy  
 Set the TBD Transmitter steady-state voltage, vf (min.) to 0.387 V as suggested for Av in mellitz\_3ck\_01b\_0919  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 For task for discussion.

CI 162 SC 162.9.3 P139 L34 # 8  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D CR Vf  
 TBD for the peak value of p(k) may be determined since the baseline for device package was accepted. If Nv=200 is accepted. If The peak value of p(k) in terms Vf may be determined based on the collection of posted channels as suggested in mellitz\_3ck\_01b\_0919.  
 SuggestedRemedy  
 Change entry for the Linear fit pulse peak (min.) peak value to 0.397 x vf.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 For task force discussion.

CI 162 SC 162.9.3 P140 L8 # 248  
 Ran, Adee Intel  
 Comment Type T Comment Status D  
 The maximum step size for c(1) is 0.05, while for all other coefficient it is 0.02. From implementation point of view, there is no benefit from having c(1) with a larger step size than all others.  
 Training algorithms can be made simpler if the steps are equal for all coefficients, so that decrements/increments in c(1) have the same effect on signal swing as other coefficients.  
 SuggestedRemedy  
 Change step size limits for c(1) to align with all other coefficients.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See comment #35.

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Cl 162 SC 162.9.3 P140 L9 # 35

Dudek, Mike

Marvell

Comment Type T Comment Status D

The abs step size for c(1) max in table 162-8 is 0.05 which is different from the other taps but does match the value in the COM tab162-15 and is not specified in section 162.9.3.1.4. It is 0.02 in the C2C spec in 120F

*SuggestedRemedy*

Either Change 0.05 to 0.02 here and in table 162-15 and in 162.9.3.1.4 change "-3,-2 or -1" to "-3,-2,-1 or 1" (and make the equivalent change in clause 163 see separate comment) Or. Add an extra paragraph in 162.9.3.1.4 stating "When coef\_sel is 1, the change in the normalized transmit equalizer coefficient c(coef\_sel) corresponding to a request to "increment" shall be between 0.005 and 0.05, and the change in the normalized transmit equalizer coefficient c(coef\_sel) corresponding to a request to "decrement" shall be between -0.05 and -0.005.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Commenter has provided two options to resolve this comment.

For task force discussion.

Cl 162 SC 162.9.3 P140 L10 # 249

Ran, Adeel

Intel

Comment Type T Comment Status D

The maximum step size of 2% for a PAM4 equalizer creates a significant increase in complexity for a DAC-based transmitter implementation, compared to the step size allowed in the 802.3cd specs.

A PAM4 DAC with the 2.5% specification in 802.3cd is required to be able of outputting  $6/0.025=240$  possible values, while with a 2% step size it requires  $6/0.02=300$  possible values. This means an additional bit should be used in the logic implementing the FFE and DAC control, and the analog circuits should enable more combinations.

The estimated cost in power consumption of the FFE+DAC logic and analog circuits from this small change in resolution, with a non-naive design, is about 0.3-0.4 pJ/bit. This additional power is going to be consumed regardless of the channel in question.

The benefit from this finer resolution has not been analyzed thoroughly enough to justify such an increase in implementation burden and power consumption.

*SuggestedRemedy*

Change the (max.) values for c(-3) to c(0) to 0.024 (which can be met with a DAC capable of 256 output values).

Proposed Response Response Status W

PROPOSED REJECT.

All analysis to date has used 2% step size. The commenter proposes increasing step size to 2.5% but does not provide evidence that it does not adversely affect the performance of contributed channels.

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Cl 162 SC 162.9.3 P140 L20 # 250

Ran, Adeel Intel

Comment Type T Comment Status D

The reference for SNDR (min) is 120D.3.1.6. The method there includes a reference to the linear fit procedure in 120D.3.1.3, which has  $D_p = 2$  and coefficient calculations (in 92.8.3.5.1) suitable for a 3-tap equalizer. An exception should be made to use the fitting procedure in 162.9.3.1.1 (which is suitable for a 5-tap equalizer) instead. A table footnote can be used.

A similar change may also be required in clauses 136 and 137 (maintenance).

*SuggestedRemedy*

Add the following sentence as a footnote to the referenced subclause:

The measurement uses the method described in 120D.3.1.6 with the exception that the linear fit procedure in 162.9.3.1.1 is used.

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 162 SC 162.9.3 P140 L20 # 251

Ran, Adeel Intel

Comment Type T Comment Status D

SNDR (min) is currently TBD.

As an initial proposal for this value, I suggest re-using the values from 802.3cd: 32.5 dB for backplane/C2C and 32.2 dB for cable assembly.

The effect of SNDR is known so further analysis is not required. These values are more challenging to meet and to measure at 53 Gb/s, but it should not be impossible.

*SuggestedRemedy*

Change SNDR from TBD to values in the comment, here and in 163.9.2.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

The proposal is:

For 162.9.3, set SNDR to 32.2 dB.

For 163.9.2, set SNDR to 32.5 dB.

For task force discussion.

Cl 162 SC 162.9.3 P140 L24 # 252

Ran, Adeel Intel

Comment Type T Comment Status D

Maximum for even-odd jitter is specified here. This is mainly required for transmitters which are driven by a half-rate clock.

For >53.1 Gb/s signaling, a >26.3 GHz clock is needed to drive the transmitter clock in half-rate. This is a high frequency for current CMOS processes and implementations with quarter-rate clocking (13.3 GHz clock) should be considered.

With quarter-rate signaling, even if the even-odd jitter (mismatches between phases 0:2 and between 1:3) is controlled to meet the specifications, the quadrature jitter (mismatches between phases 0:1 and between 2:3) can be large, and the current even-odd jitter measurements do not cover this impairment.

We need to limit quadrature jitter so a similar portion of the UI.

New specification for quadrature jitter will be provided in future contributions. I assume it will be similar to the EOJ measurement with slight modifications. For the time being the measurement method can be left as TBD.

*SuggestedRemedy*

Add a line for "Quadrature jitter, Pk-Pk", with subclause reference TBD, and value 0.019 UI.

Proposed Response Response Status W

PROPOSED REJECT.

Commenter proposes a new parameter that has not been discussed previously. A methodology and definition has not been provided.

For task force discussion.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

Cl 162 SC 162.9.3 P141 L39 # 253

Ran, Adeel Intel

Comment Type T Comment Status D

The addition of coefficient c(-3) requires several changes in the fitting procedure:

1. D<sub>p</sub> should be changed from 3 to 4
2. The dimensions of R<sub>m</sub> should be M\*N<sub>p</sub>-by-5 (instead of by-4)
3. l runs from -3 to 1 (instead of -2 to 1)
4. In equation 162-1, the left-hand term should be R<sub>m</sub>(j, i+4) (instead of i+3).

*SuggestedRemedy*

Change per comment.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Implement with editorial license.

Cl 162 SC 162.9.3.1.1 P141 L50 # 34

Dudek, Mike Marvell

Comment Type T Comment Status D bucket

There are three pre-cursors.

*SuggestedRemedy*

Change "-2 to 1" to "-3 to 1"

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 162 SC 162.9.3.1.2 P142 L38 # 5

Mellitz, Richard Samtec

Comment Type TR Comment Status D CR Vf

TBD for Vf min may be determined since the baseline for device package was accepted. If Nv=200 is accepted for Vf then Vf min will be Av minus dc host and HCB losses.

