Cl **140** *SC* **140.6** *P* **41** *L* **39** # 9

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **D** *optical specs*

With the introduction of the Tx peak-to-peak power (max) spec, the 100GBASE-LR1 overload requirement has now increased by 0.8 dB as the receiver has to handle this peak-peak power. The peak-to-peak power spec does not state that overshoot and undershoot are evenly distributed so it is possible that all of the peak power is overshoot. To avoid overload problems with the increased power the Outer Optical Modulation Amplitude (OMAouter) max should be reduced and the Transmitter peak-to-peak power should be reduced for the LR1 spec.

SuggestedRemedy

Change Outer Optical Modulation Amplitude (max) to 4.7 dBm. Change Tx peak-to-peak power (max) to 5.5 dBm.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Pending Task Force presentation and discussion.

Cl **140** *SC* **140.6.1** *P* **41** *L* **16** # 8

Nicholl, Gary — Cisco Systems

Comment Type **T** *Comment Status* **A** *optical specs*

Implement the changes captured in http://www.ieee802.org/3/cu/public/cu_adhoc/cu_archive/cole_3cu_adhoc_050520_v4.pdf and discussed during the May 5th ad-hoc conference call, and in keeping with directional straw polls #1-#6 as captured in http://www.ieee802.org/3/cu/public/cu_adhoc/cu_archive/minutes_3cu_adhoc_050520.pdf.

For reference the changes can be summarized as follows:
1. Change TDECQ(max), TECQ(max) and SECQ(max) values for 400GBASE-LR4-6 from 3.5dB to 3.4dB
2. Change to a single extinction ratio range for the specification of TxOMA for 100GBASE-FR1, 100GBASE-LR1, 400GBASE-FR4 and 400GBASE-LR4-6, with values consistent with those defined for ER<4.5.
3. Change the way TxOMA requirements are represented in the “transmit characteristics” tables.
4. Change the way RS requirements are represented in the “receive characteristics” tables.
5. Use TECQ rather than SECQ when representing RS requirements.

SuggestedRemedy

During offline discussions after the May 5th ad-hoc call a few minor issues were identified with some of the numbers in cole_3cu_adhoc_050520_v4 (that don't change the intent or direction).

It is therefore proposed to implement the changes as captured in nicholl_3cu_03_051920, which will be presented during the P8023cu_D21 comment resolution in support of this comment.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

According to Straw Poll #1 on 5/26 there was consensus to make the changes captured in nicholl_3cu_03_051920.

Implement the changes as captured in nicholl_3cu_03_051920, with editorial license.

Cl **140** *SC* **140.6.1** *P* **41** *L* **37** # 24

Dudek, Mike Marvell

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

There is a problem with the signal detect for 100GBASE-FR1. The threshold in 140.5.4 refers to the minimum received power in Table 140-7 which is -6.9dBM, however there is a note that it is informative. The -6.9dBm is calculated as the max channel loss (4dB) below the minimum transmitter average power in table 14-6 (or -2.9dBm) but that number is informative and at infinite extinction ratio the average power would be -3.2dBm, resulting in a minimum average input power of -7.2dBm. (Note the problem is even worse in 100GBASE-DR but fixing that would be out of scope.)

SuggestedRemedy

Make the Average launch power (min) for 100GBASE-FR1 to be normative. (note this is needed to ensure inter-operability on the signal detect with 100GBASE-DR, otherwise the Average Receiver power (min) could have been adjusted instead.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Average launch power (min) is informative for all PAM4 optical PMDs in 802.3.

Subclause 140.10a (Requirements for interoperation between 100GBASE-DR, 100GBASE-FR1 and 100GBASE-LR1) is also informative and was added to provide guidance to end users on how to interconnect the different PMD types. It should not be the primary reason for changing PMD optical specifications, e.g. changing average launch power (min) from informative to normative.

Update (5/26):

PROPOSED ACCEPT IN PRINCIPAL

Implement the following changes througout the draft.

