802.3dj D1.2 Comment Resolution Optical Track

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Introduction

- This slide package was assembled by the 802.3dj editorial team to provide background and detailed resolutions to aid in comment resolution.
- Specifically, these slides are for the various optical track comments.

Optical Return Loss for 800GBASE-FR4-500 Comment 214

Cl 181	*SC* 181.8	*P* 432	*L* 17	# 214

Stassar, Peter — Huawei

Comment Type TR *Comment Status* X

The value for optical return loss (ORL) is the same as Tx optical return loss tolerance, which is wrong. The ORL should be the same as for 100GBASE-DR and 200GBASE-DR1.

SuggestedRemedy

In Table 181-8 change optical return loss to 27 dB minimum

Proposed Response *Response Status* O

Both FR4 and FR4-500 are on duplex links (single fiber each direction), and also 200GBASE-DR1 and 200GBASE-DR1-2

There are many established specifications for using 25 dB over 2 km duplex links, such as 200GBASE-FR4, 100GBASE-FR1, 50GBASE-FR and 800GBASE-FR4.

There is one precedent for a 500 m duplex link in 100GBASE-DR for 27 dB. The same value has been used for the new 200GBASE-DR1 and there is no technical reason why for FR4-500 the ORL should be different.

Link assumptions (initiated by Paul Kolesar during the bs project) for 500 m and 2 km are different regarding loss and number of connectors.

The 27 dB ORL for 100GBASE-DR was established in the cd project in March 2017 with wide support.

The related presentation can be found at: https://www.ieee802.org/3/cd/public/Mar17/traverso_3cd_01_0317.pdf

Authored by Matt Traverso, Marco Mazzini and Hai-Feng Liu, and supported by Gary Nicoll, Brian Welch, Mike Dudek and Paul Kolesar.

Optical Channel for 800GBASE-FR4/LR4 Comments 215 and 216

Cl **183** *SC* **183.9.5.1** *P* **491** *L* **11** # 126

Brown, Matt — Alphawave Semi

Comment Type **T** *Comment Status* **D** *Optical channel*

In Table 183-5... In the column labelled "Insertion loss" the "value" provided for both PMD types is "Minimum". It is not evident what this means. Perhaps it means the minimum insertion loss specified in Table 183-9 "Optical channel characteristics". If that is that case then either use this value (0 dB) or reference this table (e.g., with a footnote). If it means something else then provide a bit more context, perhaps in a footnote.

SuggestedRemedy

Clarify "Minimum" in Table 183-15 per comment.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
All previous PAM4 optical clauses use the same text.
However, it is not defined sufficiently well for a reader of this document to understand what "MINIMUM" means.
The term "Minimum" in the Insertion Loss column means to test TDECQ with a low value of insertion loss, however, it doesn't have to be 0 dB, it just needs to be a small enough value to not stress the sensitivity on the O/E. Footnote b was intended to clarify this.
However, the text in footnote be could be improve to better help the reader of this document.
For task force discussion.

Cl **183** *SC* **183.9.5.1** *P* **491** *L* **21** # 125

Brown, Matt — Alphawave Semi

Comment Type **T** *Comment Status* **D** *Optical channel*

Table 183-15 footnote b states "There is no intent to stress the sensitivity of the O/E converter associated with the oscilloscope." 183.9.5.1 specifies characteristics of a test channel to be used for transmitter compliance testing. It seems rather obvious that this isn't about stress testing the scope O/E converter. Is there something subtle that's missing in this statement?

SuggestedRemedy

Either (a) delete footnote c or (b) provide missing context.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Footnote b was intended to clarify the meaning of "minimum" in the insertion column.

Resolve using the response to comment #126.

