

# Adding Missing PMA Instantiations for Annex 176B

Comment # 266

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# Background

- Annex 176B was added in 802.3dj to provide PMA instantiations for 200 Gb/s, 400 Gb/s, 800 Gb/s, 1.6 Tb/s physical layer implementations.
- Current draft seems to cover the instantiations with all possible AUIs and PMDs by tables. However, some AUIs and PMDs are not reflected in several rows of tables for 200 Gb/s and 400 Gb/s.
- This contribution makes the tables complete and fixes typos.

# Proposed changes: sentences

- For 200 Gb/s PHYs, PMDs with 50 Gb/s physical lanes exist. Suggested change as follows:
  - **176B.4.1** ~~8:4~~, 8:1, and 8:2 PMA instantiations for 200GBASE-R PHYs
- For 400 Gb/s PHYs, 400GBASE-SR16 PMD with 25 Gb/s physical lanes exist. Suggested change as follows:
  - **176B.5.1** ~~16:16~~, 16:8, 16:4, and 16:2 PMA instantiations for 400GBASE-R PHYs

PMA instantiations for use within a 400GBASE-R PHY are shown in Figure 176B–1, where the number of PCS lanes  $q$  is 16. Instantiations may be of the form  $16:n:p$  and  $16:m:n:p$ , where  $p$  is the number PMD lanes. Specific implementations of the PMA instantiations are defined in Table 176B–10 through Table 176B–15. These instantiations are relevant to the 400GBASE-R PHY types listed in Table 116–3a, Table 116–5, and Table 116–5a, where the number of lanes  $p$  is 2, 4, ~~or 8~~, or 16.

# Proposed changes to Table 176B-1 and 176B-3

**Table 176B-1—200 Gb/s PMA 8:{2,4,8}:{2,4} and 8:1:1 (SS or BB) instantiations**

Sublayer	Clause/Annex	Notes
200GBASE-R 8: <i>n</i> PMA	<i>n</i> = 2, <del>or 4</del> , or 8: 120 (BM-PMA) <i>n</i> = 1: 176 (SM-PMA)	
200GAUI- <i>n</i>	<i>n</i> = 8: 120B (C2C), 120C (C2M) <i>n</i> = 4: 120D (C2C), 120E (C2M) <i>n</i> = 2: 120F (C2C), 120G (C2M) <i>n</i> = 1: 176C (C2C), 176D (C2M)	
200GBASE-R <i>n</i> : <i>p</i> PMA	<i>p</i> = 2 or 4: 120 (BM-PMA) <i>p</i> = 1: 176 (SM-PMA)	

Support 200GAUI-8

**Table 176B-3—200 Gb/s PMA 8:{2,4,8}:{2,4,8}:{2,4} and 8:1:1:1 (BBB or SSS) instantiations**

Sublayer	Clause/Annex	Notes
200GBASE-R 8: <i>m</i> PMA	<i>m</i> = 2, 4, or 8: 120 (BM-PMA) <i>m</i> = 1: 176 (SM-PMA)	
200GAUI- <i>m</i>	<i>m</i> = 8: 120B (C2C) <i>m</i> = 4: 120D (C2C) <i>m</i> = 2: 120F (C2C) <i>m</i> = 1: 176C (C2C)	
200GBASE-R <i>m</i> : <i>n</i> PMA	{ <i>m</i> , <i>n</i> } = 2, 4, or 8: 120 (BM-PMA) { <i>m</i> , <i>n</i> } = 1: 176 (SM-PMA)	
200GAUI- <i>n</i>	<i>n</i> = 8: 120C (C2M) <i>n</i> = 4: 120E (C2M) <i>n</i> = 2: 120G (C2M) <i>n</i> = 1: 176D (C2M)	
200GBASE-R <i>n</i> : <i>p</i> PMA	<del>{<i>n</i>, <i>p</i>}</del> = 2 or 4: 120 (BM-PMA) <del>{<i>n</i>, <i>p</i>}</del> = 1: 176 (SM-PMA)	