*SuggestedRemedy*

Set the TBD Vf min 0.387 V as suggested for Av in mellitz\_3ck\_01b\_0919

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

Cl 162 SC 162.9.3.1.2 P142 L38 # 4

Mellitz, Richard Samtec

Comment Type TR Comment Status D CR Vf

The dependence of Vf on Nv is has proved to be confusing. Since we specify that ratio of Pmax to Vf there really is no good reason not to make Nv more like a real steady state voltage. See Mellitz\_3ck\_01b\_0919 for reference.

*SuggestedRemedy*

Add exception in the exception list for this subclause setting Nv to 200 for the determination of Vf.

Refer to clause "136.9.3.1 Transmitter output waveform" : Change k = -2 to 1 to k = -3 to 1

Refer to clause "120D.3.1.3 Linear fit to the measured waveform": Change Dp= 3 to Dp= 4

See Mellitz\_3ck\_01b\_0919 for reference.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

Cl 162 SC 162.9.3.1.2 P142 L42 # 254

Ran, Adeel Intel

Comment Type E Comment Status D bucket

Missing space after v<sub>f</sub>

*SuggestedRemedy*

Add space.

Proposed Response Response Status W

PROPOSED ACCEPT.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

CI 162 SC 162.9.3.1.2 P142 L42 # 7

Mellitz, Richard

Samtec

Comment Type TR Comment Status D CR Vf

TBD for the peak value of p(k) may be determined since the baseline for device package was accepted. If Nv=200 is accepted. If The peak value of p(k) in terms Vf may be determined based on the collection of posted channels as suggested in mellitz\_3ck\_01b\_0919.

*SuggestedRemedy*

Change to line 42 to: The peak value of p(k) shall be greater than  $0.397 \times vf$  after the transmit equalizer initial condition has been set to preset 1 (no equalization). See slide 15 mellitz\_3ck\_01b\_0919

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion

CI 162 SC 162.9.3.1.3 P143 L5 # 255

Ran, Adee

Intel

Comment Type T Comment Status D bucket

The tolerances in Table 162-9 should correspond to the maximum step size of each coefficient in Table 162-8.

Currently all should be +/-0.02 except c(1) which is 0.05 (but subject to another comment may also be 0.02).

*SuggestedRemedy*

Change all values after the +/- signs per comment.

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 162 SC 162.9.3.1.4 P143 L15 # 256

Ran, Adee

Intel

Comment Type T Comment Status D

"When coef\_sel is -3, -2, or -1, (...) between 0.005 and 0.02"

According to Table 162-8 c(0) has the same maximum step size. c(1) subject to another comment may be changed to also have the same maximum.

*SuggestedRemedy*

Change "or -1" to "-1, or 0".

If my other comment is accepted, also add 1 to the list.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Commenter is referring to comment #248.

CI 162 SC 162.9.3.1.4 P143 L20 # 257

Ran, Adee

Intel

Comment Type T Comment Status D

"When coef\_sel is 0, the change in the normalized transmit equalizer coefficient c(-2)"

Should be "coef\_sel is 1" and "coefficient c(+1)". But I suggest in another comment to make c(1) have the same steps as all others.

*SuggestedRemedy*

If my other comment is accepted, delete this paragraph. Otherwise, change per comment.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Commenter is referring to comment #248.

CI 162 SC 162.9.3.1.5 P143 L39 # 36

Dudek, Mike

Marvell

Comment Type T Comment Status D

The max/min values in this section need to match those in table 162-8 and those in the COM table 162-15

*SuggestedRemedy*

on line 39 change -0.25 to -0.2, on line 42 change -0.25 to -0.34, on line 46 change 0.1 to 0.12.

Proposed Response Response Status W

PROPOSED ACCEPT.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

CI 162 SC 162.9.3.1.5 P143 L49 # 258

Ran, Adee Intel  
 Comment Type T Comment Status D bucket

This paragraph specifies the maximum value of c(-3) when it is set to the minimum setting.

But the text says  
 "and c(-2) having received sufficient "increment" requests so that it is at its maximum value"

which is incorrect.

*SuggestedRemedy*

Change to  
 "and c(-3) having received sufficient "decrement" requests so that it is at its minimum value".

Proposed Response Response Status W  
 PROPOSED ACCEPT.

CI 162 SC 162.9.3.4 P144 L18 # 37

Dudek, Mike Marvell  
 Comment Type T Comment Status D

The test fixture delay should be clarified so that the connector is not included in the delay that is removed

*SuggestedRemedy*

Change "associated with the TP2 test fixture" to from the measurement point TP2 to the beginning of the TP2 test fixture MDI connector". Make the equivalent change in section 162.9.4.5 for the Receiver ERL.

Proposed Response Response Status W  
 PROPOSED ACCEPT.

CI 162 SC 162.9.3.4 P144 L26 # 9

Mellitz, Richard Samtec  
 Comment Type TR Comment Status D ERL

The relation between Pmax/Vf and ERL has not been established for this data rate

*SuggestedRemedy*

Change line 36 to ERL >= 11 dB. Change TBD parameters in table 162-10 beta\_x, rho\_x, N, and N\_bx to 2.4 GHz, 0.3, 1000 UI, and 12 UI respectively as suggested on slide 6 of mellitz\_3ck\_04\_1119.

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

CI 162 SC 162.9.4 P145 L15 # 10

Mellitz, Richard Samtec  
 Comment Type TR Comment Status D ERL

ERL of 11 dB seems to capture most of posted channel data as suggested in slide 5 mellitz\_3ck\_04\_1119

*SuggestedRemedy*

Change ERL min to 11 dB

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

CI 162 SC 162.9.4.3.1 P146 L9 # 170

Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D

Replace IL TBD test case 2

*SuggestedRemedy*

Min=28 dB, Max=29 dB

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

CI 162 SC 162.9.4.3.1 P146 L9 # 169

Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D

Replace IL TBD test case 1

*SuggestedRemedy*

Min=19.84 dB, Max=21.84 dB, Delta Loss Between Test channel and cable assembly = 2(10.975-6.6)

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

Cl 162 SC 162.9.4.3.3 P146 L37 # 38

Dudek, Mike

Marvell

Comment Type T Comment Status D

Table 162-12 only provides the COM value not all the parameters.

*SuggestedRemedy*

Change to the equivalent wording of clause 136 "The COM parameters are as modified by Table 162-12.

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 162 SC 162.9.4.3.5 P147 L1 # 259

Ran, Adeo

Intel

Comment Type E Comment Status D

bucket

"per-lane FEC symbol error counters (see 91.6)"

this refers to RS-FEC, but RS-FEC-Int can be used instead.

*SuggestedRemedy*

Change to "per-lane FEC symbol error counters (see 91.6 or 161.6)".

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 162 SC 162.9.4.5 P148 L48 # 11

Mellitz, Richard

Samtec

Comment Type TR Comment Status D

ERL

ERL of 11 dB seems to capture most of posted channel data as suggested in slide 5 mellitz\_3ck\_04\_1119

*SuggestedRemedy*

Change to "Receiver ERL at TP3 shall be greater than or equal to 11dB"

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

Cl 162 SC 162.11 P149 L26 # 39

Dudek, Mike

Marvell

Comment Type T Comment Status D

Sentence does not make sense.

*SuggestedRemedy*

Delete "The are" if other MDI's are allowed, or just delete "are" if the MDI's are restricted to those in Annex 162C

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Delete "are possible" in sentence

The possible MDIs are defined in Annex 162C.

