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# Single PMD for Two PHYs – Alternative Solution for i-31

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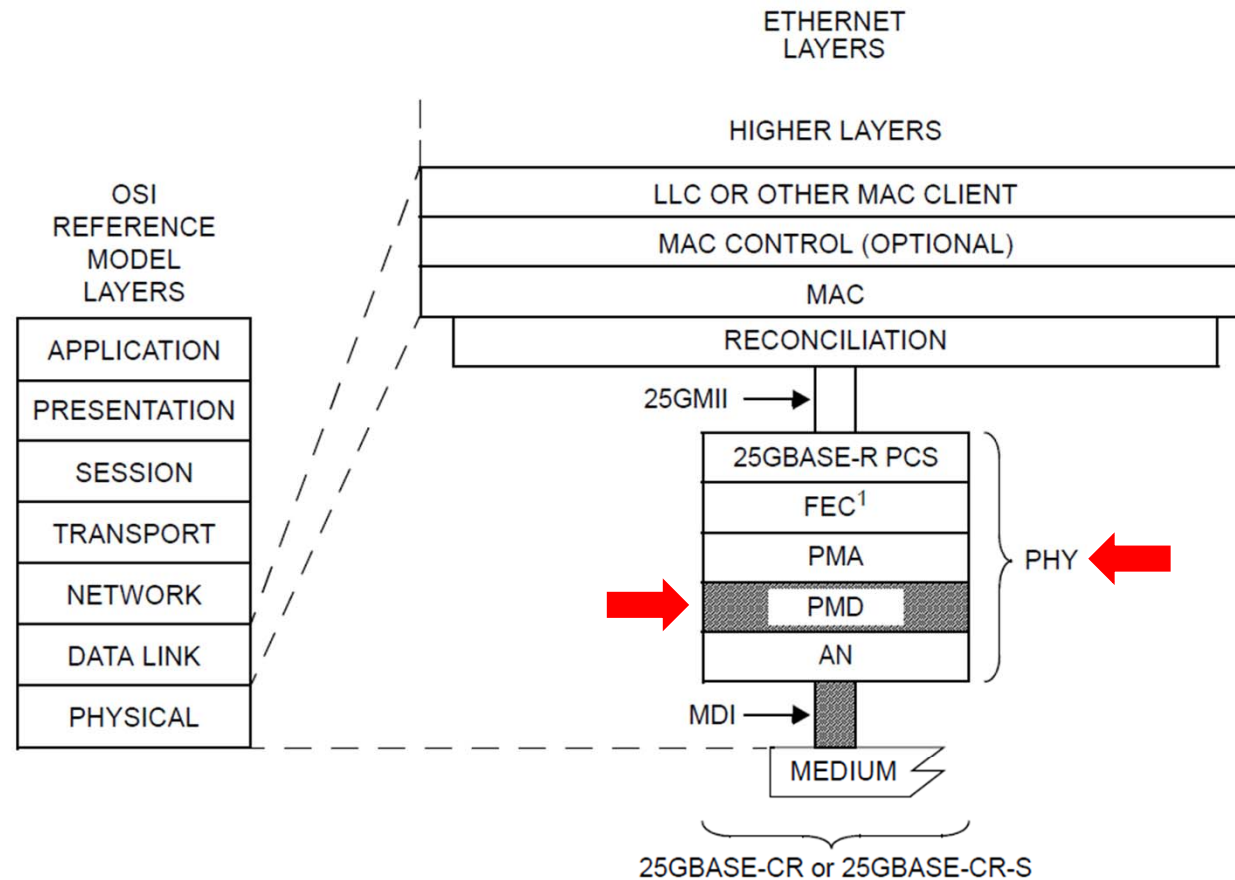
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- 25GBASE-CR and 25GBASE-CR-S are used as names for both of PHY and PMD
  
- Those Two PHYs are technically different
  - 25GBASE-CR PHY includes Clause 108 RS-FEC sublayer
  - 25GBASE-CR-S PHY does not include Clause 108 RS-FEC sublayer
  
