

# Review Of 802.3cc\_D0.3

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Chief Editor P802.3cc

# Agenda

1. Review D0.3 page-by-page, explaining changes to D0.2 (uploaded).
2. Record comments in PDF of D0.3 that will be uploaded after meeting.
3. Seek whether Task Force ready to approve D1.0.

# Reference Existing Clauses (200.2)

## 112.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the [25GBASE-SR PMD](#). The service interface for this PMD is described in an abstract manner and does not imply any particular implementation. The PMD service interface supports the exchange of encoded data between the PMA entity that resides just above the PMD, and the PMD entity. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 105.3. The PMD service interface primitives are summarized as follows:

```
PMD:IS_UNITDATA.request
PMD:IS_UNITDATA.indication
PMD:IS_SIGNAL.indication
```

In the transmit direction, the PMA continuously sends a bit stream to the PMD, at a nominal signaling rate of 25.78125 GBd. The PMD converts this stream of bits into appropriate signals on the MDI.

In the receive direction, the PMD continuously sends a bit stream to the PMA corresponding to the signals received from the MDI, at a nominal signaling rate of 25.78125 GBd.

The SIGNAL\_DETECT parameter defined in this clause maps to the SIGNAL\_OK parameter in the PMD:IS\_SIGNAL.indication(SIGNAL\_OK) inter-sublayer service primitive defined in 105.4.

The SIGNAL\_DETECT parameter can take on one of two values: OK or FAIL. When SIGNAL\_DETECT = FAIL, the rx\_bit parameters are undefined.

NOTE—SIGNAL\_DETECT = OK does not guarantee that the rx\_bit parameters are known to be good. It is possible for a poor quality link to provide sufficient light for a SIGNAL\_DETECT = OK indication and still not meet the BER defined in [112.1.1](#).