Cl 162 SC 162.11.2 P150 L3 # 79

Palkert, Tom

Molex

Comment Type T Comment Status D

Differential to common-mode return loss, Differential to common mode conversion loss and Common-mode to common-mode return loss are not required if ERL and COM are used to specify Cable Assembly characteristics.

*SuggestedRemedy*

Delete Differential to common-mode return loss, Differential to common mode conversion loss and Common-mode to common-mode return loss from Table 162-13 (Cable assembly characteristics summary)

Proposed Response Response Status W

PROPOSED REJECT.

The cable assembly Channel Operating Margin (COM) for each lane is derived from measurements of the cable assembly signal, near-end crosstalk and far-end crosstalk paths. COM is computed using the path calculations defined in 162.11.7.1 and the procedure in 93A.1.

The cable assembly signal and crosstalk paths are impacted by the parameters requested to be removed. We have an explicit bound on these parameters with the expectation that a cable assembly meeting ERL, IL, and these specification parameters will pass COM i.e., cable assembly specification parameters independent of COM. At least one benefit of the specification parameters is to enable characterization of the cable assembly by direct measurement.

For task force discussion.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

CI 162 SC 162.11.2 P150 L6 # 276

DiMinico, Christopher

MC Communications

Comment Type T Comment Status D Late

Comment#2

Min Cable/PCB calculation for 802.3cd assumed linear scaling for cable and PCBs.  
Use same Cable/PCB IL assumptions for Max/Min Cable Assembly.

Table 162–13—Cable assembly characteristics summary [Minimum insertion loss at 26.56 GHz 162.11.2 11.09 dB]

Table 162A–1—Insertion loss budget values at 26.56 GHz [ILCamin 11.09 dB]

*SuggestedRemedy*

See diminico\_3ck\_2\_0220.pdf.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Use ILchmin and ILCamin versus ILch0.5m and ILCa0.5m equation 162A-2 and Table162A-1.

Change values In Table 162–13—Cable assembly characteristics summary [Minimum insertion loss at 26.56GHz 162.11.2 change 11.09 dB to 13 dB. In Table 162A–1—Insertion loss budget values at 26.56 GHz [ILCamin change 11.09 dB to 13 dB. See diminico\_3ck\_2\_0220.pdf

CI 162 SC 162.11.3 P150 L8 # 13

Mellitz, Richard

Samtec

Comment Type TR Comment Status D ERL

ERL of 13.5 dB seems to capture most of posted channel data as suggested in slide 3 mellitz\_3ck\_04\_1119

*SuggestedRemedy*

Change Minimum cable assembly ERL to 13.5 dB in table 162-13.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Resolve with comment #12

CI 162 SC 162.11.3 P150 L22 # 40

Dudek, Mike

Marvell

Comment Type T Comment Status D

The delay being removed from the measurement should be better specified.

*SuggestedRemedy*

Change "delay associated with the specific cable assembly test fixture" to "delay from Tp1 or TP4 to the connector of the specific cable assembly test fixture"

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 162 SC 162.11.3 P150 L39 # 12

Mellitz, Richard

Samtec

Comment Type TR Comment Status D ERL

ERL of 13.5 dB seems to capture most of posted channel data as suggested in slide 3 mellitz\_3ck\_04\_1119

*SuggestedRemedy*

Change line 39 to Cable assembly ERL at TP1 and at TP4 shall be greater than or equal to 13.5 dB for cable assemblies that have a COM less than 4 dB. Also change TBD parameters in table 162-14 beta\_x, rho\_x, N, and N\_bx to 2.4 GHz, 0.21, 3000 UI, and 12 UI respectively as suggested on slide 4 of mellitz\_3ck\_04\_1119.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

A presentation (mellitz\_3ck\_04\_1119) relating to this comment is anticipated at the January meeting.

For task force discussion.

## IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

CI 162 SC 162.11.4 P150 L43 # 260

Ran, Adee

Intel

Comment Type T Comment Status D

The conversion parameter specifications were defined in clause 92 and re-used for all the cable assembly specs at rates where the Nyquist frequencies were about 13 GHz. This project needs new specs for the first time since 802.3bj.

My proposal in the suggested remedy creates similar shapes but with frequencies scaled by approximately the signaling rate ratio ( $2^{68/66}$ ).

If this proposal is not accepted, numbers can be left as TBDs and figures can be empty as placeholders.

*SuggestedRemedy*

Copy the text and equations from clause 92 and apply the following changes:

D2CRL (162.11.4): based on equation 92-28 changing frequencies: 25.78 to 53.135, 12.89 to 26.5625, and 19 to 39.

D2CCL (162.11.5): based on equation 92-29 changing frequencies: 12.89 to 26.5625, 15.7 to 32.4 and 19 to 40.

C2CRL (162.11.6): based on equation 92-30 (2 dB) changing frequencies: 19 to 40.

Add Figures with updated graphs.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter is correct that the project needs new specs for the first time since 802.3bj. Table 162-13-Cable assembly characteristics summary does not reference 92.

As we need new specifications seems prudent to support them with measurements or analysis.

The commenter mentions differential to common mode return loss. The draft has TBDs for differential to common mode conversion loss.

CI 162 SC 162.11.7 P151 L24 # 200

Ghiasi, Ali

Ghiasi Quantum/Inphi

Comment Type TR Comment Status D COM burst penalty

COM table and analysis does not include penalty due to burst error, current COM code on some weired channel

*SuggestedRemedy*

[http://www.ieee802.org/3/ck/public/19\\_03/anslow\\_3ck\\_01\\_0319.pdf](http://www.ieee802.org/3/ck/public/19_03/anslow_3ck_01_0319.pdf) page has 2 dB of SNR penalty with pre-coding on for tap weights [0.85, 0.05, 0.25, -0.05, 0.15], the Anslow analysis showed that non of the 115 channels would be as bad but how can we gurantee some weired channel will not in the mix that passes 3 dB COM but would fail due to burst error? Assuming there is interest we can bring a proposal in future task force meeting for an analytical burst error estimator that can be added to COM.

Proposed Response Response Status W

PROPOSED REJECT.

The reference receiver is defined as an idealized DFE for purposes of analysis. Implemented PMD receivers may or may not include a DFE and may or may not create error bursts as analyzed in the referenced [anslow\\_3ck\\_01\\_0319](http://www.ieee802.org/3/ck/public/19_03/anslow_3ck_01_0319.pdf).

The BER requirements for PHYs as defined in 162.1 and 163.1 are stated explicitly "assuming errors are sufficiently uncorrelated", and "If the PMD and PMA create errors that are not sufficiently uncorrelated, the BER is required to be lower as appropriate to maintain a frame loss ratio lower than (the maximum FLR)". In both clauses, the requirements apply to a signal "that has passed through a compliant channel".

In other words, it is the PHY implementer's responsibility to compensate for any correlated errors caused by the receiver, including bursts due to DFE error propagation (if the receiver indeed creates such bursts with a compliant channel), by having low enough BER or improved SNR to cover the penalty. The way this is to be achieved is implementation dependent.

Since implemented receivers are expected to perform as if errors are uncorrelated, channel compliance does not need to account for possible correlated errors in the reference receiver.

Note that the referenced work showed that even with a very pessimistic error propagation model (which exceeds the reference receiver's results for all of the contributed channels), the "SNR penalty" with interleaved RS-FEC and precoding was limited to less than 1.5 dB.

