Comment responses for #165, #170, #327, #347

David Ofelt - HPE
Gary Nicholl - Cisco
Eugene Opsasnick - Broadcom
Jeff Slavick - Broadcom
Kapil Shrikhande - Marvell
Mike Dudek - Marvell

Related comments

Cl **176B** SC **176B.3** P **772** L **50** # 165

Ofelt, David — Juniper Networks / HPE

Comment Type **TR** *Comment Status* **X**

This sub-clause is "Special case for 200GBASE-R, 400GBASE-R, and 800GBASE-R PMAs" which discusses the bit-mux to symbol-mux conversion needed for 200GBASE-R and 400GBASE-R interfaces. There are actually two incompatible sets of 200GBASE-R and 400GBASE-R PMAs- one based on 100ppm signaling and the other on 50ppm signaling. The rest of the clause is accurate for the second (50ppm) group and shows that you just need a PMA-BM in addition to a PMA-SM to convert between the generations. For the first group (100ppm) there also needs to be a XS inserted in order to rate match between the different ppm domains. It would be useful to add some text to this part of 176B to indicate that the 100ppm interfaces need an XS - this would be similar to the text we added to 120.1.4

SuggestedRemedy

Add a new subclase either under or after 176B.3 called "Special case for 200GBASE-R and 400GBASE-R using 100ppm signaling" with text indicating that an XS is required to rate match between ppm domains. Detailed suggestions for the text will come in a presentation.

Cl **116** SC **116.2.2** P **169** L **24** # 347

Slavick, Jeff — Broadcom

Comment Type **T** *Comment Status* **X**

Add note to the description of the XS that is can be used for ppm domain adjustments.

SuggestedRemedy

NOTE — The Clause 176 PMA specifies 50ppm clock accuracy while Clause 120 PMA specifies 100ppm for some rates and situations. A 200/400GMII Extender with clock rate compensation may be used to adapt between the different ppm domains.

Cl **120** SC **120.1.4** P **200** L **14** # 170

Dudek, Mike — Marvell

Comment Type **TR** *Comment Status* **X**

The wording here is very strange. The 200GMII extender is not part of the PHY. Saying " Alternatively" and "shall be implemented within an extender" isn't appropriate.

SuggestedRemedy

Replace the second sentence with an additional bullet. "For a Physical Layer that includes a 200GAUI-1 interface or a 200GBASE-KR1, 200GBASE-CR1, 200GBASE-DR1, or 200GBASE-DR1-2 PMD, and a 200GAUI-8, 200GAUI-4, or 200GAUI-2 PMA output that is only limited to ±100ppm the 200GAUI-8, 200GAUI-4, or 200GAUI-2 PMA shall be implemented within a 200GMII Extender (see Clause118) with rate matching (see 119.2.4.1). Do the same for the 400G bullet.

Cl **119** SC **119.1.4** P **200** L **13** # 327

Slavick, Jeff — Broadcom

Comment Type **TR** *Comment Status* **X**

If there is a 200Gbps link then all links, regardless of their proximity to the PCS, need to be at 50ppm or hidden within an XS with rate compensation.

SuggestedRemedy

Remove "that is in the same package as the PCS" from item 7) and item 9)

PPM changes made from D2.1 to D2.2

- The following slides were reviewed when closing comments against D2.1 that provides some background for the ppm topic:
  - https://ieee802.org/3/dj/public/25_09/nicholl_3dj_02_2509.pdf
- As noted in slide 10 of nicholl_3dj_02_2509 further updates are needed.
- The following slides show the ppm tolerances for some 200G/400G ethernet PMD/AUIs running at lane rates less than 200Gbps per lane.