## 200.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the [25GBASE-LR](#) and [25GBASE-ER](#) PMDs. The service interfaces for these PMDs are described in an abstract manner and do not imply any particular implementation. The PMD service interface supports the exchange of encoded data between the PMA entity that resides just above the PMD, and the PMD entity. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 105.3. The PMD service interface primitives are summarized as follows:

```
PMD:IS_UNITDATA.request
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In the transmit direction, the PMA continuously sends a bit stream to the PMD, at a nominal signaling rate of 25.78125 GBd. The PMD converts this stream of bits into appropriate signals on the MDI.

In the receive direction, the PMD continuously sends a bit stream to the PMA corresponding to the signals received from the MDI, at a nominal signaling rate of 25.78125 GBd.

The SIGNAL\_DETECT parameter defined in this clause maps to the SIGNAL\_OK parameter in the PMD:IS\_SIGNAL.indication(SIGNAL\_OK) inter-sublayer service primitive defined in [105.4](#).

The SIGNAL\_DETECT parameter can take on one of two values: OK or FAIL. When SIGNAL\_DETECT = FAIL, the rx\_bit parameters are undefined.

NOTE—SIGNAL\_DETECT = OK does not guarantee that the rx\_bit parameters are known to be good. It is possible for a poor quality link to provide sufficient light for a SIGNAL\_DETECT = OK indication and still not meet the BER defined in [200.1.1](#).



(Replace text above with below)

The PMD service interfaces for 25GBASE-LR and 25GBASE-ER are the same as PMD service interface for 25GBASE-SR as described in 112.2 with the BER as specified in 200.1.1.

# OMA\_max in Table 200-6

- Baseline proposal set “Average launch power (max)” to 2 dBm to avoid overload of PSM4 receiver (2 dBm).
- PSM4 has received OMA (max) specification of 2.2 dBm.
- Current baseline for 25GBASE-LR has OMA (max) specification of 3 dBm, which has room to be reduced.
- Propose reducing 25GBASE-LR OMA (max) to 2.2 dBm to avoid overload of PSM4.

# Reference Existing Clauses (200.8)

## 112.8 Safety, installation, environment, and labeling

### 112.8.1 General safety

All equipment subject to this clause shall conform to IEC 60950-1.

### 112.8.2 Laser safety

25GBASE-SR optical transceivers shall conform to Hazard Level 1 laser requirements as defined in IEC 60825-1 and IEC 60825-2, under any condition of operation. This includes single fault conditions whether coupled into a fiber or out of an open bore.

Conformance to additional laser safety standards may be required for operation within specific geographic regions.

Laser safety standards and regulations require that the manufacturer of a laser product provide information about the product's laser, safety features, labeling, use, maintenance, and service. This documentation explicitly defines requirements and usage restrictions on the host system necessary to meet these safety certifications.<sup>10</sup>

### 112.8.3 Installation

It is recommended that proper installation practices, as defined by applicable local codes and regulation, be followed in every instance in which such practices are applicable.

### 112.8.4 Environment

Normative specifications in this clause shall be met by a system integrating a 25GBASE-SR PMD over the life of the product while the product operates within the manufacturer's range of environmental, power, and other specifications.

It is recommended that manufacturers indicate, in the literature associated with the PHY, the operating environmental conditions to facilitate selection, installation, and maintenance.

It is recommended that manufacturers indicate, in the literature associated with the components of the optical link, the distance and operating environmental conditions over which the specifications of this clause will be met.

### 112.8.5 Electromagnetic emission

A system integrating a 25GBASE-SR PMD shall comply with applicable local and national codes for the limitation of electromagnetic interference.