The presentation that proposed the bit error ratio specifications is as follows: [http://www.ieee802.org/3/cd/public/July16/anslow\\_3cd\\_01\\_0716.pdf](http://www.ieee802.org/3/cd/public/July16/anslow_3cd_01_0716.pdf)

Commenter has not provided changes to the draft.

For task force discussion.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

**Cl 162**    **SC 162.11.7**                      **P152**                      **L33**                      # 14

Mellitz, Richard                                      Samtec

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

To move forwards a value for SNR\_Tx needs to be chosen

*SuggestedRemedy*

Replace TBD with 32 dB as in slide 8 of mellitz\_3ck\_03\_1119, slide 9 of lim\_3ck\_01\_1119 in Table 162-15.

**Proposed Response**                      **Response Status**    **W**

PROPOSED ACCEPT IN PRINCIPLE.

Presentations (mellitz\_3ck\_03\_1119 and lim\_3ck\_01\_1119) relating to this comment are anticipated at the January meeting.

For task force discussion.

**Cl 162**    **SC 162.11.7**                      **P152**                      **L38**                      # 150

Dawe, Piers    Mellanox

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

Slide 6 of heck\_3ck\_01\_0919 shows that the DFE taps are never strongly negative, yet the draft would allow such untypical/hypothetical channels.

*SuggestedRemedy*

Remember that a tap weight limit isn't a hard pass-fail limit; channels can go outside it but don't get a free pass for the excess ISI noise that they cause, and that cable channels are smoother than backplane channels.

Add a minimum tap weight limit of -0.03 or greater for all taps, including the floating taps.

**Proposed Response**                      **Response Status**    **W**

PROPOSED ACCEPT IN PRINCIPLE.

The commenter has not provided sufficient evidence to justify the proposed change.

A minimum tap weight is specified as -0.3 for tap 2 and -0.2 for the remaining fixed taps, and -0.05 for the floating taps.

Some analysis is required to show that the proposed change would not result in good channels being rejected.

For task force discussion.

**Cl 162**    **SC 162.11.7**                      **P152**                      **L39**                      # 261

Ran, Adee    Intel

**Comment Type**    **T**                      **Comment Status**    **D**

b\_max(n) for n=2 was changed from the baseline proposal value 0.2 to 0.3. This change was accepted by Motion #13 in the November 2019 meeting without sufficient technical discussion on the benefits or costs. According to the minutes there was only 6 minutes of discussion just before the meeting closing time, and the motion was not announced beforehand.

The original 0.2 was the value which was used in all presentations and made the candidate channels work.

Allowing a large coefficient such as 0.3 for n=2 combined with the even higher limit (0.85) for n=1 results in a situation that the ISI the DFE has to cope with is >100% of the desired signal. This means that the receiver needs to have large dynamic ranges and low internal noises (including detection sensitivity). These parameters are not included in COM, but the implications are becoming impractical for real implementations, especially ADC/DSP based ones which are considered likely.

In order to match channel compliance with actual operation, we should make the reference receiver close to the expected performance of actual implementation, and not make it too capable. Real receivers will likely use linear equalization (Tx or CTLE) to cope with most of the loss-related ISI, if the reference Tx equalization and CTLE leave too much ISI, maybe they should be made more flexible and capable, rather than leave the ISI to a DFE with large taps. For example, we could add another zero-pole pair in the CTLE or another coefficient in the Tx.

This change was hasty and should be reverted, until a technical discussion (that did not take place in November) is conducted, including options, benefits and consequences.

*SuggestedRemedy*

Set b\_max(2) back to 0.2.

**Proposed Response**                      **Response Status**    **W**

PROPOSED REJECT.

The change in value made as a result of a successful motion.

For task force discussion.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

CI 162 SC 162.11.7 P152 L45 # 151  
 Dawe, Piers Mellanox  
 Comment Type TR Comment Status D  
 40 UI span was chosen to fit data on backplane channels, and is excessive even for them. Cable channels are smoother. Very short low loss cables should pass easily anyway.  
 SuggestedRemedy  
 Change 40 to an appropriate number, e.g. 24.  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 The commenter has not provided sufficient evidence for the proposed change.  
 For task force discussion.

CI 162 SC 162.11.7 P152 L48 # 262  
 Ran, Adeo Intel  
 Comment Type T Comment Status D  
 The bound on sigma\_tmax is practically making the DFE floating taps not worth implementing. Which is a good thing, because the power cost of this method is prohibitive with the very challenging power budgets demanded by real applications, and it requires automatic optimization of the placement of taps - another challenge that may not be easy to handle in practice.  
 The reference receiver should represent a minimum receiver implementation. A floating-tap DFE as modeled here isn't what a minimum implementation will likely have, and most practical future channels will not need it. Therefore it should not be included in the reference receiver.  
 Applications that need better receivers may look for better than minimum ones, for example, ones that implement floating taps (since that seems to solve a specific problem), or that need less than 3 dB of COM.

SuggestedRemedy  
 Remove the floating tap banks from the reference receiver - including the new parameters related to it and all the new text in 93A.1.6.

Proposed Response Response Status W  
 PROPOSED REJECT.

Prior analysis, (heck\_3ck\_01\_0519, kareti\_3ck\_01a\_1118.pdf) showed that floating taps were required for critical channels to pass COM. kasapi\_3ck\_01\_1119.pdf limits tail taps to prevent channels with worse ISI from passing. Comment does not provide evidence to support the proposed change.

CI 162 SC 162.11.7 P152 L48 # 149  
 Dawe, Piers Mellanox  
 Comment Type TR Comment Status D  
 This DFE floating tap tail root-sum-of-squares limit is 0.03. For the worst of 7 borderline channels in kasapi\_3ck\_01\_1119 slide 12 (kareti1, which is an outlier and probably should not be supported), the value is 0.022. Even for this channel with the most unlucky combination of package lengths including out-of-scope ones, it's <= 0.025 (slide 13). We should not encourage even worse channels than this, such as the failing channels on slides 16-17, and cable channels are smoother than backplane channels.  
 SuggestedRemedy  
 Remember that this parameter isn't a hard pass-fail limit; channels can exceed the limit but don't get a free pass for the excess ISI noise that they cause.  
 Change 0.03 to 0.02 or less.

Proposed Response Response Status W  
 PROPOSED REJECT.

The commenter has not provided evidence to support the proposed change. Analysis is required to determine if the proposed change would allow all candidate channels to pass.

For task force discussion.

CI 162 SC 162.11.7 P152 L50 # 171  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 The DFE taps for RSS is on different line and not clear  
 SuggestedRemedy  
 Combine the requirement of DFE location and RSS limit in the single line. Here is a suggested wording "DFE floating tail taps [25-40] root-sum-of-squares limit  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 It is not clear that the proposed change improves the clarity.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

CI 162 SC 162.11.7 P153 L4 # 15  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D  
 Eta\_0 needs to include the effects of host NEXT noise. Thus cannot be the same as for KR COM.  
 SuggestedRemedy  
 Replace 8.2e-9 V<sup>2</sup>/GHz with 9e-9 V<sup>2</sup>/GHz as in slide 8 of mellitz\_3ck\_03\_1119 ans slide 9 of lim\_3ck\_01\_1119 in Table 162-15.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 For task force discussion.