- Those Two PMDs are technically almost same
  - They are merely used in different PHYs
  - They have different test specifications, but that is a minor difference
  
- Defining Two PMDs obscures difference between Two PHYs

# Definition of PHY and PMD

- 1.4.327 Physical Layer entity (**PHY**): Within IEEE 802.3, the portion of the Physical Layer between the Medium Dependent Interface (MDI) and the Media Independent Interface (MII), Gigabit Media Independent Interface (GMII) or 10 Gigabit Media Independent Interface (XGMII), consisting of the Physical Coding Sublayer (PCS), the Physical Medium Attachment (PMA), and, if present, the WAN Interface Sublayer (WIS) and Physical Medium Dependent (PMD) sublayers. The PHY contains the functions that transmit, receive, and manage the encoded signals that are impressed on and recovered from the physical medium. (For example, see IEEE Std 802.3, Clauses 23 to 26, Clauses 36, Clause 40, Clauses 48 to 54, Clauses 58 to 63, Clause 65, Clause 66, and Clauses 82 to 89.)
- 1.4.329 Physical Medium Dependent (**PMD**) sublayer: Within IEEE 802.3, that portion of the Physical Layer responsible for interfacing to the transmission medium. The PMD is located just above the Medium Dependent Interface (MDI).

# PHY vs PMD



25GMII = 25 GIGABIT MEDIA INDEPENDENT INTERFACE  
 AN = AUTO-NEGOTIATION  
 FEC = FORWARD ERROR CORRECTION  
 LLC = LOGICAL LINK CONTROL  
 MAC = MEDIA ACCESS CONTROL  
 MDI = MEDIUM DEPENDENT INTERFACE

PCS = PHYSICAL CODING SUBLAYER  
 PHY = PHYSICAL LAYER DEVICE  
 PMA = PHYSICAL MEDIUM ATTACHMENT  
 PMD = PHYSICAL MEDIUM DEPENDENT

NOTE 1—CONDITIONAL BASED ON PHY TYPE

# Alternative Proposal

## ■ Merge Two PMDs to Single PMD and Keep Two PHYs

Table 105-2—Nomenclature and clause correlation, 25GBASE-R

Nomenclature	Clause														
	73	74	78	106		107	108	109	109A	109B	110		111		112
	Auto-Negotiation	BASE-R FEC	EEE	RS	25GMII	25GBASE-R PCS	25GBASE-R RS-FEC	PMA	25GAUI C2C	25GAUI C2M	25GBASE-CR PMD	25GBASE-CR-S PMD	25GBASE-KR PMD	25GBASE-KR-S PMD	25GBASE-SR PMD
25GBASE-CR	M <sup>a</sup>	M	O <sup>a</sup>	M	O	M	M	M	O		M				
25GBASE-CR-S	M	M	O	M	O	M		M	O		<b>M</b>	M			
25GBASE-KR	M	M	O	M	O	M	M	M	O				M		
25GBASE-KR-S	M	M	O	M	O	M		M	O				<b>M</b>	M	
25GBASE-SR			O	M	O	M	M	M	O	O					M

<sup>a</sup>O = Optional, M = Mandatory

Keep →

Keep →

Merge Merge

- From architectural point of view, defining two almost same PMDs in the protocol stack is a poor practice of abstraction
  
- By merging Two PMDs to Single PMD, we can clarify the difference between Two PHYs
  - FEC-mode resolution using AN remains same and is still complicated
  
- By keeping Two PHYs, not making RS-FEC optional, we can avoid confusion in the market
  
- More editorial efforts are required than my first proposal
  - Similar number of changes (see Appendix)
  - Higher dependence on context
    - We occasionally have to revise use of PHY and PMD in the original document

# Appendix

## Potential Straw Poll

- I would support the following approach (Chicago Rule)
  - A. Keep Two PHYs and Two PMDs (as defined in D3.0)
  - B. Keep Two PHYs and merge Two PMDs to Single PMD (as proposed in hidaka\_3by\_02\_0116.pdf)
  - C. Merge Two PHYs to Single PHY, make RS-FEC optional, and merge Two PMDs to Single PMD (as proposed in hidaka\_3by\_01\_0116.pdf)