### 112.8.6 Temperature, humidity, and handling

The optical link is expected to operate over a reasonable range of environmental conditions related to temperature, humidity, and physical handling (such as shock and vibration). Specific requirements and values for these parameters are considered to be beyond the scope of this standard.

### 112.8.7 PMD labeling requirements

It is recommended that each PHY (and supporting documentation) be labeled in a manner visible to the user, with at least the applicable safety warnings and the applicable port type designation (e.g. 25GBASE-SR).

Labeling requirements for Hazard Level 1 lasers are given in the laser safety standards referenced in 112.8.2.

<sup>10</sup>A host system that fails to meet the manufacturer's requirements and/or usage restrictions may emit laser radiation in excess of the safety limits of one or more safety standards. In such a case, the host manufacturer is required to obtain its own laser safety certification.

## 200.8 Safety, installation, environment, and labeling

### 200.8.1 General safety

All equipment subject to this clause shall conform to IEC 60950-1.

### 200.8.2 Laser safety

25GBASE-LR and 25GBASE-ER optical transceivers shall conform to Hazard Level 1 laser requirements as defined in IEC 60825-1 and IEC 60825-2, under any condition of operation. This includes single fault conditions whether coupled into a fiber or out of an open bore.

Conformance to additional laser safety standards may be required for operation within specific geographic regions.

Laser safety standards and regulations require that the manufacturer of a laser product provide information about the product's laser, safety features, labeling, use, maintenance, and service. This documentation explicitly defines requirements and usage restrictions on the host system necessary to meet these safety certifications.<sup>2</sup>

### 200.8.3 Installation

It is recommended that proper installation practices, as defined by applicable local codes and regulation, be followed in every instance in which such practices are applicable.

### 200.8.4 Environment

Normative specifications in this clause shall be met by a system integrating a 25GBASE-LR or 25GBASE-ER PMD over the life of the product while the product operates within the manufacturer's range of environmental, power, and other specifications.

It is recommended that manufacturers indicate in the literature associated with the PHY the operating environmental conditions to facilitate selection, installation, and maintenance.

It is recommended that manufacturers indicate, in the literature associated with the components of the optical link, the distance and operating environmental conditions over which the specifications of this clause will be met.

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A system integrating a 25GBASE-LR or 25GBASE-ER PMD shall comply with applicable local and national codes for the limitation of electromagnetic interference.

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The optical link is expected to operate over a reasonable range of environmental conditions related to temperature, humidity, and physical handling (such as shock and vibration). Specific requirements and values for these parameters are considered to be beyond the scope of this standard.

### 200.8.7 PMD labeling requirements

It is recommended that each PHY (and supporting documentation) be labeled in a manner visible to the user, with at least the applicable safety warnings and the applicable port type designation (e.g., 25GBASE-LR).

Labeling requirements for Hazard Level 1 lasers are given in the laser safety standards referenced in 200.8.2.

<sup>2</sup>A host system that fails to meet the manufacturer's requirements and/or usage restrictions may emit laser radiation in excess of the safety limits of one or more safety standards. In such a case, the host manufacturer is required to obtain its own laser safety certification.

**200.8 Safety, installation, environment, and labeling**  
All equipment subject to this clause shall conform to the applicable requirements of 112.8.