Consistent style with  
Table 176B-1, avoid to list  
all possible values of *n*

# Proposed changes to Table 176B-4

Table 176B-4—200 Gb/s PMA 8:1:1:{2,4}, 8:{2,4,8}:{2,4,8}:1 (BBS or SSB) instantiations		
Sublayer	Clause/Annex	Notes
200GBASE-R 8:m PMA	$m = 2, 4, \text{ or } 8$ : 120 (BM-PMA) $m = 1$ : 176 (SM-PMA)	
200GAUI-m	$m = 8$ : 120B (C2C) $m = 4$ : <del>120E (C2M)</del> 120D (C2C) $m = 2$ : 120F (C2C) $m = 1$ : 176C (C2C)	
200GBASE-R m:n PMA	$\{m, n\} = 2, 4, \text{ or } 8$ : 120 (BM-PMA) $\{m, n\} = 1$ : 176 (SM-PMA)	
200GAUI-n	$n = 8$ : 120C (C2M) $n = 4$ : 120E (C2M) $n = 2$ : 120G (C2M) $n = 1$ : 176D (C2M)	
200GBASE-R n:8 PMA	$n = 2, \text{ or } 4, \text{ or } 8$ : 120 (BM-PMA) $n = 1$ : 176 (SM-PMA)	The combination of n:8 PMA and 8:p PMA forms an n:p PMA, which converts between bit-multiplexing and symbol-multiplexing.
200GBASE-R 8:p PMA	$p = 2 \text{ or } 4$ : 120 (BM-PMA) $p = 1$ : 176 (SM-PMA)	

Typo

Support 200GAUI-8

# Proposed changes to Table 176B-5

**Table 176B–5—200 Gb/s PMA 8:1:{2,4,8}·{2,4}, 8:{2,4,8}:1:1 (BSS or SBB) instantiations**

Sublayer	Clause/Annex	Notes
200GBASE-R 8: <i>m</i> PMA	<i>m</i> = 2, 4, or 8: 120 (BM-PMA) <i>m</i> = 1: 176 (SM-PMA)	
200GAUI- <i>m</i>	<i>m</i> = 8: 120B (C2C) <i>m</i> = 4: <del>120E (C2M)</del> 120D (C2C) <i>m</i> = 2: 120F (C2C) <i>m</i> = 1: 176C (C2C)	
200GBASE-R <i>m</i> :8 PMA	<i>m</i> = 2, 4, or 8: 120 (BM-PMA) <i>m</i> = 1: 176 (SM-PMA)	The combination of <i>m</i> :8 PMA and 8: <i>n</i> PMA forms an <i>m</i> : <i>n</i> PMA, which converts between bit-multiplexing and symbol-multiplexing.
200GBASE-R 8: <i>n</i> PMA	<i>n</i> = 2, <del>or 4</del> , or 8: 120 (BM-PMA) <i>n</i> = 1: 176 (SM-PMA)	
200GAUI- <i>n</i>	<i>n</i> = 8: 120C (C2M) <i>n</i> = 4: 120E (C2M) <i>n</i> = 2: 120G (C2M) <i>n</i> = 1: 176D (C2M)	
2200GBASE-R <i>n</i> : <i>p</i> PMA	<del><i>n</i>:<i>p</i></del> = 2 or 4: 120 (BM-PMA) <del><i>n</i>:<i>p</i></del> = 1: 176 (SM-PMA)	

Typo

Support 200GAUI-8

Consistent style with Table 176B-1, avoid to list all possible values of *n*

# Proposed changes to Table 176B-10 and 176B-11

Table 176B-10—400 Gb/s PMA 16:{4,8,16}:{4,8,16}, ~~16:4:4~~ and 16:2:2 (SS or BB) instantiation

Sublayer	<del>400 Gb/s</del> Clause/Annex	Notes
400GBASE-R 16: <i>n</i> PMA	<i>n</i> = 4, 8, or 16: 120 (BM-PMA) <i>n</i> = 2: 176 (SM-PMA)	
400GAUI- <i>n</i>	<i>n</i> = 16: 120B (C2C), 120C (C2M) <i>n</i> = 8: 120D (C2C), 120E (C2M) <i>n</i> = 4: 120F (C2C), 120G (C2M) <i>n</i> = 2: 176C (C2C), 176D (C2M)	
400GBASE-R <i>n</i> : <i>p</i> PMA	<i>p</i> = 4, 8 or 16: 120 (BM-PMA) <i>p</i> = 2: 176 (SM-PMA)	

