

IEEE P802.3cu D2.1 100 Gb/s per wavelength on SMF 1st Working Group recirculation ballot comments

Cl 140 SC 140.11.4.6 P56 L12 # 1 [REDACTED]  
 Shariff, Masood CommScope  
 Comment Type **TR** Comment Status **A** references  
 IEC 61753-1-1 has been withdrawn and superseded by IEC 61753-1 Edition 2.0 August 1, 2018  
 SuggestedRemedy  
 Change to IEC 61753-1 Edition 2.0  
 Response Response Status **C**  
 ACCEPT IN PRINCIPLE.  
 Add "IEC 61753-1" to 140.10.3 (need to import from IEEE Std 802.3cd-2018) for 100GBASE-FR1 and 100GBASE-LR1.  
 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 151.11.1 P78 L3 # 2 [REDACTED]  
 Shariff, Masood CommScope  
 Comment Type **ER** Comment Status **A** bucket  
 Consistency with clause title and Table 151-14  
 SuggestedRemedy  
 From: fiber optic cable To: optical fiber cable  
 Response Response Status **C**  
 ACCEPT.

Cl 151 SC 151.11.3 P79 L31 # 3 [REDACTED]  
 Shariff, Masood CommScope  
 Comment Type **TR** Comment Status **A** references  
 IEC 61753-1-1 has been withdrawn and superseded by IEC 61753-1 Edition 2.0 August 1, 2018  
 SuggestedRemedy  
 Change to IEC 61753-1 Edition 2.0  
 Response Response Status **C**  
 ACCEPT IN PRINCIPLE.  
 See comment #1

Cl 151 SC 151.13.4.7 P84 L27 # 4 [REDACTED]  
 Shariff, Masood CommScope  
 Comment Type **TR** Comment Status **A** references  
 IEC 61753-1-1 has been withdrawn and superseded by IEC 61753-1 Edition 2.0 August 1, 2018  
 SuggestedRemedy  
 Change to IEC 61753-1 Edition 2.0  
 Response Response Status **C**  
 ACCEPT IN PRINCIPLE.  
 See comment #1

Cl 140 SC 140.7.9 P47 L41 # 5 [REDACTED]  
 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 Figure 140-5 has been replaced by three sets of figures (see comment #10), and the terms "min" and "max" are clearly indicated.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 SC 140.11.4.4 P55 L22 # 6 [REDACTED]  
 Anslow, Pete Self  
 Comment Type **E** Comment Status **A** 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  
 Response Response Status **C**  
 ACCEPT.

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Cl 140 SC 140.11.4.6 P56 L9 # 7  
 Anslow, Pete Self  
 Comment Type E Comment Status A 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  
 Response Response Status C  
 ACCEPT.

Cl 140 SC 140.6.1 P41 L16 # 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](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](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.

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Cl 140 SC 140.6 P41 L39 # 9

Lewis, David Lumentum

Comment Type T Comment Status A 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.

Response Response Status C

ACCEPT IN PRINCIPLE.

Change "Transmitter peak-to-peak power (max)" for 100GBASE-LR1 in Table 140-6 from 5.8dBm to 5.5 dBm.

It is not clear that also changing "Outer Optical Modulation Amplitude (OMAouter) (max)" is necessary to protect the receiver.

Cl 140 SC 140.6.3 P44 L43 # 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 151 SC 151.7.3 P67 L27 # 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 140 SC 140.7.5a P46 L3 # 12

Sorbara, Massimo GlobalFoundries

Comment Type T Comment Status A 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 occurring directly at the output of the optical transmitter."

Response Response Status C

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 eye closure at TP2."

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CI 140 SC 140.7.5b P46 L10 # 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 Z

REJECT.

This comment was WITHDRAWN by the commenter.

CI 140 SC 140.7.5c P46 L38 # 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 Z

REJECT.

This comment was WITHDRAWN by the commenter.