CI 162 SC 162.11.7 P153 L6 # 146  
 Dawe, Piers Mellanox  
 Comment Type T Comment Status D  
 One-sided noise spectral density of 8.2e-9 V<sup>2</sup>/GHz is extremely aggressive and optimistic, being half that for 50GBASE-CR, and was chosen to make particular backplane channels with issues pass COM. As high loss cable channels are smoother than backplanes, we should not be so desperate in this clause.  
 SuggestedRemedy  
 Change to 1e-8, which is 61% of 50GBASE-CR.  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 Evidence in lim\_3ck\_01a\_1110 supports change to 9e-0 V<sup>2</sup>/GHz.  
 See comment 15.

CI 162 SC 162.11.7.1 P153 L28 # 17  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D  
 add {new table for 93A transmission line with data from slide 8 of benartsi\_3ck\_01a\_0719.  
 SuggestedRemedy  
 gamma0, a1, a2 = [0 3.8206e-04 9.5909e-05]; tau=5.790E-03 ns/mm  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Implement suggested remedy with editorial license.

CI 162 SC 162.11.7.1 P153 L28 # 16  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D  
 Fill in Zp TBD's with data from slide 8 of benartsi\_3ck\_01a\_0719.  
 SuggestedRemedy  
 Change Line 28ff to Equation (93A-13) and Equation (93A-14) using zp = 110.3 mm in length and the parameter values given in {new table}, with the exception that Zc is 100 O, representing an insertion loss of 4.33 dB at 26.56 GHz on each PCB  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Implement suggested remedy with editorial license.

CI 162 SC 162.11.7.1.2 P153 L51 # 18  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D  
 Fill in TBD's with data from slide 8 of benartsi\_3ck\_01a\_0719.  
 SuggestedRemedy  
 use same data as for signal path  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 [Editor's note: Changed subclause from 162.11.7.2 to 162.11.7.1.2]

CI 162 SC 162.14.4.2 P159 L23 # 263  
 Ran, Adeel Intel  
 Comment Type T Comment Status D bucket  
 In Item PC4, The reference should be 162.8.11 and the value/comment should include the exceptions listed in 162.8.11 for including c(-3).  
 Item PC5 has a reference to a subclause in 162 that does not exist 0 it should point to clause 136.  
 SuggestedRemedy  
 Per comment.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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CI 162 SC 162.14.4.5 P160 L50 # 264  
 Ran, Adeel Intel  
 Comment Type E Comment Status D bucket  
 In item CA3, spaces should be inserted between numbers and units.  
 SuggestedRemedy  
 Per comment.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

CI 162A SC 162A.5 P231 L20 # 205  
 Kocsis, Sam Amphenol  
 Comment Type ER Comment Status D  
 Eq. 162A-1 defines Ilchmax using Ilcamax, but Eq. 162A-2 defines ILch0.5m using Ilcamin.  
 SuggestedRemedy  
 Change notation of "ILch0.5m" to be "ILchmin"  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Change ILCh0.5m (162A-2) to Ilchmin and in Table 162A-1.

CI 162A SC 162A.5 P231 L47 # 206  
 Kocsis, Sam Amphenol  
 Comment Type TR Comment Status D  
 Table 162A-1, Parameter Ilcamin is based on an incorrect assumption from diminico\_3ck\_01a\_0719. ILch0.5m is derived from Ilcamin, so it is also invalid.  
 SuggestedRemedy  
 Change Ilcamin to TBD, pending future contribution recommendation and motion. Change ILch0.5m to TBD, pending future contribution recommendation and motion.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Change Ilcamin to 13 dB in Table 162-13 P150 L6 and in Table 162A-1 P231 L46  
 See diminico\_3ck\_2\_0120.pdf

CI 162A SC 162A.5 P232 L10 # 203  
 Kocsis, Sam Amphenol  
 Comment Type TR Comment Status D  
 Figure 162A-1 has "MCB Via" included in the MCB allocated budget of 2.3dB.  
 SuggestedRemedy  
 Remove the markers including the "MCB Via" in the MCB allocated budget of 2.3dB. There is an additional 0.2dB via allowance for an MCB implementation, per adopted diminico\_3ck\_01a\_0719 contribution.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.

In Figure 162A-1 move arrow associated with MCB IL of 2.3 dB not to include MCB via as illustrated in adopted baseline - diminico\_3ck\_01\_1119.pdf and use text of note in same revised as follows.  
 Note: 2.3 dB MCB PCB includes test point IL (RF connector). The MCB Via allowance is 0.2 dB.  
 See diminico\_3ck\_2\_0120.pdf

CI 162A SC 162A.5 P232 L30 # 204  
 Kocsis, Sam Amphenol  
 Comment Type TR Comment Status D  
 Figure 162A-1 has an incorrect note regarding the MCB implementation  
 SuggestedRemedy  
 Change wording, per adopted diminico\_3ck\_01a\_0719 contribution. "NOTE - MCB PCB includes test point IL. Allowance for MCB via IL is 0.2dB.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve with comment#203.

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CI 162A SC 162a.5 P232 L32 # 80  
 Palkert, Tom Molex  
 Comment Type T Comment Status D  
 Need to clarify that insertion loss values include the sma connector on the compliance board  
 SuggestedRemedy  
 Add a note or modify diagrams in Fig 162A-1 to make it clear that insertion loss values include loss of sma connectors on compliance boards.  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE. Resolve with comment#203.

CI 162B SC 162B.1.1.1 P234 L46 # 183  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 The test fixture PCB frequency max of 40 GHz too low  
 SuggestedRemedy  
 Replace 40 GHz with 53 GHz  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 The commenter provides no justification to support the proposed change.  
 Careful consideration of equipment capability needs to be assessed with measurement BW requirements e.g., RX BW, etc.  
 For committee discussion

CI 162B SC 162B.1.2.1 P225 L46 # 184  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 The test fixture PCB frequency max of 40 GHz too low  
 SuggestedRemedy  
 Replace 40 GHz with 53 GHz  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 Resolve with comment#183.

CI 162B SC 162B.1.3 P235 L24 # 277  
 DiMinico, Christopher MC Communications  
 Comment Type TR Comment Status D Late  
 Annex 162B 162B.1.3 Mated test fixtures  
 Provide values for TBDs;  
 162B.1.3.1 Mated test fixtures differential insertion loss Equation (162B-3) and Equation (162B-5).  
 162B.1.3.3 Mated test fixtures common-mode conversion insertion loss Equation (162B-9).  
 162B.1.3.5 Mated test fixtures common-mode to differential mode return loss Equation (162B-10).  
 SuggestedRemedy  
 See diminico\_3ck\_1\_0220.pdf.

Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 See diminico\_3ck\_1\_0220.pdf.  
 Slide 6: 162B.1.3.1 Mated test fixtures differential insertion loss Equation (162B-3) and Equation (162B-5). Slide 9: 162B.1.3.3 Mated test fixtures common-mode conversion insertion loss Equation (162B-9). Slide 8: 162B.1.3.5 Mated test fixtures common-mode to differential mode return loss Equation (162B-10).  
 Consider with ghiasi\_3ck\_01\_0120.

CI 162B SC 162B.1.3 P235 L28 # 67  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D  
 It is confusing to just refer to 92.11.3 where there are multiple specifications that don't apply.  
 SuggestedRemedy  
 Change to "92.11.3 as modified by 162B.1.3.1 to 162B.1.3.6"  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Replace sentence: The mated test fixtures specifications are listed in 92.11.3 and using the multi-lane integrated crosstalk noise in 162B.1.3.6.  
 With: The mated test fixtures specifications are given below.

