Cl **162** *SC* **162.8.11** *P* **145** *L* **23** # 18

Sun, Junqing — Credo Semiconductor

Comment Type **TR** *Comment Status* **A** *max_wait_timer [CC]*

max_wait_timer nees to be extended for 100G due to high complexity. 15 seconds has been discussed.

SuggestedRemedy

set max_wait_timer equal to 15 seconds. 10s is the second choice.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Based 2020/5/6 Strawpoll #2 there is consensus to do the following:

Set the value for max_wait_timer to 12 s in 162.8.11.

Also update link_fail_inhibit_timer in Table 73–7 with min and max values of 12.1 and 12.2.

For task force discussion.
2020/4/1 Straw Poll #7 and #8
I would support a max_wait_timer value, TMWT, in the range (assuming integer values):
A: TMWT <= 3 s
B: 3 s < TMWT <= 6 s
C: 6 s < TMWT <= 9 s
D: 9 s < TMWT <= 12 s
E: 12 s < TMWT <= 15 s
F: 15 s < TMWT
G: Need for information

2020/4/1 Strawpoll #7
Chicago rules:
A: 3 B: 7 C: 13 D: 15 E: 13 F: 4 G: 8

2020/4/1 Strawpoll #8
Pick one:
A: 1 B: 3 C: 3 D: 6 E: 3 F: 2 G: 4

2020/4/1 Strawpoll #9
I believe a value can be chosen this comment cycle:
Yes: 12
No: 9
Abstain: 16

2020/5/6 Straw Poll #1
I would support a max_wait_timer value as follows:
A: 6 s
B: 9 s
C: 12 s
D: 15 s
Pick one:
A: 5 B: 8 C: 17 D: 5

2020/5/6 Straw Poll #2
I support closing comment #18 using a max_wait_timer value of 12 s:
Yes: 25
No: 11

Cl **162** *SC* **162.7** *P* **137** *L* **24** # 25

Slavick, Jeff — Broadcom

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

Table 162-5 has a bunch of new entries that don't map to anything. Some of the existing mappings are wrong as well

SuggestedRemedy

Using editorial license. Rename Table 162-5 to "MDIO/PMD variable mapping". Copy first 7 rows from Table 162-6 to Table 162-5, inserting before Restart training row. Delete Table 162-6. Replace the rows after Seed 0 in Table 162-5 with the following information for each lane

Receiver status #	BASE-R PMD status	1.151.(0+4*#)	local_trained_#
Frame lock #	BASE-R PMD status	1.151.(1+4*#)	local_tf_lock_#
Start-up protocol status #	BASE-R PMD status	1.151.(2+4*#)	training_#
Training failure #	BASE-R PMD status	1.151.(3+4*#)	training_failure_#
Receiver ready #	LP status #	1.(1220+#).15	remote_rx_ready
Modulation and precoding status #	LP status #	1.(1220+#).11:10	remote_tp_mode
Rx frame lock #	LP status #	1.(1220+#).9	remote_tf_lock
Initial condition request #	LP control #	1.(1120+#).13:12	ic_req
Coefficient select #	LP control #	1.(1120+#).4:2	coef_sel
Coefficient request #	LP control #	1.(1120+#).1:0	coef_req
Receiver ready #	LD status #	1.(1420+#).15	local_rx_ready
Initial condition status #	LD status #	1.(1420+#).8	ic_sts
Coefficient status #	LD status #	1.(1420+#).2:0	coef_sts
Modulation and precoding request #	LD control #	1.(1320+#).11:10	local_tp_mode

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Updating references to variables is necessary, but the rearrangement of the tables is not.

The format we've used for previous PMD Clauses has one table for status variables and another for control variables. The context here is relative to the register not the function where control means RW and status means RO.

The task force reviewed the following presentation:
http://www.ieee802.org/3/ck/public/20_03/slavick_3ck_02_0320.pdf

Implement option B in slides 9 to 11 in the referenced presentation with editorial license.

Cl **161** *SC* **161.6** *P* **123** *L* **3** # 42

Gustlin, Mark — Cisco Systems

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

FEC histogram counter are very useful for understanding the performance of an interface. Add in optional histogram counters for the RS-FEC decoder.