Results:

Room count:



# Appendix

## Detail Changes

# Clause 45

- P31, L38: delete “or 25GBASE-KR-S”
- P31, L39: delete “or 25GBASE-CR-S”
- P32, L13: delete “, 25GBASE-KR-S”
- P32, L14: delete “, 25GBASE-CR-S”
- P32, L29: delete “, 25GBASE-KR-S”
- P32, L31: delete “, 25GBASE-CR-S”
- P32, L45: delete “and 25GBASE-KR-S”
- P32, L47: delete “and 25GBASE-CR-S”
- P34, L13-25: change Table 45-17b as follows:
  - Reassign 1.19.15:3 to “Reserved”
  - Reassign 1.19.2 to “25GBASE-SR ability”
  - Reassign 1.19.1 to “25GBASE-CR ability” and change “25GBASE-CR” with “25GBASE-CR **PMD**”
  - Delete row of “1.19.2 25GBASE-CR-S ability”
  - Reassign 1.19.0 to “25GBASE-KR ability” and change “25GBASE-KR” with “25GBASE-KR **PMD**”
- P34, L30: change “(1.19.4)” with “(1.19.2)”
- P34, L36: change “25GBASE-CR ability (1.19.3)” with “25GBASE-CR **PMD** ability (1.19.1)”
- P34, L41-46: delete clause “45.2.1.14b.3 25GBASE-CR-S ability (1.19.2)”
- P34, L47: change “25GBASE-KR ability (1.19.1)” with “25GBASE-KR **PMD** ability (1.19.0)” and change clause number with “45.2.1.14b.3”
- P35, L1-5: delete clause “45.2.1.14b.5 25GBASE-KR-S ability (1.19.0)”
- P47, L20-29: change Table 45-209 as follows:
  - Change name column of 7.48.13 as follows:  
25GBASE-KR **PHY** or 25GBASE-CR **PHY**
  - Change description column of 7.48.13 as follows:  
1 = **PHY** is negotiated to perform 25GBASE-KR **PHY** or 25GBASE-CR **PHY**  
0 = **PHY** is not negotiated to perform 25GBASE-KR **PHY** or 25GBASE-CR **PHY**
  - Change name column of 7.48.12 as follows:  
25GBASE-KR-S **PHY** or 25GBASE-CR-S **PHY**
  - Change description column of 7.48.12 as follows:  
1 = **PHY** is negotiated to perform 25GBASE-KR-S **PHY** or 25GBASE-CR-S **PHY**  
0 = **PHY** is not negotiated to perform 25GBASE-KR-S **PHY** or 25GBASE-CR-S **PHY**
  - Change description column of 7.48.7 as follows:  
1 = **PHY** is negotiated to perform RS-FEC  
0 = **PHY** is not negotiated to perform RS-FEC

# Clause 69, 73, 74

- P51, L25-30: change the paragraph inserted after the third paragraph in 69.2.3 as follows:

Backplane Ethernet also specifies 25GBASE-KR **PHY** and 25GBASE-KR-S **PHY**. The 25GBASE-KR **PHY** embodiment employs the PCS defined in clause 107, the BASE-R FEC defined in Clause 74, the RS-FEC defined in Clause 108, the PMA defined in Clause 109, and the **25GBASE-KR** PMD defined in Clause 111, and specifies 25 Gb/s operation over one differential path in each direction. The 25GBASE-KR-S **PHY** embodiment employs the PCS defined in clause 107, the BASE-R FEC defined in Clause 74, the PMA defined in Clause 109, and the **25GBASE-KR** PMD defined in Clause 111, and specifies 25 Gb/s operation over one differential path in each direction.