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CI 162B SC 162B.1.3.1 P235 L32 # 185  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 Mated text fixtue loss need slight adjustment and min and max loss TBD need to be replaced with proposed limits  
 SuggestedRemedy  
 Nom IL=  
 $0.9503*(0.471*\text{SQRT}(A3)+0.141*A3+0.0012*A3^2)$   
 $\text{Max Loss}=(0.??+0.471xV??+0.141x??)x0.???????? ???? 0.????=?=26.55 \text{ GHz}$   
 $6.905+0.562x?? 26.55<??=50 \text{ GHz}$   
 $\text{MIN IL}=(0.0656*\text{SQRT}(A2)+0.164*A2)$   
 See ghiasi\_3ck\_01\_0120  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve with proposals diminico\_3ck\_1\_0220.pdf slide 6 and ghiasi\_3ck\_01\_0120 for 162B.1.3.1 Mated test fixtures differential insertion loss Equation (162B-3) and Equation (162B-5).  
 Consider with Comment#277.

CI 162B SC 162B.1.3.2 P237 L35 # 188  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 Differential return loss is TBD  
 SuggestedRemedy  
 $\text{DRL}=20-9*f \text{ from } 0.01<f\leq 3.1 \text{ GHz}$   
 $= 18-0.32*f \text{ dB } 3.1 \text{ GHz } <f\leq 32.5 \text{ GHz}$   
 $= 5 \text{ dB } 32.5<f\leq 50 \text{ GHz}$   
 see ghiasi\_3ck\_01\_0120  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 Resolve with proposals diminico\_3ck\_1\_0220.pdf slide 6 and ghiasi\_3ck\_01\_0120 for 162B.1.3.1 Mated test fixtures differential insertion loss Equation (162B-3) and Equation (162B-5).  
 Consider with Comment#277.

CI 162B SC 162B.1.3.3 P237 L1 # 129  
 Brown, Matt Huawei Technologies Canada  
 Comment Type T Comment Status D  
 What is meant by common-mode conversion insertion loss? Is this common-mode to differential insertion loss?  
 SuggestedRemedy  
 Change "common-mode conversion insertion loss" to "common-mode to differential insertion loss". 4 instances  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 What is meant by common-mode conversion insertion loss?  
 It's a mixed-mode s-parameter;  
 common-mode stimulus, differential response either from port 1 (common) -to-port 2 (differential) SDC21 or port 2 (common) -to-port 1 (differential) SDC21.  
 Insertion loss was given to distinguishes it from return loss SDD11/22. Mode conversion is a well understood parameter description.  
 I believe the justification for this description was that it can be applied to common-mode stimulus, differential mode response or differential-mode stimulus, common-mode response.

CI 162B SC 162B.1.3.4 P237 L32 # 130  
 Brown, Matt Huawei Technologies Canada  
 Comment Type T Comment Status D  
 No units specified.  
 SuggestedRemedy  
 Change "common-mode return loss" to "common-mode return loss in dB".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

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Cl **162B** SC **162B.1.3.5** P**237** L**30** # **187**  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type **TR** Comment Status **D**  
 Common mode to differential transfer is TBD  
 SuggestedRemedy  
 CMCIL=30+0.935\*f from 0.01<f<=15 GHz  
 = 16 dB 15 GHz <f<=50 GHz  
 see ghiasi\_3ck\_01\_0120  
 Proposed Response Response Status **W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve with proposals diminico\_3ck\_1\_0220.pdf slide 9 and ghiasi\_3ck\_01\_0120 for  
 162B.1.3.3 Mated test fixtures common-mode conversion insertion loss Equation (162B-8).  
 Consider with Comment#277.

Cl **162B** SC **162B.1.3.5** P**237** L**30** # **186**  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type **TR** Comment Status **D**  
 Common mode to differential RL is TBD  
 SuggestedRemedy  
 CMDRL=30+30\*f/25.78 from 0.01<f<=12.89 GHz  
 = 17.85+0.225\*f dB 12.89 GHz <f<=35 GHz  
 = 10 dB 35<f<=50 GHz  
 see ghiasi\_3ck\_01\_0120  
 Proposed Response Response Status **W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Resolve with proposals diminico\_3ck\_1\_0220.pdf slide 8 and ghiasi\_3ck\_01\_0120 for  
 162B.1.3.5 Mated test fixtures common-mode to differential mode return loss Equation  
 (162B-10).  
 Consider with Comment#277.

Cl **162B** SC **162B.1.3.6** P**239** L**20** # **131**  
 Brown, Matt Huawei Technologies Canada  
 Comment Type **T** Comment Status **D**  
 In Table 162B-4, there are a few issues with the second column. The table title indicates  
 that the table is for integrated crosstalk noise for multi-lane mated test fixture; so the title of  
 the second column should be "Value" or similar. The values specified include text "less  
 than"; this is typically indicated with the text "(max.)" in the parameter column.  
 SuggestedRemedy  
 Change the title of column 2 to "Value".  
 For the values in column 2 remove "less than".  
 For each parameter in column 1 add "(max.)".  
 Proposed Response Response Status **W**  
 PROPOSED ACCEPT IN PRINCIPLE.  
 Change the title of column 2 to "Value".  
 Less than a number does not include the number. Less than is used elsewhere for this  
 parameter as in Table 162B-2

Cl **162C** SC **162C** P**242** L**14** # **207**  
 Kocsis, Sam Amphenol  
 Comment Type **ER** Comment Status **D**  
 The adopted baseline at  
 "http://www.ieee802.org/3/ck/public/18\_09/palkert\_3ck\_01\_0918.pdf" should include  
 relevant details from  
 "http://www.ieee802.org/3/ck/public/18\_09/mcsorley\_3ck\_01a\_0918.pdf" for the DSFP MDI  
 SuggestedRemedy  
 Update Table162C-3, with details in Sheet1  
 Proposed Response Response Status **W**  
 PROPOSED ACCEPT.

Cl **162C** SC **162C.1** P**243** L**5** # **68**  
 Dudek, Mike Marvell  
 Comment Type **E** Comment Status **D**  
 Incorrect references  
 SuggestedRemedy  
 Change 146.9 and 146.10 to 162.9 and 162.10  
 Proposed Response Response Status **W**  
 PROPOSED ACCEPT.

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Cl 162C SC 162C.1 P243 L12 # 28

Dudek, Mike Marvell

Comment Type T Comment Status D

The TBD in the title of table 162C-2 isn't necessary (compare table 136C-2)

*SuggestedRemedy*

Delete the (TBD) in the title of table162C-2

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 162C SC 162C.2.5 P249 L41 # 29

Dudek, Mike Marvell

Comment Type E Comment Status D

Wrong reference

*SuggestedRemedy*

Change Table 136C-3 to Table 162C-3. Also on page 250 line 43

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 163 SC 163 P162 L13 # 265

Ran, Adeo Intel

Comment Type T Comment Status D

Too many comments already just from reviewing 162.

*SuggestedRemedy*

Apply changes from accepted comments against clause 162 to clause 163 where necessary, and vice versa.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has made a very general statement and provided no specific remedy. The application of comments for Clause 162 to Clause 163 and vice versa will not be applicable for most comments. The commenter is encouraged to indicate which comments may apply to both clauses during comment resolution.

