802.3db D0.1 Editors' Report

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IEEE P802.3db 100 Gb/s, 200 Gb/s, and 400 Gb/s Short Reach Fiber Task Force
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Editorial Team

- Earl Parsons, Commscope

  Sections 167.1 – 167.6, 167.9 – 167.11

- Ramana Murty, Broadcom

  Sections 167.7 – 167.8

Status

- Draft 0.1 posted March 15, 2021.
- Open for comments March 16, 2021. Please send comments by marking up D0.1 or sending e-mail to editors.
- Please send comments by March 26, 2021, 12:00 midnight AOE.
- Plan to post comments against D0.1 prior to and resolve comments at the April 1, 2021 meeting.

- Draft 0.1 contains the new clause 167 for 802.3db. Next draft will include modifications to the introduction and previous clauses, and update the Table of Contents.

Clause 167

New Clause for 100G multimode links:

167. Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-VR, 200GBASE-VR2, 400GBASE-VR4, 100GBASE-SR, 200GBASE-SR2, and 400GBASE-SR4

Draft 0.1 written using Clause 138 (802.3cd and 802.3cm PAM4 MMF links) as the starting point, and material borrowed generously from 802.3cu.

Section 167.1

167.1 Overview

- Follow Clause 138 format for Table 167-1 and Table 167-2
  - 100G PMDs in first table, 200G and 400G PMDs in second table
- BER target 2.4e-4, same as .3cu

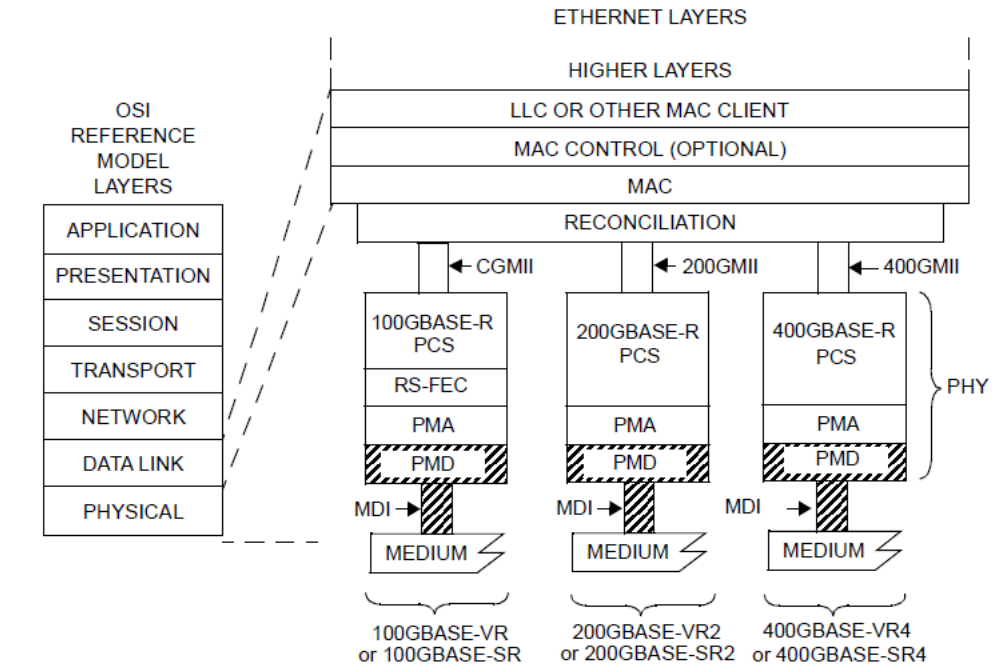

Figure 167–1—100GBASE-VR, 200GBASE-VR2, 400GBASE-VR4, 100GBASE-SR, 200GBASE-SR2, and 400GBASE-SR4 PMD relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 Ethernet model