In Table 140-6:
Change the Average launch power (min) for 100GBASE-FR1 from -2.9dBm to -3.2dbm

In Table 140-7:
Change the Average receive power (min) for 100GBASE-FR1 from -6.9dBm to -7.2dBm

In Section 140.10a.1:
Change:
"The 100GBASE-FR1 and 100GBASE-DR PMDs can interoperate with each other provided that the fiber optic cabling (channel) characteristics for 100GBASE-DR (see 140.10 and Table 140–12) are met"
to:
"The 100GBASE-FR1 and 100GBASE-DR PMDs can interoperate with each other provided that the fiber optic cabling (channel) characteristics for 100GBASE-DR (see 140.10 and Table 140–12) are met and the 100GBASE-FR1 transmitter average power is greater than or equal to the value for average launch power (min) for 100GBASE-DR in Table 140-6."

Cl **140** *SC* **140.6.1** *P* **41** *L* **37** # 22

Dudek, Mike Marvell

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

To improve inter-operability between 100GBASE-LR1 and 100GBASE-DR the average launch power min for LR1 needs to be increased a little and needs to be made normative. With the existing OMA numbers and not knowing what the loss of a 100GBASE-DR channel is it is possible to use an attenuator on the output of the 100GBASE-LR1 transmitter with an attenuation between 0.8dB and 1.1dB except that with the 1.1dB attenuator and a max loss 100GBASE-DR channel the 100GBASE-DR receiver signal detect might not detect the input. It is very convenient to use a single value attenuator without having to know the loss of the channel and this allows the use of a 0.95dB attenuator with +/-0.15dB tolerance.

SuggestedRemedy

Increase the average launch power (min) for 100GBASE-LR1 from -2dBm to -1.8dBm. Change note" a" to say "For 100GBASE-LR1 to ensure inter-operability with 100GBASE-FR1 and 100GBASE-DR the average launch power min is normative, for 100GBASE-FR1 and 100BASE-DR the average launch power min is informative."

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Subclause 140.10a (Requirements for interoperation between 100GBASE-DR, 100GBASE-FR1 and 100GBASE-LR1) is informative and was added to provide guidance to end users on how to interconnect the different PMD types. It should not be the primary reason for changing PMD optical specifications.

The commenter has not provided data on the impact of the proposed change on the 100GBASE-LR1 transmitter.

Update 5/26:

PROPOSED ACCEPT IN PRINCIPAL

In Table 140-15:
Change the Max Loss for the direction “100GBASE-LR1 transmitter to 100GBASE-DR receiver” from 4.1dB to 3.9dB.

Cl **140** *SC* **140.6.1** *P* **41** *L* **51** # 30

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **D** *10logCeq*

Although the relative and absolute overshoot limits catch some bad transmitters that the K limit would catch, they don't catch all of them. P802.3ct and P802.3cw have the equivalent of a K limit, so it's not unnecessary. The motivation for removing it was poor accuracy of the TDECQ method.

SuggestedRemedy

Reinstate the K limit for 100GBASE-FR1, 100GBASE-LR1, 400GBASE-FR4 and 400GBASE-LR4-6. For these PMDs, apply it at TP2 as well as at TP3, same as TECQ. Improve the accuracy of the TDECQ method.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

This is a similar comment to #59, #62, #68, #69, and #87 against D2.0. These five comments were rejected by the task force due to an earlier decision to remove 10logCeq and replace it with overshoot limits.

The response to #87 is included here for reference.

Based on the results of Straw Poll #1 taken at the 3/17 interim conference call , the Task Force consensus was to maintain the decision made at the 802.3cu TF meeting in Geneva to remove “TDECQ-10Log10(Ceq) and to clean up the draft to correctly reflect this decision (including among other changes to remove “SECQ-10Log10(Ceq)” from the receiver specifications).