SuggestedRemedy

Add into the RS-FEC-Int MDIO function mapping the following registers: RS-FEC symbol error per codeword 1 through RS-FEC symbol error per codeword 15 (a total of 15 registers). 32b each. Each counter counts the number of codewords that contain that specific number of errors. Also add an RS-FEC codeword counter that counts all of the codewords that are received (errored or not), also 32 bits. Note that each of these counters counts all codewords or symbol errors from both interleaved codewords, we do no break these out by interleaved instance.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The following presentation was reviewed by the task force:
http://www.ieee802.org/3/ck/public/20_03/gustlin_3ck_01_0320.pdf

Implement the changes outlined in the referenced presentation, except specify that the counters are optional to implement.

Implement with editorial license.

Cl **162** *SC* **162.9.3.1** *P* **148** *L* **1** # 57

Ran, Adee — Intel

Comment Type **T** *Comment Status* **R**

The COM parameter b_max(n) for n=2 is 0.3. This resulted from observations that for some channels there is a large 2nd postcursor after the linear equalization performed in the COM calculation.

However, it is likely that many real implementations will not implement a 2nd DFE tap and instead use linear equalization (a combination of CTLE, FFE in the receiver, and possibly the Tx equalizer c(+1) too) to handle this ISI.

If linear equalization is required for the 2nd postcursor then it may be beneficial to make it available in the transmitter by adding c(+2). Implementation of another tap in the transmitter is simple (impact on power etc. is low). Receivers may chose whether to use internal equalization or utilize the training protocol to control c(+2).

Note that this additional coefficient does not necessarily need to have an equivalent in COM; it is observed that in COM results, even c(+1) is left at 0 for most channels, so the addition of another tap may just increase run time and is not expected to change the results. However, c(+1) (and the proposed c(+2)) can be used in actual implementations where the Rx may have different structure than the COM reference.

SuggestedRemedy

A presentation is planned with further details.

Response *Response Status* **C**

REJECT.

The task force reviewed the following presentation:
http://www.ieee802.org/3/ck/public/20_03/ran_3ck_04a_0320.pdf

Based on 2020/5/6 Straw Poll #3 there is no consensus to make the changes proposed in the referenced presentation at this time.

2020/5/6 Straw Poll #3
I would support closing comment #57 using the proposal on slide 4 of ran_3ck_04a_0320:
Yes: 10
No: 17

Cl **163** *SC* **163.9.1** *P* **175** *L* **35** # 58

Ran, Adee Intel

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

As was discussed in the January 2020 meeting there is interest in enabling DC-coupled channels in some applications (mainly backplane and C2C) when the two link partners support this operation. Avoiding AC coupling capacitors in the channels can help board design, improve signal integrity, and reduce costs, and it is becoming a common requirement.

Current channel specs refer back to 93.9.4 where it is stated that AC coupling capacitors may not exist between TP0 and TP5, but in that case some specifications may need modifications for interoperability (without stating the modifications explicitly). This leaves the burden of defining new Rx and Tx specifications to implementers and integrators - with no standard to assist them.

Indeed, the current transmitter specifications in 120F.3.1 and in 163.9.1 allow high common mode voltage up to 1.9 V, which is detrimental for DC coupling with modern CMOS devices. This high value is also not useful for Tx design with modern applications.

DC coupling can be supported by limiting the Tx common mode voltage to a more reasonable and useful range. If this is done, the existing specs may be useable without change for DC coupled channels (although receivers may still need special support for this).

This proposal is specific for KR and C2C specifications which require on-board AC coupling; CR and C2M have AC coupling in the cable and in the module, respectively, so they need a separate discussion.

SuggestedRemedy

In the transmitter characteristics tables of Clause 163 and Annex 120F, Change the Tx common mode voltage to be between 0.2 and 0.8 volts.

Additional content may be beneficial for the AC coupling subclauses. I intend to provide some text in a presentation, to complement the suggested Tx specs.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

The following presentation was reviewed by the task force:
http://www.ieee802.org/3/ck/public/20_03/ran_3ck_01a_0320.pdf

Implement the changes proposed on slides 4 and 5 in the referenced presentation, except set the cutoff frequency to 50 kHz and maximum common mode voltage of 1V. Implement with editorial license.

Cl **120F** *SC* **120F.4.1** *P* **209** *L* **52** # 69

Mellitz, Richard Samtec

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

C2C, KR, and CR devices may be the same ports on chips. Align Av, Afe, and Ane with table 163-10

SuggestedRemedy

replace the TBD"s with Av=0.0413,Afe=0.413,Ane=0.608

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Replace the TBDs with Av=0.413,Afe=0.413,Ane=0.608

Cl **162** *SC* **162.9.3** *P* **146** *L* **19** # 73

Healey, Adam Broadcom Inc.