# Reference Existing Clauses (200.9)

## 88.10 Fiber optic cabling model

The fiber optic cabling model is shown in Figure 88-3.

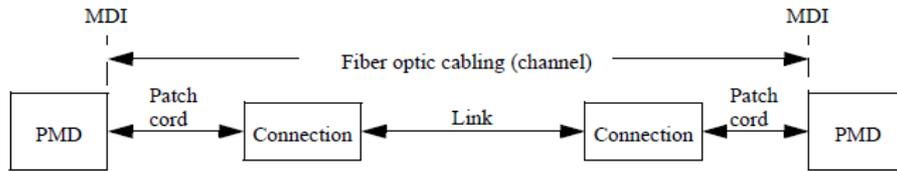


Figure 88-3—Fiber optic cabling model

The channel insertion loss is given in Table 88-14. A channel may contain additional connectors as long as the optical characteristics of the channel, such as attenuation, dispersion, reflections, and polarization mode dispersion meet the specifications. Insertion loss measurements of installed fiber cables are made in accordance with ANSI/TIA/EIA-526-7/method A-1. The fiber optic cabling model (channel) defined here is the same as a simplex fiber optic link segment. The term channel is used here for consistency with generic cabling standards.

Table 88-14—Fiber optic cabling (channel) characteristics

Description	100GBASE-LR4		100GBASE-ER4		Unit
Operating distance (max)	10	30	40		km
Channel insertion loss <sup>a, b</sup> (max)	6.3	18	18		dB
Channel insertion loss (min)	0	0			dB
Positive dispersion <sup>b</sup> (max)	9.5	28	36		ps/nm
Negative dispersion <sup>b</sup> (min)	-28.5	-85	-114		ps/nm
DGD_max <sup>c</sup>	8	10.3	10.3		ps
Optical return loss (min)	21	21	21		dB

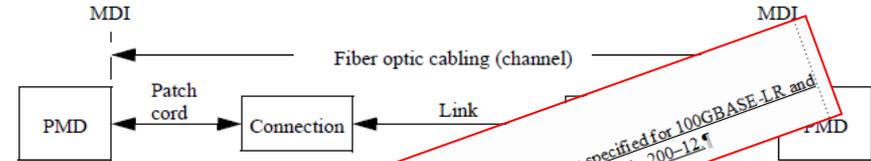
<sup>a</sup>These channel insertion loss values include cable, connectors, and splices.

<sup>b</sup>Over the wavelength range 1294.53 nm to 1310.19 nm

<sup>c</sup>Differential Group Delay (DGD) is the time difference at reception between the fractions of a pulse that were transmitted in the two principal states of polarization of an optical signal. DGD\_max is the maximum differential group delay that the system must tolerate.

## 200.9 Fiber optic cabling model

The fiber optic cabling model is shown in Figure 200-3.



The channel insertion loss is given in Table 200-12. A channel may contain additional connectors as long as the optical characteristics of the channel, such as attenuation, dispersion, reflections, and polarization mode dispersion meet the specifications. Insertion loss measurements of installed fiber cables are made in accordance with ANSI/TIA/EIA-526-7/method A-1. The fiber optic cabling model (channel) defined here is the same as a simplex fiber optic link segment. The term channel is used here for consistency with generic cabling standards.

Table 200-12—Fiber optic cabling (channel) characteristics<sup>§</sup>

Description <sup>§</sup>	25GBASE-LR <sup>§</sup>		25GBASE-ER <sup>§</sup>		Unit <sup>§</sup>
Operating distance (max) <sup>§</sup>	10 <sup>§</sup>	30 <sup>§</sup>	40 <sup>§</sup>		km <sup>§</sup>
Channel insertion loss <sup>a, b</sup> (max) <sup>§</sup>	6.3 <sup>§</sup>	18 <sup>§</sup>	18 <sup>§</sup>		dB <sup>§</sup>
Channel insertion loss (min) <sup>§</sup>	0 <sup>§</sup>	11 <sup>§</sup>			dB <sup>§</sup>
Positive dispersion <sup>b</sup> (max) <sup>§</sup>	9.5-22.6 <sup>§</sup>	28-27.6 <sup>§</sup>	36-36.8 <sup>§</sup>		ps/nm <sup>§</sup>
Negative dispersion <sup>b</sup> (min) <sup>§</sup>	-28.5-27.9 <sup>§</sup>	-85-83.7 <sup>§</sup>	-114-111.6 <sup>§</sup>		ps/nm <sup>§</sup>
DGD_max <sup>c</sup> <sup>§</sup>	8 <sup>§</sup>	10.3 <sup>§</sup>	10.3 <sup>§</sup>		ps <sup>§</sup>
Optical return loss (min) <sup>§</sup>	21 <sup>§</sup>	21 <sup>§</sup>	21 <sup>§</sup>		dB <sup>§</sup>

<sup>a</sup>These channel insertion loss values include cable, connectors, and splices.<sup>§</sup>

<sup>b</sup>Over the wavelength range 1295 nm to 1325 nm for 25GBASE-LR and 1295 nm to 1310 nm for 25GBASE-ER.<sup>§</sup>

<sup>c</sup>Differential Group Delay (DGD) is the time difference at reception between the fractions of a pulse that were transmitted in the two principal states of polarization of an optical signal. DGD\_max is the maximum differential group delay that the system must tolerate.<sup>§</sup>

# Cable Dispersion Values

## 200.7.5.2 Channel requirements¶

The channel requirements for testing the transmitter are described in 88.8.5.2, where the requirements for 100GBASE-LR4 apply to 25GBASE-LR and the requirements for 100GBASE-ER4 apply to 25GBASE-ER.¶