Straw Poll #1:
With regards to the inclusion of TDECQ-10log(Ceq) parameter, I support:
a) Full removal from both Tx and Rx tables: 27
b) Reinstate for both Tx and Rx tables: 9
(17 Abstain)

Cl **140** *SC* **140.6.3** *P* **44** *L* **43** # 10

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **A** *RS figure*

It would be helpful to add a graph showing how OMAouter and RS vary with TDECQ and TECQ respectively.

SuggestedRemedy

Insert two graphs after Table 140-8 for 100GBASE-FR1 and 100GBASE-LR1, each showing the variation of Tx OMAouter and RS against TDECQ and TECQ respectively. A presentation in support of this comment will show the form of the two graphs.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Implemented the three sets of figures as captured in lewis_3cu_01_052620 with editorial license, for both clauses 140 and 151.

Cl **140** *SC* **140.7.5a** *P* **46** *L* **3** # 12

Sorbara, Massimo — GlobalFoundries

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

To help ease the reading, provide a definition of TECQ in a sentence at the beginning of the beginning of the clause. Then the remainder of the paragraph remains as is in specification of compliance cross-reference.

SuggestedRemedy

Add the following sentence at the beginning of sub-clause 140.7.5a: "Transmitter eye closure for PAM4 (TECQ) is a measure of the optical transmitter's vertical eye closure occuring directly at the output of the optical transmitter."

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Adding the following sentence at the beginning of sub-clause 140.7.5a:

"The transmitter eye closure for PAM4 (TECQ) is a measure of the optical transmitter's vertical eye closure at TP2."

Cl **140** *SC* **140.7.5b** *P* **46** *L* **8** # 28

Dawe, Piers — Mellanox

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

The response to D2.0 comment 47 says "Implement the changes in rodes_3cu_01_032420 and in slide 6 of zivny_01_032420, with editorial license." Slide 6 of zivny_01_032420 says:
"Guarding against the overshoot
Overshoot, undershoot aka relative overshoot
Measure at TP3 with both positive and negative dispersion
Measure also at TP2
Again compensation for Oscilloscope noise allowed
..."

SuggestedRemedy

Change the name to "relative over/under-shoot".
Make it clear that it applies with zero chromatic dispersion (TP2) and most +ve, most -ve chromatic dispersion (TP3), e.g. refer to 121.8.5.2 Channel requirements.
Make it clear that relative over/under-shoot may be measured with or without the variable reflector of Figure 121-4, TDECQ conformance test block diagram.
Define a standard amount of measurement noise: either 0.075*OMA in the usual fb/2 bandwidth, representing receiver noise, or a lower ratio to OMA representing at least the relative amount of noise from a real scope in a 400GBASE-LR4-6 measurement after the dispersive fibre.
State that the measurement should take the actual scope noise into account, but do not spell out how to do that (because it depends too much on the details of how a particular scope works).
Specify the "hit ratio" for the measurement. This should be better than 5e-5 but not so demanding that an over/under-shoot measurement would take longer than a TDECQ measurement (even though the calculation afterwards is trivial in comparison).
Adjust the spec limit if these changes give different measured numbers.
Make similar changes in Clause 151.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

See comment #32.

Cl **140** *SC* **140.7.5b** *P* **46** *L* **10** # 13

Sorbara, Massimo — GlobalFoundries

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

The first sentence of the Transmitter over/under-shoot states the following: "The transmitter over/under-shoot percentage of each lane shall be within the limits given in Table 140–6 if measured using a test pattern specified for transmitter over/under-shoot in Table 140–10." I believe that the use of the specified test pattern is mandatory for measuring the over/undershoot, not optional.

SuggestedRemedy

Per the understanding that use of the test pattern specified in Table 140-6 for transmitter over/under-shoot, we propose to change 'if' to 'while': "The transmitter over/under-shoot percentage of each lane shall be within the limits given in Table 140–6 ifwhile measured using a test pattern specified for transmitter over/under-shoot in Table 140–10."