Example ppm requirements for PMDs with lane rates below 200Gbps

Table 121–6—200GBASE-DR4 transmit characteristics

Description	Value	Unit
Signaling rate, each lane (range)	26.5625 ± 100 ppm	GBd
Modulation format	PAM4	—
Lane wavelength (range)	1304.5 to 1317.5	nm

50G PAM4

Table 124–6—400GBASE-DR4 transmit characteristics

Description	Value	Unit
Signaling rate, each lane (range)	53.125 ± 100 ppm	GBd
Modulation format	PAM4	—
Lane wavelength (range)	1304.5 to 1317.5	nm

100G PAM4

Example ppm requirements for AUIs with lane rates below 200Gbps

120C.3.1 200GAUI-8 and 400GAUI-16 C2M host output characteristics

A 200GAUI-8 or 400GAUI-16 C2M host output shall meet all specifications in 83E.3.1 with the following exceptions:

— The signaling rate per lane is 26.5625 GBd ±100 ppm.

NRZ

Table 120E–1—200GAUI-4 and 400GAUI-8 C2M host output characteristics at TP1a

Parameter	Reference	Value	Units
Signaling rate per lane (range)	120E.3.1.1	26.5625 ± 100 ppm	GBd

50Gbps PAM4

Table 120G–1—Host output characteristics at TP1a

Parameter	Reference	Value	Units
Signaling rate, each lane (range)		53.125 ± 50 ppm[a]	~~GBd~~
…			

100Gbps PAM4

[a] For 100GAUI-1, 200GAUI-2, or 400GAUI-4 C2M with a PMA in the same package as the PCS sublayer or for any 800GAUI-8 C2M. In other cases, the signaling rate is derived from the signaling rate presented to the PMA input lanes (see Figure 135–3 and Figure 120–3) by the adjacent PMA or FEC sublayers.

All 800GAUI-n are 50ppm

Issue

Need a method to convert from lanes running with a signaling rate range of ±100ppm to lanes running with a signaling rate range of ±50ppm for 200GbE and 400GbE stackups containing sublayers with both.

The following slides provide the proposed updates to address this issue.

Solution 1/5

In Clause 176B add a new sub-clause:

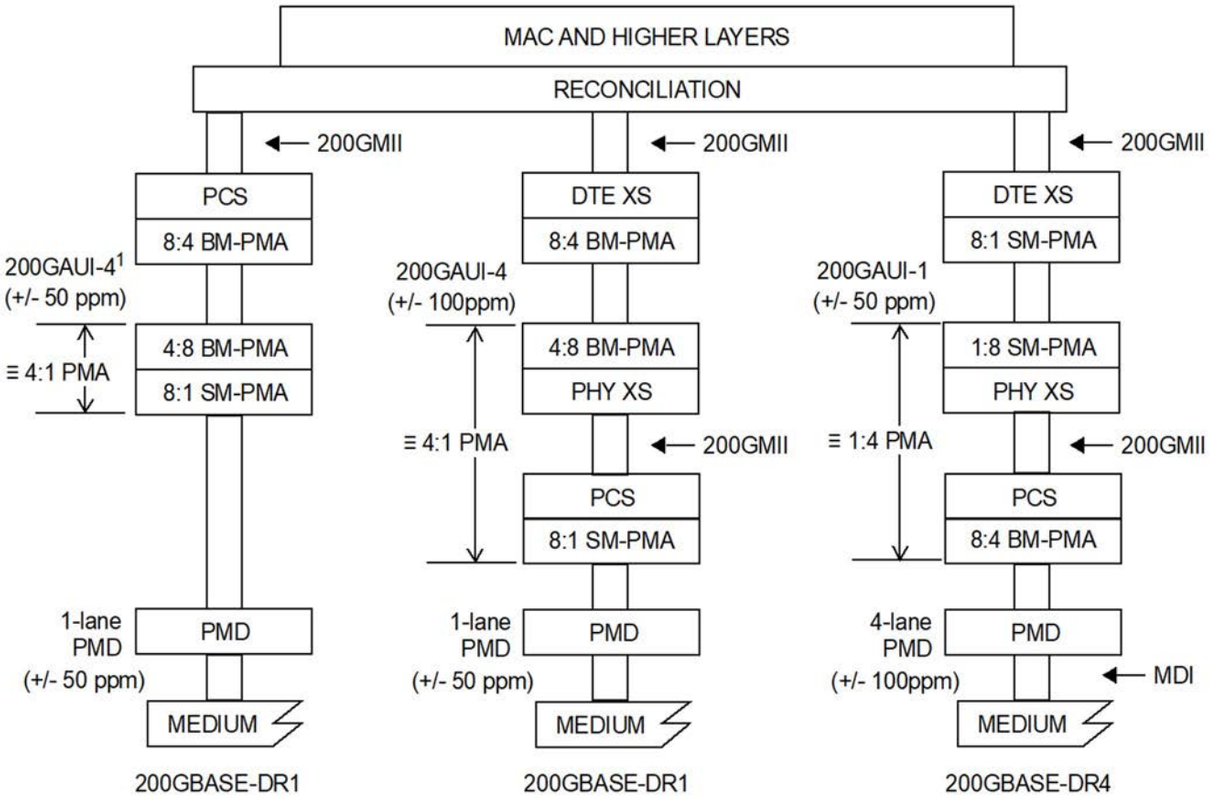
176B.3.1 Special case for 200BASE-R and 400GBASE-R Physical Layers with 100 ppm signaling