- P52, L10-21: change Table 69-1a as follows:
  - Delete column of “Clause 111 25GBASE-KR-S PMD”
  - Change “Clause 111 25GBASE-KR PMD” for “25GBASE-KR-S” as “M” (Mandatory)
  - Chang “25GBASE-KR” with “25GBASE-KR **PHY**” and “25GBASE-KR-S” with “25GBASE-KR-S **PHY**” in the nomenclature column

- P55, L7: insert the following sentences after the end of the paragraph which is ending with “during auto-negotiation.”:

On the other hand, if the physical medium is known to be not supported by 25GBASE-CR-S **PHY** (e.g. CA-25G-L cable assembly), 25GBASE-CR **PHY** may advertise only A10 ability bit without advertising A9 ability bit during auto negotiation in order to prevent unreliable operation with 25GBASE-CR-S **PHY**. Likewise, if the physical medium is known to be not supported by 25GBASE-KR-S **PHY**, 25GBASE-KR **PHY** may advertise only A10 ability bit without advertising A9 ability bit during auto negotiation in order to prevent unreliable operation with 25GBASE-KR-S **PHY**.

- P57, L3: change “25GBASE-KR or 25GBASE-CR” with “25GBASE-KR **PHY** or 25GBASE-CR **PHY**” in row 7 of Table 73-5
- P57, L5: change “25GBASE-KR-S or 25GBASE-CR-S” with “25GBASE-KR-S **PHY** or 25GBASE-CR-S **PHY**” in row 8 of Table 73-5
- P57, L40: change “25GBASE-KR, 25GBASE-KR-S, 25GBASE-CR, or 25GBASE-CR-S PMD” with “25GBASE-KR, 25GBASE-KR-S, 25GBASE-CR, or 25GBASE-CR-S **PHY**”
- P57, L50: change “technology-dependent PMD” with “technology-dependent PMD **or PHY**”
- P57, L54: change “technology-dependent PMD” with “technology-dependent PMD **or PHY**”
- P59, L21: change “PHYs described in Clause 110 and Clause 111” with “PHYs described in Clause **105**”

# Clause 105, 107, 109, 110

- P76, L34-36: change the paragraph for item c) as follows:
  - c) The Media Dependent Interface (MDI) as specified in Clause 110 for 25GBASE-CR **PMD**, in Clause 111 for 25GBASE-KR **PMD**, or in Clause 112 for 25GBASE-SR uses a single-lane data path.
- P77, L42: change “the RS-FEC sublayer (see Clause 110)” with “the RS-FEC sublayer **defined in Clause 108**”
- P77, L47: change “the RS-FEC sublayer (see Clause 111)” with “the RS-FEC sublayer **defined in Clause 108**”
- P78, L16-31: change Table 105-2 as follows:
  - Delete column of “Clause 110 25GBASE-CR-S PMD”
  - Delete column of “Clause 111 25GBASE-KR-S PMD”
  - Change “Clause 110 25GBASE-CR PMD” for “25GBASE-CR-S” as “M” (Mandatory)
  - Change “Clause 111 25GBASE-KR PMD” for “25GBASE-KR-S” as “M” (Mandatory)
- P87, L16: delete row of “25GBASE-CR-S PMD” from Table 105-3
- P87, L19: delete row of “25GBASE-KR-S PMD” from Table 105-3
- P98, L35-37: change the first sentence as follows:

A PCS used with a 25GBASE-KR **PHY**, 25GBASE-KR-S **PHY**, 25GBASE-CR **PHY** or 25GBASE-CR-S **PHY** has the same requirements to support auto-negotiation as a PCS used with a 10GBASE-KR PMD.
- P129, L17: change “PMD for 25GBASE-CR, 25GBASE-CR-S, 25GBASE-KR, and 25GBASE-KR-S” with “PMD of 25GBASE-CR and 25GBASE-KR”
- P136, L22: change “PMD for 25GBASE-KR, 25GBASE-KR-S, 25GBASE-CR, or 25GBASE-CR-S” with “PMD of 25GBASE-KR or 25GBASE-CR”
- P138, L2: delete “and 25GBASE-CR-S” from clause 110 title
- P138, L7: change the first sentence of clause 110.1 as follows:

This clause specifies the 25GBASE-CR PMD and the baseband medium for the 25GBASE-CR PHY and the 25GBASE-CR-S PHY.
- P138, L11: change “25GBASE-CR and 25GBASE-CR-S” with “25GBASE-CR **PMD**”
- P138, L18: change “the 25GBASE-CR and 25GBASE-CR-S PMDs” with “the 25GBASE-CR PMD” in Table 110-1 title
- P138, L21: change “25GBASE-CR” with “25GBASE-CR PHY” and “25GBASE-CR-S” with “25GBASE-CR-S PHY” in header row of Table 110-1
- P139, L14: change “25GBASE-CR and 25GBASE-CR-S PMD sublayers” with “25GBASE-CR PMD sublayer”
- P139, L50: change “25GBASE-CR and 25GBASE-CR-S relationship” with “25GBASE-CR PMD relationship” in Figure 110-1 title
- P140, L3: change “25GBASE-CR and 25GBASE-CR-S PMDs” with “25GBASE-CR PMD”
- P140, L4: change “these PMDs” with “this PMD”
- P142, L21: change “25GBASE-CR or 25GBASE-CR-S” with “25GBASE-CR **PMD**”
- P142, L46: change “25GBASE-CR or 25GBASE-CR-S” with “25GBASE-CR **PMD**” in Figure 110-2 title

# Clause 110 (continued)

- P145, L42: change “25GBASE-CR and 25GBASE-CR-S PMDs” with “25GBASE-CR **PMD**”
- P146, L17: change “25GBASE-CR and 25GBASE-CR-S PHYs” with “25GBASE-CR **PMD**”
- P146, L23: change “25GBASE-CR and 25GBASE-CR-S PHYs” with “25GBASE-CR **PMD**”
- P146, L31: delete “or 25GBASE-CR-S”
- P146, L48-50: change the second paragraph of 110.8.4.2 as follows:

A **25GBASE-CR PMD in a** 25GBASE-CR PHY shall comply with the **25GBASE-CR PMD** receiver interference tolerance test requirements for the RS-FEC, BASE-R FEC and no-FEC modes. A **25GBASE-CR PMD in a** 25GBASE-CR-S PHY shall comply with the **25GBASE-CR PMD** receiver interference tolerance test requirements for the BASE-R FEC and no FEC modes.
- P147, L11: change “25GBASE-CR” with “25GBASE-CR **PMD**” in Table 110-5 title
- P147, L38: change “25GBASE-CR and 25GBASE-CR-S” with “25GBASE-CR **PMD**” in Table 110-6 title
- P148, L1: change “25GBASE-CR and 25GBASE-CR-S” with “25GBASE-CR **PMD**” in Table 110-6 title
- P148, L20: change “25GBASE-CR and 25GBASE-CR-S” with “25GBASE-CR **PMD**” in Table 110-7 title
- P150, L35-37: change the third paragraph of clause 110.8.4.2.5 as follows:

For a **25GBASE-CR PMD in** 25GBASE-CR and 25GBASE-CR-S PHYs, the receiver under test shall meet the error requirements specified for the tests in Table 110-6 and Table 110-7. For a **25GBASE-CR PMD in** a 25GBASE-CR PHY, the receiver under test shall also meet the error requirements specified for the test in Table 110-5.
- P150, L51 - P151, L2: change the third paragraph of clause 110.8.4.3 as follows:

For a **25GBASE-CR PMD in** a 25GBASE-CR-S PHY, the receiver under test shall meet the error requirements specified for the tests in Table 110-6 and Table 110-7, for each case listed in Table 110-8. For a **25GBASE-CR PMD in** a 25GBASE-CR PHY, the receiver under test shall ~~also~~ meet the error requirements specified for the test in Table 110-5.
- P151, L16: change “25GBASE-CR and 25GBASE-CR-S PHYs” with “25GBASE-CR **PMD**”
- P159, L3: delete “and 25GBASE-CR-S” in clause 110.13 title
- P159, L8: delete “and 25GBASE-CR-S”
- P159, L38: delete “and 25GBASE-CR-S”
- P160, L6: in row of “\*CR”, change “25GBASE-CR” in feature column with “25GBASE-CR **PHY**”
- P160, L8: in row of “CR-S”, change “25GBASE-CR-S” in feature column with “25GBASE-CR-S **PHY**”
- P161, L20: delete “and 25GBASE-CR-S” in clause 110.13.4 title