Optical Channel for 800GBASE-FR4/LR4 Comments 215 and 216

Table 183–15—Transmitter compliance channel specifications

PMD type	Lane	Dispersion[a] (ps/nm)		Insertion loss[b]	Optical return loss[c] (dB)	Max mean DGD (ps)
		Minimum	Maximum			
800GBASE-FR4	L_0	$0.203\times(\lambda - 1271) - 9.96$	$0.187\times(\lambda - 1271) - 5.81$	Minimum	17.1	0.8
	L_1	$0.194\times(\lambda - 1291) - 5.99$	$0.183\times(\lambda - 1291) - 2.12$			
	L_2	$0.185\times(\lambda - 1311) - 2.22$	$0.177\times(\lambda - 1311) + 1.47$			
	L_3	$0.176\times(\lambda - 1331) + 1.38$	$0.169\times(\lambda - 1331) + 4.92$			
800GBASE-LR4	All	$0.225\times\lambda\times[1-(1321.1/\lambda)^4]$	$0.2175\times\lambda\times[1-(1307/\lambda)^4]$	Minimum	15.6	0.8

[a] The dispersion is measured for the wavelength of the transmitter lane under test (λ in nm). The coefficient assumes 2 km for 800GBASE-FR4 and 10 km for 800GBASE-LR4. The dispersion specifications are based on the statistical link design methodology documented in ITU-T REC G.652, Appendix I, and the optical channel characteristics methodology described in Annex TBD.

[b] There is no intent to stress the sensitivity of the O/E converter associated with the oscilloscope.

[c] The optical return loss is applied at TP2.

Proposed response to comment #126: Update footnote b to read “The value Minimum implies that the test channel insertion loss should be sufficient low that it does not significantly stress the test receiver."

Optical test patterns, part 1
Comment #139

Cl **182** *SC* **182.9.1** *P* **463** *L* **9** # **139**

Brown, Matt — Alphawave Semi

Comment Type **T** *Comment Status* **D** *(bucket)*

Table 182-16. Test pattern 3, currently PRBS31Q is defined for use for receiver sensitivity. Since the PMD types defined in Clause 182 use Inner FEC, the PRBS31Q should be encoded with Inner FEC, similar to Pattern 5.

SuggestedRemedy

In Table 182-16, change test pattern 4 from "PRBS31Q" to "PRBS31Q encoded by the 200GBASE-R, 400GBASE-R, 800GBASE-R, or 1.6TBASE-R Inner FEC" and update the defining references.
Make the same change in Table 183-12.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Implement the suggested remedy with editorial license

Optical test patterns, part 2
Comment #139

Table 183–12—Test patterns

Pattern	Pattern description	Defined in
Square wave	Square wave (8 threes, 8 zeros)	177.7.2
3	PRBS31Q	120.5.11.2.3
4	PRBS13Q	120.5.11.2.2
5	Scrambled idle test pattern encoded by the 800GBASE-R Inner FEC	119.2.4.9, 172.2.4.11, 175.2.4.11, 177.4
6	SSPRQ	177.7.1

Editor's note: It is not clear whether PRBS31Q and PRBS13Q (as direct inputs to the PMD) are necessary patterns for this PMD. Input from task force requested. Perhaps a PRBS31Q (generated by the PMA above the Inner FEC) encoded by the Inner FEC would be helpful for testing a module in isolation.

