802.3dj D1.1 Comment Resolution Common Topics

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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 common (not one specific track) comments.

Signaling rate

Comments 118, 367

Signaling rate Comment 118

Cl 176E SC 176E.4.4 P699 L9 # 118

Ghiasi, Ali — Ghiasi Quantum/Marvell

Comment Type TR *Comment Status* D *signaling rate*

Supporting +/- 100 PPM is Onerous and an unlikly use case as it means a system with 50G IO, by haivng to support +/-100 ppm one can't take advnatge of +/-50 ppm. All the optical PMDs currently only support +/-50 PPM so supporting +/-100 ppm on the eletrical interfacs has limited benefit. Multi-rate electrical SerDes that support 200G/100G/50G they will support 100 PPM and will interoperate with legacy 50G SerDes, so there is no need to add 50 PPM support to the 200G SerDes.

SuggestedRemedy

Remove support for +/- 100 PPM here and for all 200G PMA/PMDs throughout the draft, see:
176D.3.4
176E.4.6
176E.4.5
179.9.5
178.9.3

Proposed Response *Response Status* W

PROPOSED REJECT.
A possible scenario that requires more than 50 PPM is when a deployed host with a 200GAUI-4 or 400GAUI-8 electrical interface (50 Gb/s per lane) is equipped with a new 1-lane 200G module or 2-lane 400G module. The host's frequency may deviate up to 100 ppm from the nominal. The module's optical output and the remote module's electrical output are synchronous and will have the same frequency deviation.

If support for 100 ppm deviation is removed as suggested, some existing hosts may not be able to use new modules.

The statement "All the optical PMDs currently only support +/- 50 ppm" raises a different concern. An optical PMD need to support the frequency range of the AUI that drives it and for 200G and 400G this can be +/- 100 ppm. This may require changes in clauses 180 and 182 (other clauses do not define 200G or 400G PMDs).

Table 176E–2—Summary of module output specifications at TP4

Parameter	Reference	Value	Units
Signaling rate, each lane (range)[a] 200GAUI-1, 400GAUI-2 800GAUI-4, 1.6TAUI-8		 106.25 ± 100 ppm 106.25 ± 50 ppm	 GBd GBd

[a] The signaling rate is derived from the PMD receiver input.

Table 180–7—200GBASE-DR1, 400GBASE-DR2, 800GBASE-DR4, and 1.6TBASE-DR8 transmit characteristics

Description	200GBASE-DR1	~~400GBASE-DR2~~ ~~800GBASE-DR4~~ 1.6TBASE-DR8	Unit
Signaling rate, each lane (range)	106.25 ± 50 ppm		GBd

Table 180–8—200GBASE-DR1, 400GBASE-DR2, 800GBASE-DR4, and 1.6TBASE-DR8 receive characteristics

Description	Value	Unit
Signaling rate, each lane (range)	106.25 ± 50 ppm	GBd

To address clauses 180 and 182, footnotes as in electrical clauses can be added. Comment #367 addresses these footnotes.

Signaling rate Comment 367

Cl 178 SC 178.9.2 P 301 L 50 # 367

Ran, Adee Cisco Systems, Inc.

Comment Type **TR** *Comment Status* **D** *Signaling rate*

Footnote a is very specific about the cases where the rule applies, which are the majority of expected practical implementations; there are few exceptions, and they are atypical (200GBASE-KR1 or 400GBASE-KR2 PMD in a PHY that includes a chip-to-chip interface defined in Annex 120B or Annex 120D).
It would be simpler to understand if the footnote addressed the exceptions instead.

The first editor's note below the table suggests better wording.

Also applies to clause 179, Annex 176D, and Annex 176E.

SuggestedRemedy

Replace the text in footnote a with the text in the editor's note.
Delete the editor's note.