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The word "if" is used in all other PMD clauses. The reason for using "if" is to emphasize that none of these parameters are required to be measured, but if they are then the correct test pattern and method is to be used.

Cl **140** *SC* **140.7.5b** *P* **46** *L* **13** # 20

Dudek, Mike — Marvell

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

"Equalizer turned off" is not defined.

SuggestedRemedy

add to the end of the sentence "i.e. with the tap 2 coefficient set to 1 and all other tap coefficents set to zero". Also to the end of line 43. As an alternative this definition of "equalizer turned off" could be added to section 140.7.5 and these two sentences could be changed to ".... using the TDECQ reference receiver with the equalizer turned off (see 140.7.5)."

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change the sentence in 140.7.5b
from:
"Transmitter over/under-shoot is measured using the TDECQ reference receiver (see140.7.5) with the equalizer turned off."
to:
"Transmitter over/under-shoot is measured using the TDECQ reference receiver (see140.7.5) with the equalizer turned off, i.e. with one of the tap coefficients set to 1 and all other tap coefficients set to 0."

Cl **140** *SC* **140.7.5b** *P* **46** *L* **19** # 31

Dawe, Piers — Mellanox

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

Defining Overshoot = (Pmax - P3)/OMAouter * 100 is not very accurate because the way of measuring P3 isn't very accurate. Also, if the signal isn't very linear, it may not be measuring the right thing.

SuggestedRemedy

Change to ((Pmax - Paverage)/OMAouter -0.5) * 100. Similarly for Undershoot. Similarly in 151.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Pending Task Force presentation(s) and discussion.

Cl **140** *SC* **140.7.5b** *P* **46** *L* **27** # 32

Greg , LeCheminant — Keysight Technologies

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

The test definition in 140.7.5b needs to be updated to provide correct values when using the compliance SSPRQ pattern.

The current overshoot (OS) and undershoot (US) limits were determined experimentally by Rodes and Bhatt. OS/US measurements were made on a large set of transmitters. The transmitters were then each placed in a system to correlate transmitter performance to system level results including error floors and overload conditions. OS/US limits of 22% were set based on what levels of transmitter performance resulted in unacceptable system level performance. The OS/US values were based on a measurement using a square wave, while the system results used SSPRQ. The OS/US compliance pattern is SSPRQ, as the square wave yields optimistic OS/US values compared to the SSPRQ. To reconcile the differences between test patterns, the transmitters from the original experiment set were retested using the SSPRQ pattern. The OS/US test method was also modified using a hit ratio method, where a small percentage of samples are allowed to exist above the OS or below the US limit. This has the added benefit of providing consistent results independent of the waveform sample population. Rather than change the current spec limit of 22%, the hit ratio method is adapted to yield equivalent system level differentiation at the same 22% limit. That is, OS/US values observed using SSPRQ and hit ratio yield the same OS/US values as the square wave method used in the original results. Correlation with system level performance is maintained. By experimentation, the hit ratio that achieves this correlation was determined to be 1e-2.

SuggestedRemedy

change line 27 to

Pmax: is based on a 1e-2 hit ratio, where Pmax is the smallest power level that results in the number of samples above that level not exceeding the product of hit ratio and total number of observed samples, with all samples acquired in a single unit interval eye diagram

Change line 29 to

Pmin: is based on a 1e-2 hit ratio, where Pmin is the largest power level that results in the number of samples below that level not exceeding the product of hit ratio and total number of observed samples, with all samples acquired in a single unit interval eye diagram

Response *Response Status* **C**

ACCEPT.

Cl **140** *SC* **140.7.5c** *P* **46** *L* **38** # 14

Sorbara, Massimo — GlobalFoundries

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

The first sentence of the Transmitter peak-to-peak power states the following: "The transmitter peak-to-peak power of each lane shall be within the limits given in Table 140–6 if measured
using a test pattern specified for transmitter peak-to-peak power in Table 140–10." I believe that the use of the specified test pattern is mandatory for measuring the over/undershoot, not optional.