## 88.8.5.2 Channel requirements

The transmitter is tested using an optical channel that meets the requirements listed in Table 88–12.

Table 88–12—Transmitter compliance channel specifications

PMD type	Dispersion <sup>a</sup> (ps/nm)		Insertion loss <sup>b</sup>	Optical return loss <sup>c</sup>	Max mean DGD
	Minimum	Maximum			
100GBASE-LR4	$0.2325 \cdot \lambda \cdot [1 - (1324 / \lambda)^4]$	$0.2325 \cdot \lambda \cdot [1 - (1300 / \lambda)^4]$	Minimum	20 dB	0.8 ps
100GBASE-ER4	$0.93 \cdot \lambda \cdot [1 - (1324 / \lambda)^4]$	$0.93 \cdot \lambda \cdot [1 - (1300 / \lambda)^4]$	Minimum	20 dB	0.8 ps

<sup>a</sup>The dispersion is measured for the wavelength of the device under test ( $\lambda$  in nm). The coefficient assumes 10 km for 100GBASE-LR4 and 40 km for 100GBASE-ER4.

<sup>b</sup>There is no intent to stress the sensitivity of the BERT's optical receiver.

<sup>c</sup>The optical return loss is applied at TP2.

	Minimum Transmitter Wavelength (nm)	Maximum Transmitter Wavelength (nm)	Minimum Dispersion (ps/nm)	Maximum Dispersion (ps/nm)
25GBASE-LR	1295	1325	-27.9	22.6
25GBASE-ER (30km)	1295	1310	-83.7	27.6
25GBASE-ER (40km)	1295	1310	-111.6	36.8

# Reference Existing Clauses (200.10)

## 88.11 Characteristics of the fiber optic cabling (channel)

The 100GBASE-LR4 and 100GBASE-ER4 fiber optic cabling shall meet the specifications defined in Table 88–14. The fiber optic cabling consists of one or more sections of fiber optic cable and any intermediate connections required to connect sections together.

### 88.11.1 Optical fiber cable

The fiber optic cable requirements are satisfied by cables containing IEC 60793-2-50 type B1.1 (dispersion un-shifted single-mode), type B1.3 (low water peak single-mode), or type B6\_a (bend insensitive) fibers or the requirements in Table 88–15 where they differ.

**Table 88–15—Optical fiber and cable characteristics**

Description	Value	Unit
Nominal fiber specification wavelength	1310	nm
Cabled optical fiber attenuation (max)	0.43 <sup>a</sup> or 0.5 <sup>b</sup>	dB/km
Zero dispersion wavelength ( $\lambda_0$ )	$1300 \leq \lambda_0 \leq 1324$	nm
Dispersion slope (max) ( $S_0$ )	0.093	ps/nm <sup>2</sup> km

<sup>a</sup>The 0.43 dB/km at 1295 nm attenuation for optical fiber cables is derived from Appendix I of ITU-T G.695.

<sup>b</sup>The 0.5 dB/km attenuation is provided for Outside Plant cable as defined in ANSI/TIA 568-C.3. Using 0.5 dB/km may not support operation at 10 km for 100GBASE-LR4 or 40 km for 100GBASE-ER4.

### 88.11.2 Optical fiber connection

An optical fiber connection, as shown in Figure 88–3, consists of a mated pair of optical connectors.

#### 88.11.2.1 Connection insertion loss

The maximum link distance is based on an allocation of 2 dB total connection and splice loss. For example, this allocation supports four connections with an average insertion loss per connection of 0.5 dB. Connections with different loss characteristics may be used provided the requirements of Table 88–14 are met.

#### 88.11.2.2 Maximum discrete reflectance

The maximum discrete reflectance shall be less than –26 dB.

### 88.11.3 Medium Dependent Interface (MDI) requirements

The 100GBASE-LR4 or 100GBASE-ER4 PMD is coupled to the fiber optic cabling at the MDI. The MDI is the interface between the PMD and the “fiber optic cabling” (as shown in Figure 88–3). Examples of an MDI include the following:

- Connectorized fiber pigtail
- PMD receptacle

When the MDI is a connector plug and receptacle connection, it shall meet the interface performance specifications of IEC 61753-1-1 and IEC 61753-021-2.

NOTE—Transmitter compliance testing is performed at TP2 as defined in 88.5.1, not at the MDI.

## 200.10 Characteristics of the fiber optic cabling (channel)

The 25GBASE-LR and 25GBASE-ER fiber optic cabling shall meet the specifications defined in Table 200–12. The fiber optic cabling consists of one or more sections of fiber optic cable and any intermediate connections required to connect sections together.