Implement in 179, 176D and 176E with appropriate changes.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT.
[Editor's note: This comment proposes an update to a technically complete area in the draft]

Table 178–6—Summary of transmitter specifications at TP0v

Parameter	Reference	Value	Units
Signaling rate, each lane (range)		106.25 ± 50 ppm[a]	GBd

[a] For a 200GBASE-KR1 or 400GBASE-KR2 PMD in the same package as the PCS sublayer or for any 800GBASE-KR4 or 1.6TBASE-KR8 PMD. In other cases, the signaling rate is derived from the input to the PMD transmit function

Editor's recommendation: change footnote a to the alternative proposed in the editor's note.

Editor's note (to be removed by D2.0):
Alternative text for footnote a: This requirement does not hold for a 200GBASE-KR1 or 400GBASE-KR2 PMD in a PHY that includes a chip-to-chip interface defined in Annex 120B or Annex 120D. For these cases, the signaling rate is derived from the signaling rate of the chip-to-chip interface.

Add similar footnotes in the Transmit characteristics tables in clauses 180 and 182, with the respective PMD names, and including the C2M interfaces.

Table 178–9—Summary of receiver specifications at TP5v

Parameter	Reference	Value	Units
Signaling rate, each lane (range)	178.9.3.2	106.25 ± 100 ppm	GBd
Interference tolerance	178.9.3.3	Table 178–10	—
Jitter tolerance	178.9.3.4	Table 179–17	—
Difference effective return loss, *dERL* (min)	178.9.3.5	TBD	dB
Differential-mode to common-mode return loss, *RLcd*	178.9.3.6	Equation (178–4)	dB
NOTE—For 200GBASE-KR1 or 400GBASE-KR2, although the PMD transmitter is specified with a signaling rate range of ±50 ppm when in the same package as the PCS, the signaling rate range may be ±100 ppm when derived from an intermediate interface (e.g., 200GAUI-4).			

Electrical clauses include informative NOTE for receiver specifications.

Add similar NOTEs in Receive characteristics tables in clauses 180 and 182, with the respective PMD names.

Error ratio: BER_{added}

Comments 137, 143, 164, 165, 166, 316, 361

BER_{added} for AUIs Comments 137, 143

Cl **176D** SC **176D.2.1** P**676** L**35** # 137

Dudek, Mike — Marvell

Comment Type **TR** *Comment Status* **D** *error ratio*

The value of BERadded is incorrect. It should be the KP4 random error correction capability minus the allowed BER for the AUI. Assuming the adopted DER of 0.67e-5, and an assumed worst case error extension for FEC symbol errors of 0.6 (see Dudek_3dj_01_2309) the random BER allowance is only 0.8e-5.
Anslow_3ck_adhoc_01_072518 slide 7 is showing the KP4 random error correction capability as 3.2e-4. however I am not sure this number is correct and the number needs to be confirmed.

SuggestedRemedy

Change 2.7e-4 to 3.12e-4. Add an editor's note that the value is to be confirmed.

Cl **176E** SC **176E.2** P**695** L**3** # 143

Dudek, Mike — Marvell

Comment Type **TR** *Comment Status* **D** *error ratio*

The value of BERadded is incorrect. It should be the KP4 random error correction capability minus the allowed BER for the AUI. Assuming the adopted DER of 2e-5, and an assumed worst case error extension for FEC symbol errors of 0.6 (see Dudek_3dj_01_2309) the random BER allowance is 2.4e-5.
Anslow_3ck_adhoc_01_072518 slide 7 is showing the KP4 random error correction capability as 3.2e-4. however I am not sure this number is correct and the number needs to be confirmed.

SuggestedRemedy

Change 2.7e-4 to 2.96e-4. Add an editor's note that the value is to be confirmed.

BERadded for an AUI should be **the KP4 random BER correction capability** (RBCC) for the whole path minus **the random BER allowance** for the AUI.
In 174A.5, the PHY-to-PHY path is allocated FLR=6e-11 (2e-12 is allocated to the extenders).

For an FLR of 6e-11 (with 64-octet frames and minimum IPG), with 4-way interleaving, the CER is 6e-11/4.125=1.45e-11 (see opsasnick_3df_logic_220630a slide 4). This yields RBCC=**2.921e-4**.