SuggestedRemedy

Per the understanding that use of the test pattern specified in Table 140-6 for transmitter over/under-shoot, we propose to change 'if' to 'while': "The transmitter peak-to-peak power of each lane shall be within the limits given in Table 140–6 ifwhile measured using a test pattern specified for transmitter peak-to-peak power in Table 140–10."

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The word "if" is used in all other PMD clauses. The reason for using "if" is to emphasize that none of these parameters are required to be measured, but if they are then the correct test pattern and method is to be used.

Cl **140** *SC* **140.7.5c** *P* **46** *L* **38** # 29

Dawe, Piers — Mellanox

Comment Type **TR** *Comment Status* **D** *peak-to-peak power*

The positive and negative peaks of an optical signal can be very different. An obvious example is a directly modulated laser, but other transmitters are not symmetric also. A receiver O to E circuit is not necessarily symmetrical either - the optical input is naturally "single ended". Therefore, the positive and negative peaks must be limited separately.

SuggestedRemedy

Change "Transmitter peak-to-peak power" which is Pmax - Pmin to "Transmitter power excursion", defined as max(Pmax-Paverage, Paverage-Pmin). Take 3 dB off the limits in Table 140-6.
Make similar changes in Clause 151.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Pending Task Force presentation(s) and discussion.

Cl **140** *SC* **140.7.9** *P* **47** *L* **17** # 21

Dudek, Mike — Marvell

Comment Type **E** *Comment Status* **D** *bucket*

To match the paragraph above (for DR) and improve clarity it would be better to change the order of the sentence.

SuggestedRemedy

Replace "The receiver sensitivity (OMAouter) shall be within the limits given in Table 140–7 for 100GBASE-FR1 and 100GBASE-LR1, if measured using a test pattern for receiver sensitivity in Table 140–10." with "The receiver sensitivity (OMAouter) for 100GBASE-FR1 and 100GBASE-LR1,shall be within the limits given in Table 140–7 if measured using a test pattern for receiver sensitivity in Table 140–10. Also change "Receiver sensitivity for 100GBASE-DR is informative" to "The receiver sensitivity (OMAouter) for 100GBASE-DR is informative"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **140** *SC* **140.7.9** *P* **47** *L* **41** # 5

Anslow, Pete — Self

Comment Type **E** *Comment Status* **A** *RS figure*

Shouldn't Figure 140-5 include something to indicate the region that is compliant?

SuggestedRemedy

Add "Meets constraints"

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Figure 140-5 has been replaced by three sets of figures (see comment #10), and the terms "min" and "max" are clearly indicated.

Cl **140** *SC* **140.10a.3** *P* **43** *L* **13** # 23

Dudek, Mike — Marvell

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

In order to provide inter-operability between 100GBASE-LR1 transmitter and 100GBASE-FR1 receiver the signal detect level threshold must be set appropriately relative to the signal received.

SuggestedRemedy

Change the average receive power (min) for 100GBASE-FR1 to -7.6dBm (or -7.4dBm if a different comment is accepted) and add to footnote b. The minimum receive power for 100GBASE-FR1 receiver occurs when a 100GBASE-LR1 transmitter has maximum loss per section 140.10a.3. Or alternatively bring 140. 5.4 into the standard and change the OK condition for 100GBASE-FR1 to Optical power at TP3 >= -7.6dBm (or -7.4dBm if a different comment is accepted) AND Compliant 100GBASE-R signal input.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Subclause 140.10a (Requirements for interoperation between 100GBASE-DR, 100GBASE-FR1 and 100GBASE-LR1) is informative and was added to provide guidance to end users on how to interconnect the different PMD types. It should not be the primary reason for changing PMD optical specifications.

The commenter has not provided data on the impact of the proposed change on the 100GBASE-FR1 receiver.