Section 167.2

167.2 Physical Medium Dependent (PMD) service interface

- Same format as Clause 138, just updated names of PMDs

Section 167.3

167.3 Delay and Skew

- Same format as Clause 138, use same delay numbers as .3cu

Section 167.4

167.4 PMD MDIO function mapping

- No changes from Clause 138

Section 167.5

167.5 PMD functional specifications

- Same format as Clause 138, just updated names of PMDs
- Updated Figure 167-2 using 400GBASE-SR4 as an example

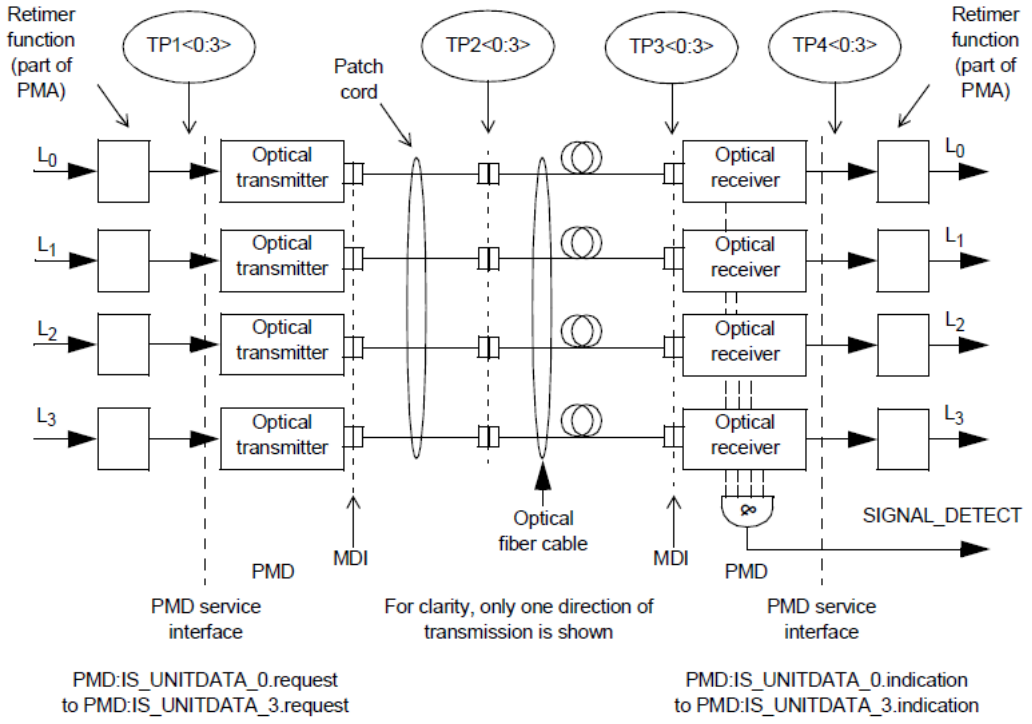

Figure 167–2—Block diagram for 400GBASE-SR4 transmit/receive paths

Section 167.6

167.6 Lane assignments

- Same format as Clause 138, just updated names of PMDs

Section 167.7

167.7 PMD to MDI optical specifications for 100GBASE-VR, 200GBASE-VR2, 400GBASE-VR4, 100GBASE-SR, 200GBASE-SR2 and 400GBASE-SR4

- Follow Clause 138 format for Tables 167-6 to 167-9.
  There are TBDs as noted in the adopted baseline (murty_3db_01c_021821.pdf).

- Corrected a typo in the adopted baseline (murty_3db_01c_021821.pdf):

  Footnote e in Table 167-8:

(Adopted baseline)	Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.5 dB.
(D0.1)	Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.4 dB.

  The SECQ value in the table (and link budget) is 4.4 dB.

Section 167.8

167.8 Definition of optical parameters and measurement methods

- Added definitions for (new to MMF links) taking text from 802.3cu.
  TECQ
  Overshoot/undershoot
  Transmitter power excursion

- Follow Clause 138 format for Tables 167-10 to 167-12.
  Added test patterns for TECQ, overshoot/undershoot, and transmitter power excursion.

- TECQ
  If the reference equalizer is defined to be different for the 50m and 100m reach, should TECQ for the SR (100m) link be measured using the reference equalizer for VR (50m) link to ensure interoperability?