### 200.10.1 Optical fiber cable

The fiber optic cable requirements are satisfied by cables containing IEC 60793-2-50 type B1.1 (dispersion un-shifted single-mode), type B1.3 (low water peak single-mode), or type B6\_a (bend insensitive) fibers or the requirements in Table 200–13 where they differ.

**Table 200–13—Optical fiber and cable characteristics**

Description	Value	Unit
Nominal fiber specification wavelength	1310	nm
Cabled optical fiber attenuation (max)	0.43 <sup>a</sup> or 0.5 <sup>b</sup>	dB/km
Zero dispersion wavelength ( $\lambda_0$ )	$1300 \leq \lambda_0 \leq 1324$	nm
Dispersion slope (max) ( $S_0$ )	0.093	

<sup>a</sup>The 0.43 dB/km at 1295 nm attenuation for optical fiber cables is derived from Appendix I of ITU-T G.695.

<sup>b</sup>The 0.5 dB/km attenuation is provided for Outside Plant cable as defined in ANSI/TIA 568-C.3. Using 0.5 dB/km may not support operation at 10 km for 25GBASE-LR or 40 km for 25GBASE-ER.

### 200.10.2 Optical fiber connection

An optical fiber connection, as shown in Figure 200–3, consists of a mated pair of optical connectors.

#### 200.10.2.1 Connection insertion loss

The maximum link distance is based on an allocation of 2 dB total connection and splice loss. For example, this allocation supports four connections with an average insertion loss per connection of 0.5 dB. Connections with different loss characteristics may be used provided the requirements of Table 200–12 are met.

#### 200.10.2.2 Maximum discrete reflectance

The maximum discrete reflectance shall be less than –26 dB.

### 200.10.3 Medium Dependent Interface (MDI) requirements

The 25GBASE-LR or 25GBASE-ER PMD is coupled to the fiber optic cabling at the MDI. The MDI is the interface between the PMD and the “fiber optic cabling” (as shown in Figure 200–3). Examples of an MDI include the following:

- Connectorized fiber pigtail
- PMD receptacle

When the MDI is a connector plug and receptacle connection, it shall meet the interface performance specifications of IEC 61753-1-1 and IEC 61753-021-2.

NOTE—Transmitter compliance testing is performed at TP2 as defined in 200.5.1, not at the MDI.

# Section Title Of 200.10.3

(Will resolve when 200.10 changed to reference of 112.3)

## 802.3cc-D0.2

### **200.10.3 Medium Dependent Interface (MDI) requirements**

The 25GBASE-LR or 25GBASE-ER PMD is coupled to the fiber optic cabling at the MDI. The MDI is the interface between the PMD and the “fiber optic cabling” (as shown in Figure 200–3). Examples of an MDI include the following:

- a) Connectorized fiber pigtail
- b) PMD receptacle

When the MDI is a connector plug and receptacle connection, it shall meet the interface performance specifications of IEC 61753-1-1 and IEC 61753-021-2.

NOTE—Transmitter compliance testing is performed at TP2 as defined in 200.5.1, not at the MDI.

## 802.3-2015

### **88.11.3 Medium Dependent Interface (MDI) requirements**

The 100GBASE-LR4 or 100GBASE-ER4 PMD is coupled to the fiber optic cabling at the MDI. The MDI is the interface between the PMD and the “fiber optic cabling” (as shown in Figure 88–3). Examples of an MDI include the following:

- a) Connectorized fiber pigtail
- b) PMD receptacle

When the MDI is a connector plug and receptacle connection, it shall meet the interface performance specifications of IEC 61753-1-1 and IEC 61753-021-2.

NOTE—Transmitter compliance testing is performed at TP2 as defined in 88.5.1, not at the MDI.

## 802.3by-D3.2

### **112.10.3 Medium Dependent Interface (MDI)**

The 25GBASE-SR PMD is coupled to the fiber optic cabling at the MDI. The MDI is the interface between the PMD and the “fiber optic cabling” (as shown in Figure 112–3). Examples of an MDI include the following:

- a) Connectorized fiber pigtail.
- b) PMD receptacle.

When the MDI is a connector plug and receptacle connection, it shall meet the interface performance specifications of IEC 61753-1 and IEC 61753-022-2.

NOTE—Compliance testing is performed at TP2 and TP3 as defined in 112.5.1, not at the MDI.

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# Summary

1. Please read and comment on D0.3.
2. TBD items
  1. APD damage threshold
  2. Stressed receiver sensitivity test conditions
3. PICS editor?