# Clause 111

- P167, L2: delete “and 25GBASE-KR-S” from clause 111 title
- P167, L7: change the first sentence of clause 111.1 as follows:

This clause specifies the 25GBASE-KR PMD and the baseband medium for the 25GBASE-KR PHY and the 25GBASE-KR-S PHY.
- P167, L16: change “the 25GBASE-KR and 25GBASE-KR-S PMDs” with “the 25GBASE-KR PMD” in Table 111-1 title
- P167, L19: change “25GBASE-KR” with “25GBASE-KR PHY” and “25GBASE-KR-S” with “25GBASE-KR-S PHY” in header row of Table 111-1
- P167, L40: Change the paragraph below Table 111-1 as follows:

A 25GBASE-KR PMD in a 25GBASE-KR PHY operates over a channel meeting the requirements of 111.9.1 or 111.9.2. A 25GBASE-KR PMD in a 25GBASE-KR-S PHY operates over a channel meeting the requirements of 111.9.2. A 25GBASE-KR PMD in a 25GBASE-KR PHY interoperates with a 25GBASE-KR PMD in a 25GBASE-KR-S PHY.
- P168, L45: change “25GBASE-KR and 25GBASE-KR-S relationship” with “25GBASE-KR PMD relationship” in Figure 111-1 title
- P168, L51: change “25GBASE-KR and 25GBASE-KR-S PMDs” with “25GBASE-KR PMD”
- P168, L52: change “these PMDs” with “this PMD”
- P171, L13: change “25GBASE-KR or 25GBASE-KR-S” with “25GBASE-KR PMD”
- P171, L32: change “25GBASE-KR or 25GBASE-KR-S” with “25GBASE-KR PMD” in Figure 111-2 title
- P173, L33: change “25GBASE-KR and 25GBASE-KR-S PMDs” with “A 25GBASE-KR PMD”
- P174, L3: change “25GBASE-KR and 25GBASE-KR-S” with “a 25GBASE-KR PMD”
- P174, L9: change “25GBASE-KR” with “a 25GBASE-KR PMD”
- P174, L20-22: change the second paragraph of 111.8.3.1 as follows:

**A 25GBASE-KR PMD** in a 25GBASE-KR PHY shall comply with the receiver interference tolerance test requirements for RS-FEC mode, BASE-R FEC mode and no-FEC mode. **A 25GBASE-KR PMD** in a 25GBASE-KR-S PHY shall comply with the receiver interference tolerance test requirements for BASE-R FEC mode and no-FEC mode.
- P174, L25: change “25GBASE-KR” with “25GBASE-KR PMD” in Table 111-4 title
- P175, L1: change “25GBASE-KR and 25GBASE-KR-S” with “25GBASE-KR PMD” in Table 111-5 title
- P175, L29: change “25GBASE-KR and 25GBASE-KR-S” with “25GBASE-KR PMD” in Table 111-6 title
- P176, L10-13: change third paragraph of clause 111.8.3.2 as follows:

For **a 25GBASE-KR PMD** in 25GBASE-KR and 25GBASE-KR-S PHYs, the receiver under test shall meet the error requirement specified for the tests in Table 111-5 and Table 111-6, for each case listed in Table 111-7. For **a 25GBASE-KR PMD** in a 25GBASE-KR PHY, the receiver under test shall also meet the error requirement specified for the test in Table 111-4 for each case listed in Table 111-7.