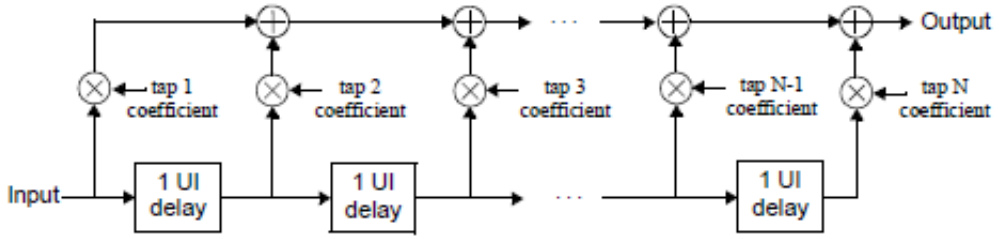

Figure 167–3—TDECQ and TECQ reference equalizer functional model

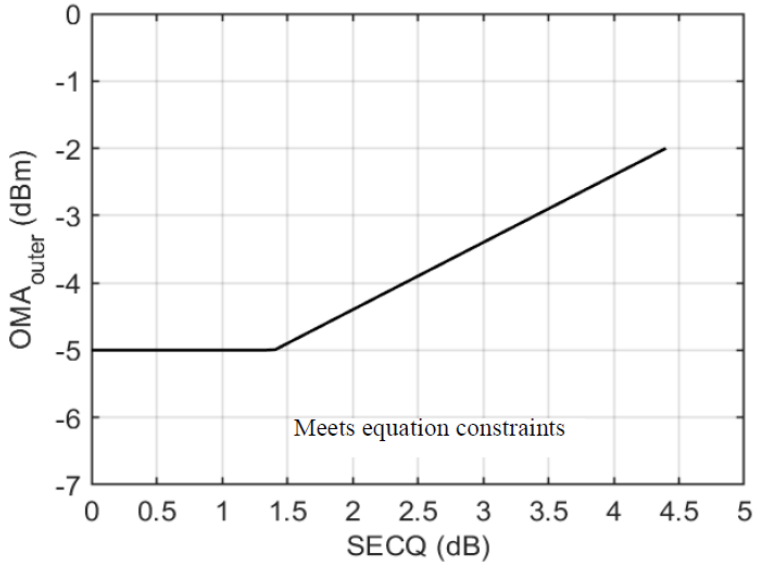

Figure 167–4—Illustration of receiver sensitivity

Section 167.8 continued

- TDECQ reference response filter definition:

For 100GBASE-SR, 200GBASE-SR2 and 400GBASE-SR4, the combination of the O/E converter and the oscilloscope used to measure the optical waveform has a 3 dB bandwidth of approximately 15 GHz with a fourth-order Bessel-Thomson response to at least 1.5 × 30 GHz. At frequencies above 1.5 × 30 GHz, the response should not exceed –24 dB. Compensation may be made for any deviation from an ideal fourth-order Bessel-Thomson response.

- TECQ reference response filter definition (follows 802.3cu):

The transmitter eye closure for PAM4 (TECQ) is a measure of the optical transmitter's eye closure at TP2. The TECQ of each lane shall be within the limits given in Table 167–7 if measured using a test pattern specified for TECQ in Table 167–11. The TECQ of each lane is measured using the methods specified for TDECQ in 167.8.5 except the combination of the O/E converter and the oscilloscope used to measure the optical waveform has a 3 dB bandwidth of approximately 26.5625 GHz with a fourth-order Bessel-Thomson response to at least 1.3 × 53.125 GHz. At frequencies above 1.3 × 53.125 GHz, the response should not exceed –24 dB. Compensation may be made for any deviation from an ideal fourth-order Bessel-Thomson response. The reference equalizer to be used for TECQ is specified in 167.8.5.1.