Cl 163 SC 163.1 P162 L15 # 138

Brown, Matt Huawei Technologies Canada

Comment Type T Comment Status D FEC AN

In Table 163-1, the Clause 161 RS-FEC-Int is specified as TBD rather than Required or Optional in the second column.

*SuggestedRemedy*

Specify RS-FEC-Int as either "Optional" or "Required".

Proposed Response Response Status W

PROPOSED ACCEPT.

Implement according to the outcome of comment #77 and #133.

See comment 77 and 133.

Cl 163 SC 163.1 P162 L15 # 134

Brown, Matt Huawei Technologies Canada

Comment Type T Comment Status D FEC AN

Tables 163-1 list two FEC types (RS-FEC and RS-FEC-Int) that might be used by a 100GBASE-KR1 PHY, but never explains the criteria for selecting one or the other, how that selection is made, nor the implications (e.g., conversion from RS-FEC to RS-FEC-Int).

*SuggestedRemedy*

Add a subclause to explain the relationship of the two FEC types, how an FEC type is selected, and the implications of the selection. Reference to a similar subclause in Clause 162 might be sufficient.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Implement according to results of comment #77 with editorial license. A pointer to a subclause within Clause 162 may be sufficient.

See comment #77.

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Cl 163 SC 163.1 P163 L32 # 41  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D  
 The inverse RS-FEC is also required to change between RS-FEC (528,514) and RS-FEC (544,514)  
 SuggestedRemedy  
 Add to footnote b. "and between RS-FEC (528,514) and RS-FEC (544,514)"  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 CL152 inverse RS-FEC is only to convert between CL91 and CL161 FEC. The application in this comment is out of scope.

Cl 163 SC 163.1 P165 L11 # 42  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D bucket  
 This paragraph is for 400G as well.  
 SuggestedRemedy  
 Change "200GAUI-n" to "200GAUI-n or 400GAUI-n" (this is how this is done in clause 162)  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 163 SC 163.2 P165 L33 # 43  
 Dudek, Mike Marvell  
 Comment Type T Comment Status D bucket  
 FEC is also used in "FEC symbol error rate" etc. where it also refers to the FEC within the 200 and 400G PCS.  
 SuggestedRemedy  
 Add to the sentence "for 100GBASE-KR1 or the RS-FEC within the Clause 119 PCS for 200GBASE-KR2 and 400GBASE-KR4".  
 Proposed Response Response Status W  
 PROPOSED ACCEPT.

Cl 163 SC 163.9.1 P169 L25 # 172  
 Ghiasi, Ali Ghiasi Quantum/Inphi  
 Comment Type TR Comment Status D  
 TP0 upper frequency for equation 93-1 and 93-2 is TBD  
 SuggestedRemedy  
 Replace TBD with 50 GHz and following equations  
 $RLd(f) = \{(20-?? \text{ ???} \quad 0.05=??=5 \text{ ?????} \}$   
 $15 \text{ ???} \quad 5<??=25 \text{ ?????}$   
 $22. 5-0.3?? \text{ ???}, \quad 25<??=50 \text{ ?????}$   
 $lref(f)=-0.0015+0.1V??+0.035?? \quad 0.05=??=50 \text{ ?????}$   
 See ghiasi\_3ck\_01\_0120.pdf  
 Proposed Response Response Status W  
 PROPOSED REJECT.  
 The commenter has not provided sufficient evidence to justify the proposed changes.  
 A presentation related to this comment is anticipated at the January meeting.  
 For task force discussion.

Cl 163 SC 163.9.1 P169 L26 # 19  
 Mellitz, Richard Samtec  
 Comment Type TR Comment Status D  
 Figure 93-3 and Figure 93-4 are not appropriate for the Nyquist sampling frequency and baud rate. Moving from 25 Gbps NRZ to 50 Gbps only incrementally changed the Nyquist frequency. 100 Gbps doubles it. In addition, specifying device fixtures to around 60 GHz may have new challenges which need to be comprehended in the standard  
 SuggestedRemedy  
 Either re-write 93-8.1.1 in terms of probational to Fb or replace 163.9.1 with new equations and figures. See presentation  
 Proposed Response Response Status W  
 PROPOSED ACCEPT IN PRINCIPLE.  
 A presentation related to this comment is anticipated at the January meeting.  
 For task force discussion.

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CI 163 SC 163.9.1 P169 L30 # 173

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D

TP5 upper frequency for equation 93-1 and 93-2 is TBD

SuggestedRemedy

Replace TBD with 50 GHz and following equations

$RLd(f) = \{(20-??) \cdot ??\} \cdot 0.05 = ?? = 5 \cdot ??\} \cdot ??\}$

15  $??\} \cdot 5 < ?? = 25 \cdot ??\} \cdot ??\}$

22.  $5 - 0.3 \cdot ?? \cdot ??\}, 25 < ?? = 50 \cdot ??\} \cdot ??\}$

$llref(f) = -0.0015 + 0.1V \cdot ?? + 0.035 \cdot ?? \cdot 0.05 = ?? = 50 \cdot ??\} \cdot ??\}$

See ghiasi\_3ck\_01\_0120.pdf

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has not provided sufficient evidence to justify the proposed changes.

A presentation related to this comment is anticipated at the January meeting.

For task force discussion.

CI 163 SC 163.9.2 P170 L10 # 25

Mellitz, Richard Samtec

Comment Type TR Comment Status D

The dependence of Vf on Nv is has proved to be confusing. The result is that a single device with a C2C and KR transmitter may have two specification which is confusing for performing tests. Since we specify that ratio of Pmax to Vf there really is no good reason no to make Nv more like a real steady state voltage. See Mellitz\_3ck\_01b\_0919 for reference.

SuggestedRemedy

Add a subsection detailing "Transmitter output waveform" similar to 163.9.3.1. Add exception and exception list for this subclause setting Nv to 200 for the determination of Vf. Refer to clause "136.9.3.1 Transmitter output waveform" : Change k = -2 to 1 to k = -3 to 1 Refer to clause "120D.3.1.3 Linear fit to the measured waveform": Change Dp= 3 to Dp= 4 See Mellitz\_3ck\_01b\_0919 for reference.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion

CI 163 SC 163.9.2 P170 L18 # 44

Dudek, Mike Marvell

Comment Type T Comment Status D

See a comment on the abs step size for c(1) max in table 162-8 suggesting a possible change to the value from 0.02 to 0.05

SuggestedRemedy

If the change is made in clause 162 then Change 0.05 to 0.02 here and on line 52 page 174 in the COM table.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Pending resolution of comment 44, implement the suggested remedy.

See comment 44.

CI 163 SC 163.9.2 P170 L30 # 45

Dudek, Mike Marvell

Comment Type T Comment Status D bucket

In footnote b "The loss of the host channel doesn't make sense as there is no "host" for the backplane.

SuggestedRemedy

Change "Loss of host channel" to "loss of Transmitter package and TP0 to TP0a test fixture."

Proposed Response Response Status W

PROPOSED ACCEPT.

CI 163 SC 163.9.2.1 P171 L5 # 20

Mellitz, Richard Samtec

Comment Type TR Comment Status D ERL

Nbx=Nb has been shown not correlate well to COM in mellitz\_3ck\_adhoc\_02\_100219. Nbx=24 seems to be a better choice

SuggestedRemedy

Change "Nbx is set to the value of Nb in Table 163-10" to "Nbx is set to 24 UI"

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

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Cl 163 SC 163.9.2.1 P171 L5 # 69

Wu, Mau-Lin

MediaTek

Comment Type T Comment Status D ERL

Current ERL calculation doesn't consider DFE "floating-tap". The concern is the ERL is very sensitive across "N\_bx" boundary as raised in wu\_3ck\_02a\_1119. We need to enhance ERL calculation methodology.