- Calculation can be done in Excel using =1-BINOM.DIST(15, 544, 1-(1-RBCC)^10, TRUE)
- Alternatively in Wolfram Alpha using SER=1-(1-RBCC)^10=2.917e-3

3.2e-4 (which appears on slide 5 of anslow_3ck_adhoc_01_072518) is the RBCC for the KP FEC without interleaving for FLR=6.2e-11 (CER=6.2e-11/1.125=5.5e-11).

The random BER allowance for the AUI-C2M is based on the adopted DER_0=2e-5 which corresponds to a random **initial error** probability of 1.5e-5 (=3/4*DER_0).

It is arguable whether the allowance should account for DFE error propagation, or should assume that it is compensated for by margin (like other implementation effects). Considering both options:

A. If DFE error propagation in AUI-C2M is assumed to be compensated for by margin, then the AUI-C2M random BER allowance should be taken as **1.5e-5**.

B. If DFE error propagation is to be accounted for, the referenced presentation dudek_3dj_01_2309 calculates the probability of a random initial error to impact two FEC symbols that are from different codewords, with maximum error propagation, as 0.6 (assuming precoding is used). Results without precoding were shown to be similar (although calculation is less straightforward). This corresponds to an increase of 60% in the initial BER, so the AUI-C2M random BER allowance should be taken as 1.5e-5*1.6=**2.4e-5**.

For AUI-C2C (comment #137), the corresponding values are **5e-6** for option A and **8e-6** for option B.

This yields the BER_{added} values in the table below.

	BER_{added}, AUI-C2M	BER_{added}, AUI-C2C
Option A (allocation does not include DFE EP)	2.921e-4 - 1.5e-5 = 2.771e-4	2.921e-4 - 5e-6 = 2.871e-4
Option B (allocation includes DFE EP)	2.921e-4 - 2.4e-5 = 2.681e-4	2.921e-4 - 8e-6 = 2.841e-4

Editors' recommendation: Use BERadded values based on "Option B" above, with 2 significant digits, rounded upwards:

- **2.9e-4** for C2C (comment #137)
- **2.7e-4** for C2M (comment #143)

BER_{added} for PMDs Comments 361, 166

Cl **178**	*SC* **178.2**	*P* **296**	*L* **50**	# 361

Ran, Adee — Cisco Systems, Inc.

Comment Type **TR** *Comment Status* **D** *error ratio*

"BERadded equal to TBD"
For a KR PMD the additional error allocation should account for possible AUI-C2C instances in the link. The allocation for AUI-C2C is 1/4 of "the total allocation for 200Gbps/lane AUIs within a PHY" which is 2e-5. Therefore for a single AUI-C2C it is 5e-6.

For a PMD in the same package as the PCS, the PHY-to-PHY link can include one AUI-C2C instance in the link partner. Therefore the additional BER allocation should be 5e-6.

For a PMD not in the same package as the PCS, the PHY-to-PHY link can include two AUI-C2C instances. Therefore the additional BER allocation should be 1e-5.

A PMD product is clearly either packaged with a PCS or not, so it is should be ok to have different specifications for the two cases.

Similarly in 179.2 for a CR PHY.

SuggestedRemedy

Specify BERadded as 5e-6 for a PMD in the same package as the PCS, and 1e-5 for a PMD not in the same package as the PCS.

Implement similarly in 179.2.

When tested as a PMD: BER_{added} = 2*8e-6 = **1.6e-5**
When tested as a PHY: BER_{added} = **8e-6**

Cl **180**	*SC* **180.2**	*P* **373**	*L* **48**	# 166

Dudek, Mike — Marvell

Comment Type **TR** *Comment Status* **D** *error ratio*

For the optical Phys two C2C AUI's and two C2M are budgetted in the complete link. Assuming the adopted DER for one C2C plus one C2M AUI pf 2.67e-5, and an assumed worst case error extension for FEC symbol errors of 0.6 (see Dudek_3dj_01_2309) the random BER allowance for one C2C plus one C2M link is 4.27E-5.