# Clause 111 (continued)

- P176, L39: change “25GBASE-KR channel” with “Channel for a 25GBASE-KR PHY” in clause 111.9.1 title
- P176, L40: change the first sentence as follows:  
A **channel for a 25GBASE-KR PHY** is used as a link connecting two 25GBASE-KR PHYs.
- P176, L47: change “25GBASE-KR-S channel” with “Channel for a 25GBASE-KR-S PHY” in clause 111.9.2 title
- P176, L48-49: change the first sentence in the first paragraph of clause 111.9.2 as follows:  
A **channel for a 25GBASE-KR-S PHY** is used as a link between a pair of 25GBASE-KR-S PHYs, between a pair of 25GBASE-KR PHYs, or between a 25GBASE-KR-S PHY and a 25GBASE-KR PHY.
- P177, L6: change “25GBASE-KR” with “Channel for a 25GBASE-KR PHY” and “25GBASE-KR-S” with “Channel for 25GBASE-KR-S PHY” in the header row of Table 111-8
- P178, L3: change “25GBASE-KR” with “Channel for a 25GBASE-KR PHY” and “25GBASE-KR-S” with “Channel for 25GBASE-KR-S PHY” in the header row of Table 111-8
- P178, L13: change “25GBASE-KR channel” with “channel for a 25GBASE-KR PHY”
- P179, L3: delete “and 25GBASE-KR-S” in clause 111.11 title
- P179, L8: delete “and 25GBASE-KR-S”
- P179, L38: delete “and 25GBASE-KR-S”
- P180, L6: in row of “\*KR”, change “25GBASE-KR” in feature column with “25GBASE-KR **PHY**”
- P180, L8: in row of “KR-S”, change “25GBASE-KR-S” in feature column with “25GBASE-KR-S **PHY**”
- P181, L2: delete “and 25GBASE-KR-S” in clause 111.11.4 title

# Clause 93A, 110A, 110B, 110C



- P205, L10: insert the following after title of clause 93A.1:  
*Change the last sentence of the fourth paragraph of clause 93A.1 as follows:*  
The values assigned to these parameters are defined by the PMD specification that invokes the method (see Table 93A-2).
- P205, L14: change “Physical Layer specifications” with “PMD specifications” in Table 93A-2 title
- P205, L18: change “25GBASE-CR (Clause 110)” with “25GBASE-CR PMD (Clause 110)”
- P205, L20: delete row of “25GBASE-CR-S (Clause 110)”
- P205, L21: change “25GBASE-KR (Clause 111)” with “25GBASE-KR PMD (Clause 111)”
- P205, L23: delete row of “25GBASE-KR-S (Clause 111)”
- P225, L7: change “25GBASE-CR and 25GBASE-CR-S” with “25GBASE-CR PMD” in clause 110A title
- P225, L14: change “25GBASE-CR and 25GBASE-CR-S” with “25GBASE-CR PMD”
- P227, L37: change “the 25GBASE-CR and 25GBASE-CR-S channels” with “the channels for a 25GBASE-CR PMD”
- P228, L6: change “25GBASE-CR, 25GBASE-CR-S, and 25GAUI C2M” with “25GBASE-CR PMD and 25GAUI C2M” in clause 110B title
- P228, L11: change “25GBASE-CR and 25GBASE-CR-S PHYs” with “a 25GBASE-CR PMD”
- P228, L14: change “25GBASE-CR and 25GBASE-CR-S PHYs” with “a 25GBASE-CR PMD”
- P231, L2: change “25GBASE-CR, 25GBASE-CR-S, and 25GAUI C2M” with “25GBASE-CR PMD and 25GAUI C2M” in clause 110B.2 title
- P231, L9: change “25GBASE-CR, 25GBASE-CR-S, and 25GAUI C2M” with “25GBASE-CR PMD and 25GAUI C2M”
- P231, L38: change “25GBASE-CR, 25GBASE-CR-S, and 25GAUI C2M” with “25GBASE-CR PMD and 25GAUI C2M”
- P232, L12-13: change “25GBASE-CR, 25GBASE-CR-S, and 25GAUI C2M” with “25GBASE-CR PMD and 25GAUI C2M” in clause 110.B.2.4 title
- P233, L6: change “25GBASE-CR and 25GBASE-CR-S PHYs” with “a 25GBASE-CR PMD”
- P233, L13: change “with either 25GBASE-CR or 25GBASE-CR-S Physical Layers” with “with 25GBASE-CR PMD and either 25GBASE-CR or 25GBASE-CR-S Physical Layers”



Thank you