Support 400GBASE-SR16 PMD,  
16:4:4 is redundant

“400 Gb/s” is not shown in other tables

Support 400GAUI-8 and 400GAUI-16

Support 400G PMDs with 8 or 16  
physical lanes

Table 176B-11—400 Gb/s PMA 16:2:{4,8,16} and 16:{4,8,16}:2 (BS or SB) instantiations

Sublayer	Clause/Annex	Notes
400GBASE-R 16: <i>n</i> PMA	<i>n</i> = 4, 8, or 16: 120 (BM-PMA) <i>n</i> = 2: 176 (SM-PMA)	
400GAUI- <i>n</i>	<i>n</i> = 16: 120B (C2C), 120C (C2M) <i>n</i> = 8: 120D (C2C), 120E (C2M) <i>n</i> = 4: 120F (C2C), 120G (C2M) <i>n</i> = 2: 176C (C2C), 176D (C2M)	
400GBASE-R <i>n</i> :16 PMA	<i>n</i> = 4, 8, or 16: 120 (BM-PMA) <i>n</i> = 2: 176 (SM-PMA)	The combination of <i>n</i> :16 PMA and 16: <i>p</i> PMA forms an <i>n</i> : <i>p</i> PMA, which converts between bit-multiplexing and symbol-multiplexing (see 176B.3).
400GBASE-R 16: <i>p</i> PMA	<i>p</i> = 4, <del>8</del> or 16: 120 (BM-PMA) <i>p</i> = 2: 176 (SM-PMA)	

Support 400GBASE-SR16 PMD

Support 400GBASE-SR16 PMD

# Proposed changes to Table 176B-12 and 176B-13

Table 176B-12—400 Gb/s PMA 16:{4,8,16}:{4,8,16}:{4,8,16} and 16:2:2:2 (*BBB* or *SSS*) instantiations

Support 400GBASE-SR16 PMD

...

Table 176B-13—400 Gb/s PMA 16:2:2:{4,8,16} and 16:{4,8,16}:{4,8,16}:2 (*BBS* or *SSB*) instantiations

Support 400GBASE-SR16 PMD

Sublayer	Clause/Annex	Notes
400GBASE-R 16: <i>m</i> PMA	<i>m</i> = 4, 8, or 16: 120 (BM-PMA) <i>m</i> = 2: 176 (SM-PMA)	
400GAUI- <i>m</i>	<i>m</i> = 16: 120B (C2C) <i>m</i> = 8: 120D (C2C) <i>m</i> = 4: 120F (C2C) <i>m</i> = 2: 176C (C2C)	
400GBASE-R <i>m</i> : <i>n</i> PMA	{ <i>m</i> , <i>n</i> } = 4, 8, or 16: 120 (BM-PMA) { <i>m</i> , <i>n</i> } = 2: 176 (SM-PMA)	
400GAUI- <i>n</i>	<i>n</i> = 16: 120C (C2M) <i>n</i> = 8: 120E (C2M) <i>n</i> = 4: 120G (C2M) <i>n</i> = 2: 176D (C2M)	
400GBASE-R <i>n</i> :16 PMA	<i>n</i> = 4, 8, or 16: 120 (BM-PMA) <i>n</i> = 2: 176 (SM-PMA)	The combination of <i>n</i> :16 PMA and 16: <i>p</i> PMA forms an <i>n</i> : <i>p</i> PMA, which converts between bit-multiplexing and symbol-multiplexing (see 176B.3).
400GBASE-R 16: <i>p</i> PMA	<i>p</i> = 4, <del>8</del> , or 16: 120 (BM-PMA) <i>p</i> = 2: 176 (SM-PMA)	