Update 5/26:

PROPOSED ACCEPT IN PRINCIPAL

See response to comment #24. If comment #24 is accepted, then the Average receive power (min) for 100GBASE-FR1 will be changed from -6.9dBm to -7.2dBm, and this is sufficient for interop between a 100GBASE-LR1 transmitter with an Average launch power (min) of -2dBm and a 100GBASE-FR1 receiver, with a maximum loss per section 140.10a.3. of 5.2dB.

Cl **140** *SC* **140.11.4.4** *P* **55** *L* **22** # 6

Anslow, Pete — Self

Comment Type **E** *Comment Status* **D** *bucket*

OM5a, OM5b, OM5c, and OM8a are all missing "N/A [ ]" in the Support column

SuggestedRemedy

Add "N/A [ ]" in the Support column to OM5a, OM5b, OM5c, and OM8a

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **140** *SC* **140.11.4.6** *P* **56** *L* **9** # 7

Anslow, Pete — Self

Comment Type **E** *Comment Status* **D** *bucket*

Item OC2 in the base standard has "Meets requirements specified in Table 140–12" so "Table 140–12" should be there in strikethrough font

SuggestedRemedy

Add "Table 140–12" in strikethrough font

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **140** *SC* **140.11.4.6** *P* **56** *L* **12** # 1

Shariff, Masood — CommScope

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

IEC 61753-1-1 has been withdrawn and superseeded by IEC 61753-1 Edition 2.0 August 1, 2018

SuggestedRemedy

Change to IEC 61753-1 Edition 2.0

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Change the reference for "IEC 61753-1:2007" to "IEC 61753-1:2018" in sub-clause 1.3.

Change "IEC 61753-1-1" to "IEC 61753-1" in 140.10.3 (need to import from IEEE Std 802.3cd-2018)

Change "IEC 61753-1-1" to "IEC 61753-1" in the table in 140.11.4.6

Change "IEC 61753-1-1" to "IEC 61753-1" in 151.11.3

Change "IEC 61753-1-1" to "IEC 61753-1" in the table in 151.13.4.7.

Cl **151** *SC* **151.7.3** *P* **67** *L* **27** # 11

Lewis, David — Lumentum

Comment Type **T** *Comment Status* **A** *RS figure*

It would be helpful to add a graph showing how OMAouter and RS vary with TDECQ and TECQ respectively.

SuggestedRemedy

Insert two graphs after Table 151-9 for 400GBASE-FR4 and 400GBASE-LR4-6, each showing the variation of Tx OMAouter and RS against TDECQ and TECQ respectively. A presentation in support of this comment will show the form of the two graphs.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See comment #10

Cl **151** *SC* **151.8.6** *P* **71** *L* **33** # 15

Sorbara, Massimo — GlobalFoundries

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

To help ease the reading, provide a definition of TECQ in a sentence at the beginning of the beginning of the clause. Then the remainder of the paragraph remains as is in specification of compliance cross-reference.

SuggestedRemedy

Add the following sentence at the beginning of sub-clause 151.8.6: "Transmitter eye closure for PAM4 (TECQ) is a measure of the optical transmitter's vertical eye closure occuring directly at the output of the optical transmitter."

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Adding the following sentence at the beginning of sub-clause 151.8.6:

"The transmitter eye closure for PAM4 (TECQ) is a measure of the optical transmitter's vertical eye closure at TP2."

Cl **151** *SC* **151.8.8** *P* **71** *L* **51** # 16

Sorbara, Massimo — GlobalFoundries

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

The first sentence of the Transmitter transition time states the following: "The transmitter transition time of each lane shall be within the limits given in Table 151–7 for 400GBASE-FR4 and 400GBASE-LR4-6, if measured using a test pattern specified for transmitter transition
time in Table 151–11." I believe that the use of the specified test pattern is mandatory for measuring the over/undershoot, not optional.