Table 183–13—Mapping of parameters to test patterns and related subclauses

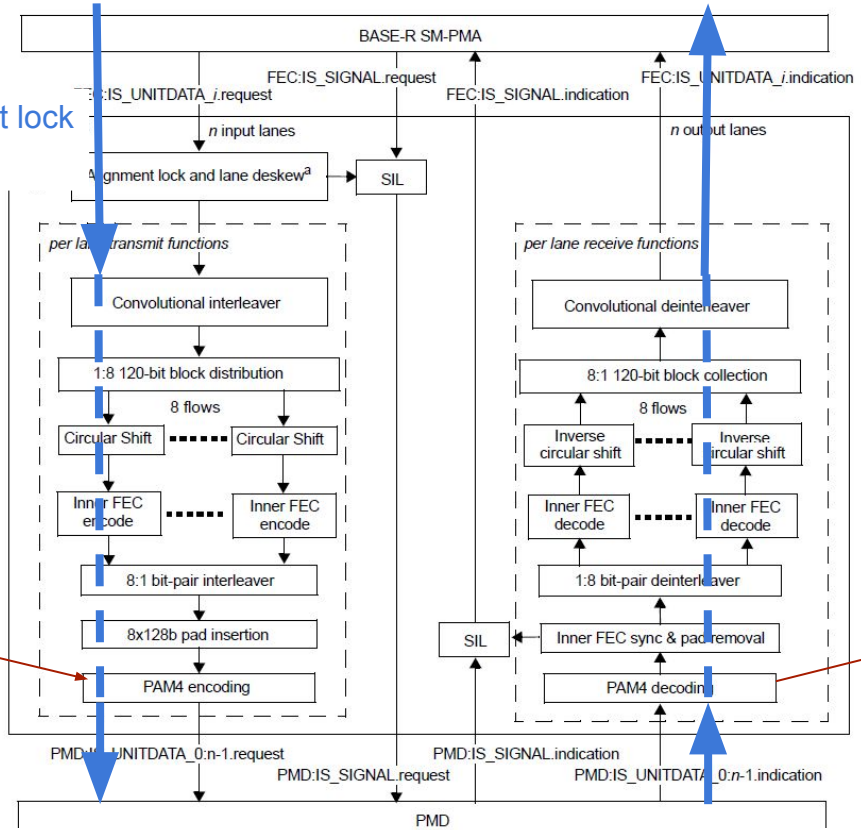
Parameter	Pattern	Related subclause
Wavelength	Square wave, 3, 4, 5, 6 or valid 800GBASE-R signal	183.9.2
Side mode suppression ratio	3, 5, 6 or valid 800GBASE-R signal	183.9.2
Average optical power	3, 5, 6 or valid 800GBASE-R signal	183.9.3
Outer Optical Modulation Amplitude (OMA_{outer})	4 or 6	183.9.4
Transmitter and dispersion eye closure for PAM4 (TDECQ)	6	183.9.5
Transmitter eye closure for PAM4 (TECQ)	6	183.9.6
Over/under-shoot	6	183.9.7
Transmitter power excursion	6	183.9.8
Extinction ratio	4 or 6	183.9.9
Transmitter transition time	Square wave or 6	183.9.10
$RIN_{xx}OMA$	4 or 6	183.9.11
Receiver sensitivity	3 or 5	183.9.12
Stressed receiver conformance test signal calibration	6	183.9.13
Stressed receiver sensitivity	3 or 5	183.9.13

Comment #139
Part 3

PRBS31 generator in PMA
(already specified), per 200G lane

PRBS31 checker with block error
counters in PMA
(already specified), per 200G lane

Bypass alignment lock
and deskew



Test pattern generators:
PRBS31Q
PRBS13Q
SSPRQ
Square wave

Test pattern checker:
PRBS31Q?

Comment #139

Proposed changes:

Add PRBS31Q, PRBS13Q, SSPRQ, square wave pattern generators at the output of the Inner FEC transmit path.

Consider adding PRBS31Q checker at the Inner FEC Rx path input.

Add pattern 8, which is PRBS31 generated at PMA, processed by the Inner FEC transmit path, except bypassing alignment lock and deskew in the Inner FEC transmit path.

Assuming that the PRBS31 generator and PRBS31 checker (with block error ratio counters) are defined in the PMA. See comment #135.

Cl **176** *SC* **176.7.4** *P* **281** *L* **8** # 135

Brown, Matt — Alphawave Semi

Comment Type **T** *Comment Status* **D** *pma counters*

176A.5 defines test methodologies for measuring block errors without the use of a PCS. This methodology generates and check a PRBS31Q sequence in the PMA. New counters are required for each lane attached to a PMD or AUI component associated with the PRBS31Q error checker.

SuggestedRemedy

Define new counters as summarized in 174A.6.1.1.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The comment refers to 176A.5, but should rather refer to 174A.6.
Pending review of slide(s) for comment #135 in the following editorial contribution:
https://www.ieee802.org/3/dj/public/24_11/brown_3dj_03_2411.pdf