*SuggestedRemedy*

Modify ERL as capable of DFE floating tap as proposed in wu\_3ck\_01\_0120. The same methodology shall be applied to CR TX, CR RX, KR TX, & KR RX ERL calculations in the following subclauses.

162.9.3.4 Transmitter effective return loss (ERL) 162.9.4.5 Receiver ERL

163.9.2.1 Transmitter ERL

163.9.3 Receiver characteristics

Proposed Response Response Status W

PROPOSED REJECT.

This topic has been discussed at an ad hoc and there appeared to be no consensus for the proposed change.

A presentation related to this comment is anticipated at the January meeting.

For task force discussion

Cl 163 SC 163.9.2.1 P171 L10 # 21

Mellitz, Richard

Samtec

Comment Type TR Comment Status D ERL

Table 163-3 was developed for a different data rate and reference package assumption. Recommendation were proposed in mellitz\_3ck\_01\_1119 slide 7.

*SuggestedRemedy*

In Table 163-3 set: beta\_x=2.4 GHz , rho\_x=.3

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

Cl 163 SC 163.9.3.1 P171 L44 # 22

Mellitz, Richard

Samtec

Comment Type TR Comment Status D ERL

Nbx=Nb has been shown not correlate well to COM in mellitz\_3ck\_adhoc\_02\_100219. Nbx=24 seems to be a better choice

*SuggestedRemedy*

Change "Nbx is set to the value of Nb in Table 163-10" to "Nbx is set to 24 UI"

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

For task force discussion.

Cl 163 SC 163.10 P174 L14 # 201

Ghiasi, Ali

Ghiasi Quantum/Inphi

Comment Type TR Comment Status D COM burst penalty

COM table and analysis does not include penalty due to burst error, current COM code on some weired channel

*SuggestedRemedy*

[http://www.ieee802.org/3/ck/public/19\\_03/anslow\\_3ck\\_01\\_0319.pdf](http://www.ieee802.org/3/ck/public/19_03/anslow_3ck_01_0319.pdf) page has 2 dB of SNR penalty with pre-coding on for tap weights [0.85, 0.05, 0.25, -0.05, 0.15], the Anslow analysis showed that non of the 115 channels would be as bad but how can we gurantee some weired channel will not in the mix that passes 3 dB COM but would fail due to burst error? Assuming there is interest we can bring a proposal in future task force meeting for an analytical burst error estimator that can be added to COM.

Proposed Response Response Status W

PROPOSED REJECT.

See comment 200.

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Cl 163 SC 163.10 P175 L25 # 23

Mellitz, Richard Samtec

Comment Type TR Comment Status D

SNR\_Tx of 33 dB has been used for much recent data presented in the ad-hocs, plenaries, and interima for making decisions. No new data have been presented otherwise.

*SuggestedRemedy*

Change the TBD for SNR\_Tx to 33 dB.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Note that comment #251 proposes this value to be 32.5 dB for transmitter SNDR. For reference, 802.3cd specifies 3cd SNDR as 32.2 dB and SNR\_TX as 32.5 dB.

For task force discussion.

Cl 163 SC 163.10 P175 L31 # 153

Dawe, Piers Mellanox

Comment Type TR Comment Status D

Slide 6 of heck\_3ck\_01\_0919 shows that the DFE taps are never strongly negative, yet the draft would allow such untypical/hypothetical channels.

*SuggestedRemedy*

Remember that a tap weight limit isn't a hard pass-fail limit; channels can go outside it but don't get a free pass for the excess ISI noise that they cause. Add a minimum tap weight limit of -0.03 for all taps, including the floating taps.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has not provided sufficient evidence to justify the proposed change.

A minimum tap weight is specified as -0.3 for tap 2 and -0.2 for the remaining fixed taps, and -0.05 for the floating taps.

The referenced presentation shows tap values exceeding -0.03 so good channels would be rejected.

Cl 163 SC 163.10 P175 L40 # 174

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type TR Comment Status D

The DFE taps for RSS is on different line and not clear

*SuggestedRemedy*

Combine the requirement of DFE location and RSS limit in the single line. Here is a suggested wording "DFE floating tail taps [25-40] root-sum-of-squares limit

Proposed Response Response Status W

PROPOSED REJECT.

The tail range is specified by N\_ts (start of tail, see line 41) and N\_f (floating tap span, see line 37).

Cl 163 SC 163.10 P175 L40 # 152

Dawe, Piers Mellanox

Comment Type TR Comment Status D

This DFE floating tap tail root-sum-of-squares limit is 0.03. For the worst of 7 borderline channels in kasapi\_3ck\_01\_1119 slide 12 (kareti1, OACH4, which is an outlier and probably should not be supported), the value is 0.022. Even for this channel with the most unlucky combination of package lengths including out-of-scope ones, it's <= 0.025 (slide 13). We should not encourage even worse channels than this, such as the failing channels on slides 16-17, and we should not indulge this one so much.

*SuggestedRemedy*

Remember that this parameter isn't a hard pass-fail limit; channels can exceed this but don't get a free pass for the excess ISI noise that they cause. Change 0.03 to 0.02.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has not provided evidence to support the proposed change. Analysis is required to determine if the proposed change would allow all candidate channels to pass.

For task force discussion.

IEEE P802.3ck D1.0 100/200/400 Gb/s Electrical Interfaces Task Force 1st Task Force review comments

Cl 163 SC 163.10 P175 L46 # 147

Dawe, Piers Mellanox

Comment Type T Comment Status D

One-sided noise spectral density of  $8.2e-9 V^2/Hz$  is extremely aggressive and optimistic, being half that for 50GBASE-KR, and was chosen to make particular backplane channels with issues pass COM. Backplane channels are very varied, so sweating this will benefit few channels at a cost to all. New backplane connectors will provide better channels.

SuggestedRemedy

Change to  $1e-8$ , which is 61% of 50GBASE-CR.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has not provided sufficient evidence for the propose change.

For task force discussion.

Cl 163 SC 163.10.1 P175 L52 # 46

Dudek, Mike Marvell

Comment Type E Comment Status D bucket

Equation should be a hot link. Also Equation 163-1 is for calculation of Add

SuggestedRemedy

Change the equation to 163-3 and make it a hot link

Proposed Response Response Status W

PROPOSED ACCEPT.

Cl 163 SC 163.10.1 P176 L46 # 175

Ghiasi, Ali Ghiasi Quantum/Inphi

Comment Type T Comment Status D

Beyond 50 GHz with loss >75 doesn't matter

SuggestedRemedy

Limit max frequency to 50 GHz instead of fb.

Proposed Response Response Status W

PROPOSED REJECT.

The commenter has not provided sufficient evidence to support the proposed change.

For task force discussion.

Cl 163 SC 163.10.2 P177 L13 # 24

Mellitz, Richard Samtec

Comment Type TR Comment Status D

Table 163-11 was developed for a different data rate and reference package assumption. Recommendation were proposed in mellitz\_3ck\_01\_1119 slide 5.

SuggestedRemedy

In Table 163-11 set:  $\beta_x=2.4 GHz$  ,  $\rho_x=.19$

Proposed Response Response Status W

PROPOSED ACCEPT.