Section 167.9

167.9 Safety, installation, environment, and labeling

- Same format as Clause 138, just updated names of PMDs

Section 167.10

167.10 Fiber optic cabling model

- Start with Clause 138
- Split Table 167-13 into two sections for 50 m and 100 m
- Table 167-14 lists 3.0 dB/km attenuation
- Table 167-14 uses published OM3 and OM4 dispersion values
  - Merits further discussion

Table 167–13—Fiber optic cabling (channel) characteristics

Description	100GBASE-VR 200GBASE-VR2 400GBASE-VR4			100GBASE-SR 200GBASE-SR2 400GBASE-SR4			Unit
	OM3	OM4	OM5	OM3	OM4	OM5	
Operating distance (max)	30	50		70	100		m
Cabling Skew (max)[a]	79						ns
Cabling Skew Variation[ab] (max)	2.4						ns
Channel insertion loss[c] (max)	1.6	1.7		1.7	1.8		dB
Channel insertion loss (min)	0			0			dB

[a]Applies only to 200GBASE-VR2, 400GBASE-VR4, 200GBASE-SR2 and400GBASE-SR4.
[b]An additional 400 ps of Skew Variation could be caused by wavelength changes, which are attributable to the transmitter not the channel.
[c]These channel insertion loss values include cable loss plus 1.5 dB allocated for connection and splice loss, over the wavelength range 840 nm to 860 nm.

Table 167–14—Optical fiber and cable characteristics

Description	OM3[a]	OM4[b]	OM5[c]	Unit
Nominal core diameter	50			μm
Nominal fiber specification wavelength	850			nm
Effective modal bandwidth (min)[d]	2000	4700		MHz.km
Cabled optical fiber attenuation (max)	3.0			dB/km
Zero dispersion wavelength (λ_0)	$1295 \le \lambda_0 \le 1340$		$1297 \le \lambda_0 \le 1328$	nm
Chromatic dispersion slope (max) (S_0)	0.105 for $1295 \le \lambda_0 \le 1310$ and $0.000375 \times (1590 - \lambda_0)$ for $1310 \le \lambda_0 \le 1340$		$-412/(840(1-(\lambda_0/840)^4))$	$ps/nm^2\ km$

[a]IEC 60793-2-10 type A1a.2
[b]IEC 60793-2-10 type A1a.3
[c]IEC 60793-2-10 type A1a.4
[d]When measured with the launch conditions specified in Table 167–7

Section 167.10 continued

167.10 Fiber optic cabling model

- MDI
- Same lane assignments for 2 pair and 4 pair as Clause 138
- 1 pair MDI same as Clause 138
- 2 pairs and 4 pairs MDI has two options
  - Option A: APC
  - Option B: PC (flat or non-angled)
  - Need to verify that the right IEC documents are cited
- No VSFF connectors are included at this time
  - Standards not published in our timeline?
  - Welcome contributions if published sooner

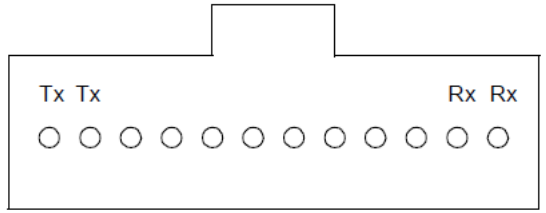

Figure 167–6—Optical lane assignments for 200GBASE-VR2 or 200GBASE-SR2

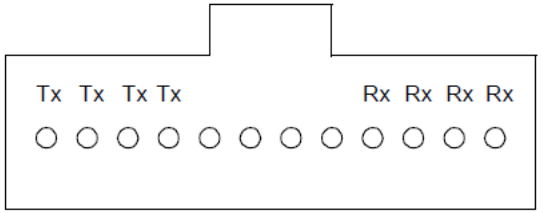

Figure 167–7—Optical lane assignments for 400GBASE-VR4 or 400GBASE-SR4

Section 167.11

167.11 Protocol implementation conformance statement (PICS) proforma for Clause 167, Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-VR, 200GBASE-VR2, 400GBASE-VR4, 100GBASE-SR, 200GBASE-SR2, and 400GBASE-SR4[2]

- We'll do this part last
- No changes made from Clause 138 yet
- Don't even look at it!