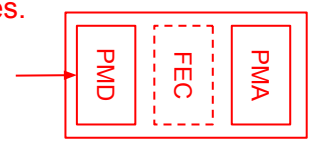
SuggestedRemedy

Change the "BERadded to 8.6e-5 here and in the equivalent places in clauses 181, 182, and 183.

When tested as a PMD: BER_{added} = 2*(2.4e-5 + 8e-6) = **6.4e-5**
When tested as a PHY: BER_{added} = 2.4e-5 + 8e-6 = **3.2e-5**

For PMDs, performance should be specified at the adjacent PMA. This is required in practice to test optical modules.

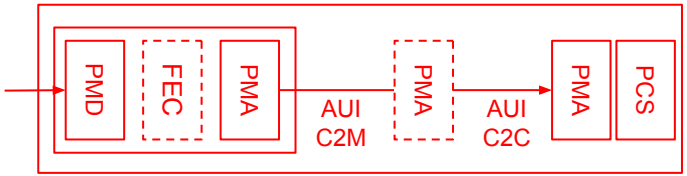
In this test, BER_{added} should be based on AUI error allocations for both the local host and the remote host.



DUT: optical moule

But often it is desirable to test a full PHY:

- For optical PMDs: an optical module plugged into a host that includes AUI-C2M and possibly AUI-C2C.
- For CR PMDs: a host port is tested for compliance, it may or may not have AUI-C2C behind the PMD.
- KR PMDs can be either integrated with the PCS or separated by AUI-C2C.



DUT: PHY

When testing a PHY it may be more practical to perform tests using error counters at the PCS. If this is done, BER_{added} should only include allocation for the link partner - one AUI-C2C, and for optical PMDs one AUI-C2M.

This is not a new concept - it is similar to the "For a complete Physical Layer" statements in existing PMD clauses.

Editors' recommendation:
Use the indicated responses on the left (which assume option B in the previous slide) with a short explanation of the values of BERadded in each case.

BER_{added} for PMDs Comments 164, 165, 316

CI 178 SC 178.2 P 296 L 50 # 164

Dudek, Mike — Marvell

Comment Type TR *Comment Status* D *error ratio*

For the KR Phys two chip to chip AUI's are budgetted in the complete link. Assuming the adopted DER of 0.67e-5, and an assumed worst case error extension for FEC symbol errors of 0.6 (see Dudek_3dj_01_2309) the random BER allowance for one C2C AUI is 0.8e-5.

SuggestedRemedy

Change the TBD for BERadded to1.6e-5

Resolve using the response to #361

CI 179 SC 179.2 P 327 L 50 # 165

Dudek, Mike — Marvell

Comment Type TR *Comment Status* D *error ratio*

For the CR Phys two chip to chip AUI's are budgetted in the complete link. Assuming the adopted DER of 0.67e-5, and an assumed worst case error extension for FEC symbol errors of 0.6 (see Dudek_3dj_01_2309) the random BER allowance for one C2C AUI is 0.8e-5.

SuggestedRemedy

Change the TBD for BERadded to1.6e-5

Resolve using the response to #361

CI 182 SC 182.2 P 424 L 39 # 316

Mi, Guangcan — Huawei Technologies Co., Ltd

Comment Type TR *Comment Status* D *error ratio*

What does the 4e-5 of BERadded corresponds to is unclear.

SuggestedRemedy

In 174A.6, the BERadded was said to represent random BER of other part of the link. In the case of optical PMDs, the most relevant is assumed to be AUI. Is this 4e-5 representing two two-part AUI link at the transmit and receive end of the link? Needs to first confirm the origin of this value, then add appropriate text to this section.
Further, should this value be different for FECo and FECi types of PMD?
this comment also applies to CL 180.

The BERadded value is the same for PMDs that use inner FEC and for PMDs that do not.
Resolve using the response to #166.

Editors' recommendation:
Use the indicated responses.