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

A +/-100 ppm frequency tolerance on the signaling rate is "traditional" but I understand reference clocks with at least half of this tolerance are available at similar costs. Incremental improvements to receiver performance margin are available with the use of a higher precision reference.

SuggestedRemedy

Change the frequency tolerance to +/-50 ppm in Tables 162-8, 162-11, 163-5, 120F-1, 120G-1, 120G-3. 120G-4, and 120G-7.

Proposed Response *Response Status* **Z**

REJECT.

This comment was WITHDRAWN by the commenter.

Cl **120F** *SC* **120F.3.1.3** *P* **205** *L* **48** # 77

Healey, Adam Broadcom Inc.

Comment Type **T** *Comment Status* **D** *TX FIR c(-3)*

A 3rd pre-cursor coefficient is not that useful for chip-to-chip channels. It adds incremental complexity (implementation and configuration) for what should be a "lightweight" interface.

SuggestedRemedy

Remove c(-3) tap for n00GAU-n C2C.

Proposed Response *Response Status* **Z**

REJECT.

This comment was WITHDRAWN by the commenter.

Cl **120G** *SC* **120G.4.2** *P* **232** *L* **33** # 141

Dawe, Piers Mellanox

Comment Type **TR** *Comment Status* **R** *(IR)*

Need a way to account for the additional reflections that are plaguing our short-channel analyses, but trying to put capacitors on the software transmission line in the scope seems impractical.

SuggestedRemedy

Add a second noise items in the measurement, a set ratio to sum(AVupp + AVmid + AVlow). To be RSSd with the measured, equalised signal.

Response *Response Status* **C**

REJECT.

The suggested remedy does not provide sufficient detail to implement.

Cl **162D** *SC* **162D** *P* **306** *L* **1** # 150

Dudek, Mike Marvell

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

This section is informative and will be rather similar to 136D duplicating lots of information with technically obvious changes.

SuggestedRemedy

Consider deleting this section

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Cable assembly lengths and MDIs are different in 136D.

136C and 136D (cable assembly enabling a 3 m length)
MDIs - SFP28,QSFP28,QSFP28-DD, OSFP
162C and 162D (cable assembly enabling a 2 m length)
SFP112,QSFP112,QSFP112-DD, OSFP, SFP112-DD, DSFP

Editorial license to generate Annex 162D content while minimizing duplication with 136D.

Cl **162** *SC* **162.11.2** *P* **157** *L* **11** # 10079

Palkert, Tom Molex

Comment Type **T** *Comment Status* **R**

Comment resubmitted from Draft 1.0. Subcl. 162.11.2 - Pg 150 - ln 3]

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 specifiy 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)

Response *Response Status* **C**

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.

Cl **120G** *SC* **120G.3.2** *P* **224** *L* **50** # 10144

Dawe, Piers — Mellanox

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

[Comment resubmitted from Draft 1.0. Subcl. 120G.3.2 - Pg 217 - ln 50]

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.

Response *Response Status* **C**

REJECT.

The reference receivers being discussed does not include precursor equalization and thus will not impact precursor ISI.

The comment does not provide sufficient evidence that removing this parameter will result an interoperable interface.

Cl **120G** *SC* **120G.4.2** *P* **232** *L* **32** # 10155

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **D** *RR noise (IR)*

[Comment resubmitted from Draft 1.0. Subcl. 120G.4.2 - Pg 226 - ln 11]

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^2/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^2/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* **Z**

REJECT.

This comment was WITHDRAWN by the commenter.

Cl **162** *SC* **162.8.11** *P* **145** *L* **34** # 10247

Ran, Adee — Intel

Comment Type **T** *Comment Status* **R**

[Comment resubmitted from Draft 1.0. Subcl. 162.8.11 - Pg 138 - ln 32]

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).

SuggestedRemedy

Add the following paragraphs:

When the training variable is set to false (see 136.8.11.7.1), the PMD control function may optiionally 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.

Response *Response Status* **C**

REJECT.

There is no consensus to make the proposed changes at this time.

Cl **162** *SC* **162.9.3** *P* **147** *L* **24** # 10252

Ran, Adee
Intel

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

[Comment resubmitted from Draft 1.0. Subcl. 162.9.3 - Pg 140 - ln 24]

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 GBd 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 measurment 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* **Z**

REJECT.

This comment was WITHDRAWN by the commenter.