SuggestedRemedy

Change 'if' to 'while'

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The word "if" is used in all other PMD clauses. The reason for using "if" is to emphasize that none of these parameters are required to be measured, but if they are then the correct test pattern and method is to be used.

Cl **151** *SC* **151.8.9** *P* **72** *L* **16** # 17

Sorbara, Massimo — GlobalFoundries

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

The first sentence of the Transmitter over/under-shoot states the following: "The transmitter over/under-shoot percentage of each lane shall be within the limits given in Table 151-7 if measured using a test pattern specified for transmitter over/under-shoot in Table 151-11." I believe that the use of the specified test pattern is mandatory for measuring the over/undershoot, not optional.

SuggestedRemedy

Per the understanding that use of the test pattern specified in Table 140-6 for transmitter over/under-shoot, we propose to change 'if' to 'while': "The transmitter over/under-shoot percentage of each lane shall be within the limits given in Table 151-7 ifwhile measured using a test pattern specified for transmitter over/under-shoot in Table 151-11."

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The word "if" is used in all other PMD clauses. The reason for using "if" is to emphasize that none of these parameters are required to be measured, but if they are then the correct test pattern and method is to be used.

Cl **151** *SC* **151.8.9** *P* **72** *L* **20** # 25

Dudek, Mike — Marvell

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

"Equalizer turned off" is not defined.

SuggestedRemedy

add to the end of the sentence "i.e. with the tap 2 coefficient set to 1 and all other tap coefficents set to zero". Also to the end of line 49. As an alternative this definition of "equalizer turned off" could be added to section 151.8.5.4 and these two sentences could be changed to ".... using the TDECQ reference receiver with the equalizer turned off (see 151.8.5)."

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

Change the sentence in 151.8.9:
from:
"Transmitter over/under-shoot is measured using the TDECQ reference receiver (see 151.8.5) with the equalizer turned off."
to:
"Transmitter over/under-shoot is measured using the TDECQ reference receiver (see 151.8.5) with the equalizer turned off, i.e. with one of the tap coefficients set to 1 and all other tap coefficients set to 0."

Cl **151** *SC* **151.8.9** *P* **72** *L* **33** # 33

Greg , LeCheminant — Keysight Technologies

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

The test definition in 151.8.9 needs to be updated to provide correct values when using the compliance SSPRQ pattern.

The current overshoot (OS) and undershoot (US) limits were determined experimentally by Rodes and Bhatt. OS/US measurements were made on a large set of transmitters. The transmitters were then each placed in a system to correlate transmitter performance to system level results including error floors and overload conditions. OS/US limits of 22% were set based on what levels of transmitter performance resulted in unacceptable system level performance. The OS/US values were based on a measurement using a square wave, while the system results used SSPRQ. The OS/US compliance pattern is SSPRQ, as the square wave yields optimistic OS/US values compared to the SSPRQ. To reconcile the differences between test patterns, the transmitters from the original experiment set were retested using the SSPRQ pattern. The OS/US test method was also modified using a hit ratio method, where a small percentage of samples are allowed to exist above the OS or below the US limit. This has the added benefit of providing consistent results independent of the waveform sample population. Rather than change the current spec limit of 22%, the hit ratio method is adapted to yield equivalent system level differentiation at the same 22% limit. That is, OS/US values observed using SSPRQ and hit ratio yield the same OS/US values as the square wave method used in the original results. Correlation with system level performance is maintained. By experimentation, the hit ratio that achieves this correlation was determined to be 1e-2.

SuggestedRemedy

Change line 33:

Pmax: is based on a 1e-2 hit ratio, where Pmax is the smallest power level that results in the number of samples above that level not exceeding the product of hit ratio and total number of observed samples, with all samples acquired in a single unit interval eye diagram

Change line 35

Pmin: is based on a 1e-2 hit ratio, where Pmin is the largest power level that results in the number of samples below that level not exceeding the product of hit ratio and total number of observed samples, with all samples acquired in a single unit interval eye diagram

Response *Response Status* **C**

ACCEPT.