CI 151 SC 151.8.6 P71 L33 # 15

Sorbara, Massimo GlobalFoundries

Comment Type T Comment Status A 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 occurring directly at the output of the optical transmitter."

Response Response Status C

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 eye closure at TP2."

CI 151 SC 151.8.8 P71 L51 # 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 Z

REJECT.

This comment was WITHDRAWN by the commenter.

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Cl 151 SC 151.8.9 P72 L16 # 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 Z

REJECT.

This comment was WITHDRAWN by the commenter.

Cl 151 SC 151.8.10 P72 L44 # 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 Z

REJECT.

This comment was WITHDRAWN by the commenter.

Cl 151 SC 151.8.13.2 P74 L38 # 19

Dudek, Mike

Marvell

Comment Type T Comment Status A bucket

It is not the optical return loss

SuggestedRemedy

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

Response Response Status C

ACCEPT.

Cl 140 SC 140.7.5b P46 L13 # 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 coefficients 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.

See comment #28

Cl 140 SC 140.7.9 P47 L17 # 21

Dudek, Mike

Marvell

Comment Type E Comment Status A 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"

Response Response Status C

ACCEPT.

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Cl 140 SC 140.6.1 P41 L37 # 22

Dudek, Mike Marvell  
 Comment Type T Comment Status A 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."

Response Response Status C

ACCEPT IN PRINCIPLE.

A straw poll was taken to confirm support for the proposed reponse.

Straw Poll #1:

I am supportive of the proposed response to comment #22 as written.  
 Y: 16, N:2, A:6

Based on the analysis captured in lewis\_3cu\_01\_060220 make the following changes to the draft.

Table 140-6.  
 Change the Average launch power (min) for 100GBASE-FR1 from -2.9dBm to -3.1dbm

Table 140-7.  
 Change the Average receive power (min) for 100GBASE-FR1 from -6.9dBm to -7.1dBm

Section 140.10.1a:  
 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."

Table 140-15 "Channel insertion loss requirements for interoperation between 100GBASE-LR1 and 100GBASE-DR":  
 -For LR1 transmitter to DR receiver, change max loss from 4.1 to 4 dB  
 -For DR transmitter to LR1 receiver, change max loss from 4.8 to 5.2 dB

Table 140-16 "Channel insertion loss requirements for interoperation between 100GBASE-LR1 and 100GBASE-FR1":  
 -For LR1 transmitter to FR1 receiver, no change  
 -For FR1 transmitter to LR1 receiver, change max loss from 5.6 to 5.1 dB

Table 151-16 "Channel insertion loss requirements for interoperation between 400GBASE-LR4-6 and 400GBASE-FR4":  
 -For LR4-6 transmitter to FR4 receiver, no change  
 -For FR4 transmitter to LR4-6 receiver, change max loss from 6.1 to 5.8 dB

Cl 140 SC 140.10a.3 P43 L13 # 23

Dudek, Mike Marvell  
 Comment Type T Comment Status A 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.

Response Response Status C

ACCEPT IN PRINCIPLE.

See comment #22.

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Cl 140 SC 140.6.1 P41 L37 # 24

Dudek, Mike

Marvell

Comment Type T Comment Status A 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.

Response Response Status C

ACCEPT IN PRINCIPLE.

See comment #22.

Cl 151 SC 151.8.9 P72 L20 # 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 coefficients 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.

See comment #28.

Cl 151 SC 151.12 P79 L49 # 26

Dudek, Mike

Marvell

Comment Type T Comment Status R 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.

Response Response Status C

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 151.8.12 P73 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.

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Cl 140 SC 140.7.5b P46 L8 # 28

Dawe, Piers Mellanox

Comment Type TR Comment Status A 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  
..."

*Suggested Remedy*

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.

Response Response Status C

ACCEPT IN PRINCIPLE.

The final responses to comments #32 and #33 partially address the suggested remedy from the commenter (hit ratio aspect of the measurement).