For 200GBASE-R and 400GBASE-R Physical Layers, the signaling rate range for bit multiplexed lanes in some cases is specified as ±100 ppm while symbol multiplexed lanes require ±50 ppm. In these cases a xMII Extender (see Clause 118), with rate matching, is required to convert from a signaling rate range of ±100 ppm to ±50 ppm.

Examples of 200GBASE-R and 400GBASE-R Physical Layers with a mix of ±100 ppm and ±50 ppm signaling domains are shown in Figure 176B-5 and Figure 176B-6.

Solution 2/5

Add Figure 176B-5 to the new subclause 176B.3.1



200GMII = 200 Gb/s MEDIA INDEPENDENT INTERFACE
200GAUI = 200 Gb/s ATTACHMENT UNIT INTERFACE
MAC = MEDIA ACCESS CONTROL
MDI = MEDIUM DEPENDENT INTERFACE

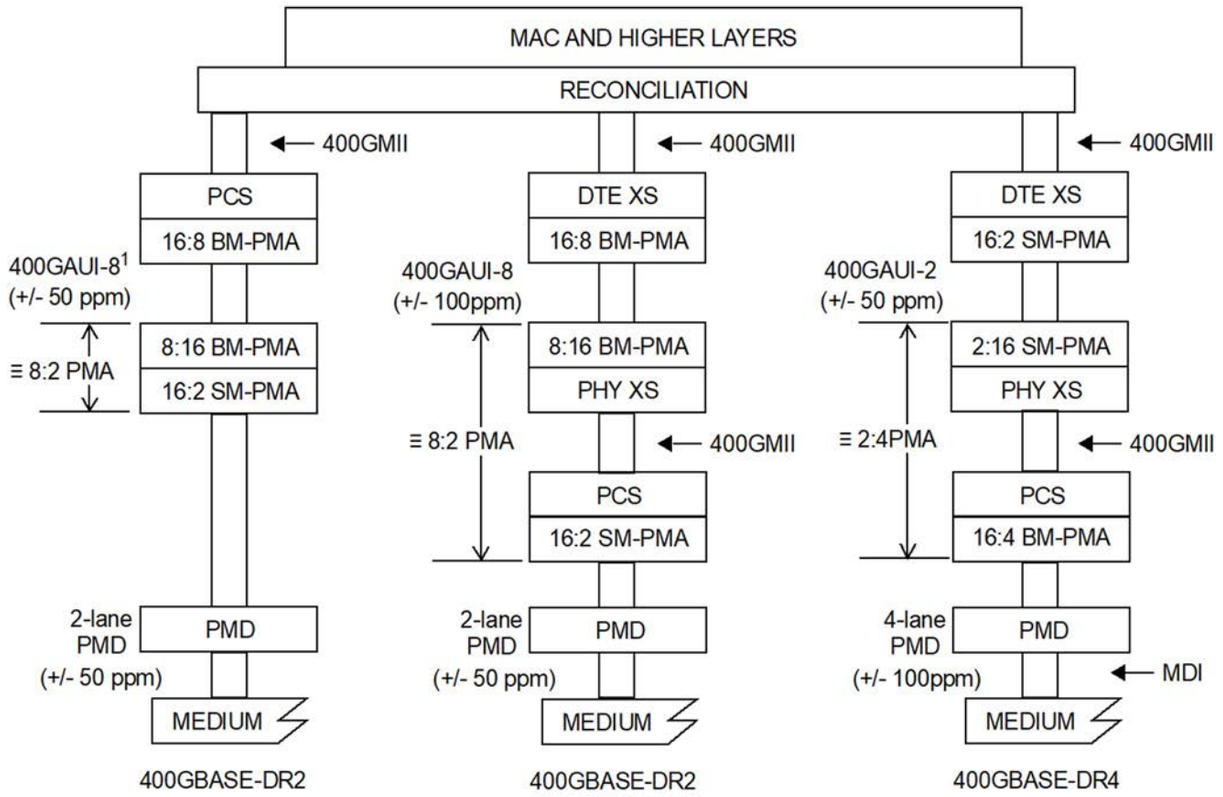
PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT

[1] 200GAUI-4 where the signaling rate range is limited to +/- 50 ppm instead of +/- 100 ppm.

Figure 176B–5— Examples of 200GBASE-R Physical layer implementations including the use of a 200GMII Extender for ppm rate matching

Solution 3/5

Add Figure 176B-6 to the new subclause 176B.3.1



400GMII = 400 Gb/s MEDIA INDEPENDENT INTERFACE
400GAUI = 400 Gb/s ATTACHMENT UNIT INTERFACE
MAC = MEDIA ACCESS CONTROL
MDI = MEDIUM DEPENDENT INTERFACE

PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT

[1] 400GAUI-8 where the signaling rate range is limited to +/- 50 ppm instead of +/- 100 ppm.

Figure 176B–6—Examples of 400GBASE-R Physical Layer implementations showing the use of a 400GMII Extender for ppm rate matching

Solution 4/5

Change items 7 and 8 in D2.2 subclause 120.1.4 as follows:

7) For a PHY that includes a 200GAUI-1 interface or a 200GBASE-KR1, 200GBASE-CR1, 200GBASE-DR1, or 200GBASE-DR1-2 PMD, the signaling rate range for a 200GAUI-8, 200GAUI-4, or 200GAUI-2 PMA output ~~that is in the same package as the PCS~~ shall be limited to ±50ppm~~, instead of ±100ppm~~. ~~Alternatively, a 200GAUI-8, 200GAUI-4, or 200GAUI-2 PMA output limited to ±100ppm shall be implemented within a 200GMII Extender (see Clause 118) with rate matching (see 119.2.4.1).~~ (see 176B.3)

8) For a 200GMII Extender that includes a 200GAUI-1 interface, the signaling rate range for a 200GAUI-8, 200GAUI-4, or 200GAUI-2 PMA output ~~that is in the same package as the DTE 200GXS or PHY 200GXS~~ shall be limited to ±50ppm~~, instead of ±100 ppm~~. (see 176B.3)

Solution 5/5

Change items 9 and 10 in D2.2 subclause 120.1.4 as follows:

9) For a PHY that includes a 400GAUI-2 interface or a 400GBASE-KR2, 400GBASE-CR2, 400GBASE-DR2, or 400GBASE-DR2-2 PMD, the signaling rate range for a 400GAUI-16, 400GAUI-8, or 400GAUI-4 PMA output ~~that is in the same package as the PCS~~ shall be limited to ±50ppm~~, instead of ±100ppm~~. ~~Alternatively, a 400GAUI-16, 400GAUI-8, or 400GAUI-4 PMA output limited to ±100ppm shall be implemented within a 400GMII Extender (see Clause 118) with rate matching (see 119.2.4.1).~~(see 176B.3)

10) For a 400GMII Extender that includes a 400GAUI-2 interface, the signaling rate range for a 400GAUI-16, 400GAUI-8, or 400GAUI-4 PMA output ~~that is in the same package as the DTE 400GXS or PHY 400GXS~~ shall be limited to ±50ppm~~, instead of ±100 ppm~~. (see 176B.3)

Thank you