Support 400GBASE-SR16 PMD



# Proposed changes to Table 176B-14

Table 176B-14—400 Gb/s PMA 16:2:{4,8,16}:{4,8,16} and 16:{4,8,16}:2:2 (SBB or BSS) instantiations

Sublayer	Clause/Annex	Notes
400GBASE-R 16: $m$ PMA	$m = 4, 8, \text{ or } 16$ : 120 (BM-PMA) $m = 2$ : 176 (SM-PMA)	
400GAUI- $m$	$m = 16$ : 120B (C2C) $m = 8$ : 120D (C2C) $m = 4$ : 120F (C2C) $m = 2$ : 176C (C2C)	
400GBASE-R $m$ :16 PMA	<del><math>m</math></del> = 4, 8, or 16: 120 (BM-PMA) <del><math>m</math></del> = 2: 176 (SM-PMA)	The combination of $m$ :16 PMA and 16: $n$ PMA forms an $m$ : $n$ PMA, which converts between bit-multiplexing and symbol-multiplexing (see 176B.3).
400GBASE-R 16: $n$ PMA	$n = 4, \text{ or } 8, \text{ or } 16$ : 120 (BM-PMA) $n = 2$ : 176 (SM-PMA)	
400GAUI- $n$	$n = 16$ : 120C (C2M) $n = 8$ : 120E (C2M) $n = 4$ : 120G (C2M) $n = 2$ : 176D (C2M)	
400GBASE-R $n$ : $p$ PMA	$\{n, p\} = 4, \text{ or } 8, \text{ or } 16$ : 120 (BM-PMA) $\{n, p\} = 2$ : 176 (SM-PMA)	

Support 400GBASE-SR16 PMD

$n$  is redundant

Support 400GAUI-16

Support 400GBASE-SR16 PMD

# Proposed changes to Table 176B-15

**Table 176B-15—400 Gb/s PMA and 16:{4,8,16}:2:{4,8,16} and 16:2:{4,8,16}:2 (BSB or SBS) instantiations**

Sublayer	Clause/Annex	Notes
400GBASE-R 16: <i>m</i> PMA	<i>m</i> = 4, 8, or 16: 120 (BM-PMA) <i>m</i> = 2: 176 (SM-PMA)	
400GAUI- <i>m</i>	<i>m</i> = 16: 120B (C2C) <i>m</i> = 8: 120D (C2C) <i>m</i> = 4: 120F (C2C) <i>m</i> = 2: 176C (C2C)	
400GBASE-R <i>m</i> :16 PMA	<i>m</i> = 4, 8, or 16: 120 (BM-PMA) <i>m</i> = 2: 176 (SM-PMA)	The combination of <i>m</i> :16 PMA and 16: <i>n</i> PMA forms an <i>m</i> : <i>n</i> PMA, which converts between bit-multiplexing and symbol-multiplexing (see 176B.3).
400GBASE-R 16: <i>n</i> PMA	<i>n</i> = 4, 8, or 16: 120 (BM-PMA) <i>n</i> = 2: 176 (SM-PMA)	
400GAUI- <i>n</i>	<i>n</i> = 16: 120C (C2M) <i>n</i> = 8: 120E (C2M) <i>n</i> = 4: 120G (C2M) <i>n</i> = 2: 176D (C2M)	
400GBASE-R <i>n</i> :16 PMA	<i>n</i> = 4, 8, or 16: 120 (BM-PMA) <i>n</i> = 2: 176 (SM-PMA)	The combination of <i>n</i> :16 PMA and 16: <i>p</i> PMA forms an <i>n</i> : <i>p</i> PMA, which converts between bit-multiplexing and symbol-multiplexing (see 176B.3).
400GBASE-R 16: <i>p</i> PMA	<i>p</i> = 4, <del>8</del> , or 16: 120 (BM-PMA) <i>p</i> = 2: 176 (SM-PMA)	

Support 400GBASE-SR16 PMD

Support 400GBASE-SR16 PMD

# Summary

- For the completeness of PMA instantiations in Annex 176B, AUIs and PMDs not involved previously are included in this contribution.

# Thank you!