However in addition the commenter has highlighted an oversight in implementing the final response to comment #47 against D2.0 ([http://www.ieee802.org/3/cu/comments/8023cu\\_D20\\_final\\_comment\\_responses\\_by\\_ID.pdf](http://www.ieee802.org/3/cu/comments/8023cu_D20_final_comment_responses_by_ID.pdf)), and specifically that "Transmitter over/under-shoot" should be measured at both TP2 and TP3 in accordance with slide 6 of zivny\_3cu\_01\_032420.

The following changes correct this oversight, and also address comments #20 and #25.

Change the second paragraph of 140.7.5b,  
From:

"Transmitter over/under-shoot is measured using the TDECQ reference receiver (see 140.7.5) with the equalizer turned off."

To:  
"Transmitter over/under-shoot is measured using the waveforms captured for the TDECQ test (see 140.7.5) and the waveform captured for the TECQ test (see 140.7.5a), but without the reference equalizer being applied in each case".

Change the second paragraph of 140.7.5c,  
From:

"Transmitter peak-to-peak power is the difference of the maximum observed power at any location of the unequalized waveform and the minimum observed power at any location of the unequalized waveform. It is measured using the TDECQ reference receiver (see 140.7.5), with the equalizer turned off.."  
to:

"Transmitter peak-to-peak power is measured using the waveforms captured for the TDECQ test (see 140.7.5) and the waveform captured for the TECQ test (see 140.7.5a), but without the reference equalizer being applied in each case". Transmitter peak-to-peak power is the difference between Pmax and Pmin, with Pmax and Pmin defined in 140.7.5b

Change the second paragraph of 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 waveforms captured for the TDECQ test (see 151.8.5) and the waveform captured for the TECQ test (see 151.8.6), but without the reference equalizer being applied in each case".

Change the second paragraph of 151.8.10,  
From:

"Transmitter peak-to-peak power is the difference of the maximum observed power at any location of the unequalized waveform and the minimum observed power at any location of the unequalized waveform. It is measured using the TDECQ reference receiver (see 151.8.5), with the equalizer turned off.."  
to:

"Transmitter peak-to-peak power is measured using the waveforms captured for the TDECQ test (see 151.8.5) and the waveform captured for the TECQ test (see 151.8.10), but without the reference equalizer being applied in each case". Transmitter peak-to-peak power is the difference between Pmax and Pmin, with Pmax and Pmin defined in 151.8.9.



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Cl 140 SC 140.7.5c P46 L38 # 29

Dawe, Piers

Mellanox

Comment Type TR Comment Status R 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.

Response Response Status U

REJECT.

The measurement methodology and associated limits in D2.1 are based on measured data presented in rodes\_3cu\_01\_032420 and associated presentations.

Changing the test methodology and limits would require supporting data. There is no consensus to make the proposed change at this time.

Cl 140 SC 140.6.1 P41 L51 # 30

Dawe, Piers

Mellanox

Comment Type TR Comment Status R 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.

Response Response Status U

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)

IEEE P802.3cu D2.1 100 Gb/s per wavelength on SMF 1st Working Group recirculation ballot comments

Cl 140 SC 140.7.5b P46 L19 # 31

Dawe, Piers Mellanox

Comment Type T Comment Status R overshoot

Defining Overshoot =  $(P_{max} - P_3)/OMA_{outer} * 100$  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  $((P_{max} - P_{average})/OMA_{outer} - 0.5) * 100$ . Similarly for Undershoot. Similarly in 151.

Response Response Status C

REJECT.

The measurement methodology and associated limits in D2.1 are based on measured data presented in rodes\_3cu\_01\_032420 and associated presentations.

Changing the test methodology and limits would require supporting data. There is no consensus to make the proposed change at this time.

Cl 140 SC 140.7.5b P46 L27 # 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.

IEEE P802.3cu D2.1 100 Gb/s per wavelength on SMF 1st Working Group recirculation ballot comments

Cl 151 SC 151.8.9 P72 L33 # 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  $1e-2$ .

*Suggested Remedy*

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.