Cl **151** *SC* **151.8.10** *P* **72** *L* **44** # 18

Sorbara, Massimo GlobalFoundries

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

The first sentence of the Transmitter peak-to-peak power states the following: "The transmitter peak-to-peak power of each lane shall be within the limits given in Table 151-7 if measured
using a test pattern specified for transmitter peak-to-peak power in Table 151-11." I believe that the use of the specified test pattern is mandatory for measuring the over/undershoot, not optional.

SuggestedRemedy

Per the understanding that use of the test pattern specified in Table 140-6 for transmitter over/under-shoot, we propose to change 'if' to 'while': "The transmitter peak-to-peak power of each lane shall be within the limits given in Table 151-7 ifwhile measured using a test pattern specified for transmitter peak-to-peak power in Table 151-11."

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The word "if" is used in all other PMD clauses. The reason for using "if" is to emphasize that none of these parameters are required to be measured, but if they are then the correct test pattern and method is to be used.

Cl **151** *SC* **151.8.12** *P* **73** *L* # 27

Stassar, Peter Huawei

Comment Type **ER** *Comment Status* **A** *RS figure*

Since the receiver sensitivity has become normative the right place for Fig. 151-6 is no longer clause 151.8 on "Definition of optical parameters and measurement methods", but rather 151.7.

SuggestedRemedy

Move Fig. 151-6 to clause 151.7, split in a figure per PMD type and add curve for Tx OMA outer. Add clarifying text. Details in pending presentation for comment resolution meeting.

Response *Response Status* **C**

ACCEPT IN PRINCIPLE.

See comment #10.

Cl **151** *SC* **151.8.13.2** *P* **74** *L* **38** # 19

Dudek, Mike Marvell

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

It is not the optical return loss

SuggestedRemedy

Change "optical return loss" to "optical return loss tolerance"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **151** *SC* **151.11.1** *P* **78** *L* **3** # 2

Shariff, Masood CommScope

Comment Type **ER** *Comment Status* **D** *bucket*

Consistency with clause title and Table 151-14

SuggestedRemedy

From: fiber optic cable To: optical fiber cable

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.

Cl **151** *SC* **151.11.3** *P* **79** *L* **31** # 3

Shariff, Masood CommScope

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

IEC 61753-1-1 has been withdrawn and superseeded by IEC 61753-1 Edition 2.0 August 1, 2018

SuggestedRemedy

Change to IEC 61753-1 Edition 2.0

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

See comment #1

Cl **151** *SC* **151.12** *P* **79** *L* **49** # 26

Dudek, Mike Marvell

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

It is not possible for a single attenuator to be used to inter-operate between an LR4-6 transmitter and an FR4 receiver, one would have to know the FR4 channel loss and adjust the attenuator value based on that loss.

SuggestedRemedy

Consider increasing the Damage Threshold, OMA Max, and Average Power max for the FR4 receiver by 0.4dB and reduce the min loss in Table 141-16 to 0.3dB (could also increase OMA max and Average Power Max for the FR4 Tx by 0.4dB). This would enable a single attenuator of 0.4 +/-0.1 dB to be used for the interconnection.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

Subclause 151.12 (Requirements for interoperation between 400GBASE-LR4-6 and 400GBASE-FR4) is informative and was added to provide guidance to end users on how to interconnect the different PMD types. It should not be the primary reason for changing normative PMD optical specifications.

The commenter has provided no data on the impact of the proposed change to the 400GBASE-FR4 receiver.

Cl **151** *SC* **151.13.4.7** *P* **84** *L* **27** # 4

Shariff, Masood CommScope

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

IEC 61753-1-1 has been withdrawn and superseeded by IEC 61753-1 Edition 2.0 August 1, 2018

SuggestedRemedy

Change to IEC 61753-1 Edition 2.0

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

See comment #1