DR / DR-x MDI: Support for Breakout (Comments #341 and #342)

**IEEE P802.3dj Task Force Meeting
IEEE 802.3 Sept 2024 Interim**

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Supporters

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Introduction

- The following presentation addresses the following comments
  - **Comment #341** (SC 180.8.3.1) - Any DR MDI is also capable of supporting any lower lane count DR interfaces than what it is specified for as applicable, as well as combinations. Clause 180.8.3.1.1 starts off specifying 400GBASE-DR2 with twelve total positions. It could support multiple ports of 200GBASE-DR1, or could support a combination of a single 400GBASE-DR2 with two ports of 200GBASE-DR1.
  - **Comment #342** (SC 182.8.3.1.1) - Any DRx-2 MDI is also capable of supporting any lower lane count DRx-2 interfaces than what it is specified for as applicable, as well as combinations. Clause 182.8.3.1.1 starts off specifying 400GBASE-DR2-2 with twelve total positions. It could support multiple ports of 200GBASE-DR1-2, or could support a combination of a single 400GBASE-DR2-2 with two ports of 200GBASE-DR1-2.

- "Breakout" scenarios can be supported – why wouldn't we?
  - Annex 162C addresses MDIs for 100GBASE-CR1, 200GBASE-CR2, and 400GBASE-CR4, and 800GBASE-CR8
  - Annex 179C addresses MDIs for 200GBASE-CR1, 400GBASE-CR2, 800GBASE-CR4, and 1.6TBASE-CR8
  - QSFP-DD maps electrical signal to optical port mapping (Per Rev 7.0 - QSFP112 specifications removed from QSFP-DD and forwarded to SNIA.)
  - OIF CMIS - The CMIS specification also explicitly defines the mapping of groups of electrical lanes to particular fibers, though it does not specifically identify lanes numbers within a group.
  - **See section 6.2.1.3. https://www.oiforum.com/wp-content/uploads/OIF-CMIS-05.2.pdf**

- This presentation suggests how DRx / DRx-2 MDI's could be specified to address break-out.

Background

- **For 200GBASE-DR1 (200GBASE-DR1-2)**
  - **Examples of MDI include:**
    - **Connectorized fiber pigtail**
    - **PMD receptacle**
  - **No wavelength assignment**
  - **Per 180.8.3.2 / 182.8.3.2 - When the MDI is a connector plug and receptacle connection, it shall meet the interface performance specifications of IEC 61753-1 and IEC 61753-021-02.**

Background (Comment #341)

- The MDI for either single 400GBASE-DR2 or 800GBASE-DR4 and its requirements are specified in 180.8.3.3- 2 to 12 fibers
- Mapping DR2 and DR4 MDI lane assignments to the same connector
- For both assignments
  - Only single port of target PHY defined
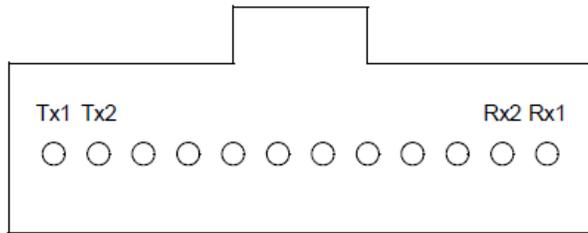
Figure 180–7—400GBASE-DR2 optical lane assignments
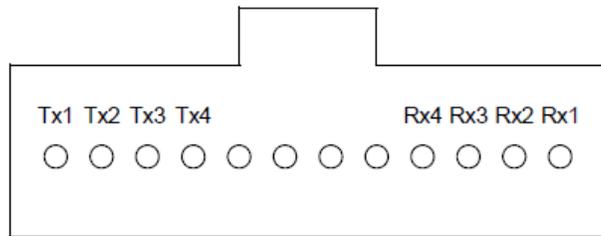
Figure 180–8—800GBASE-DR4 optical lane assignments
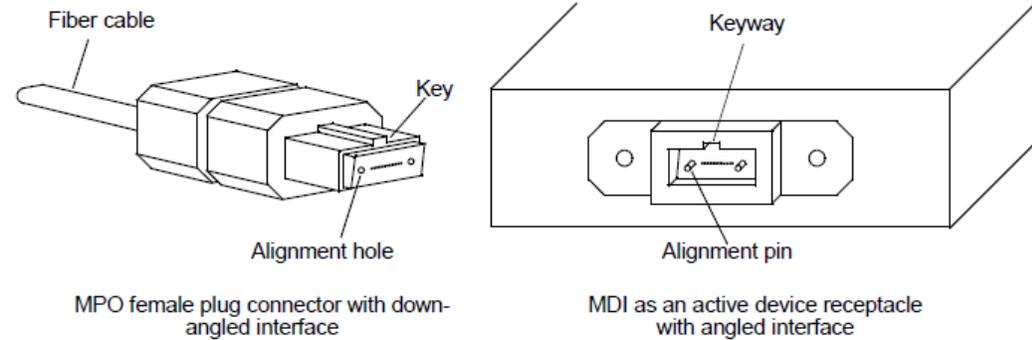
Figure 180–10—MPO female plug with down-angled interface and MDI active device receptacle with angled interface

Background (Comment #341) - continued

- **Only single port of target PMD implemented**
- **The MDI for a single 1.6TBASE-DR8 is specified in 180.8.3.4 for 16 fibers.** 1.6TBASE-DR8-2 shall use a single-row 16-fiber interface
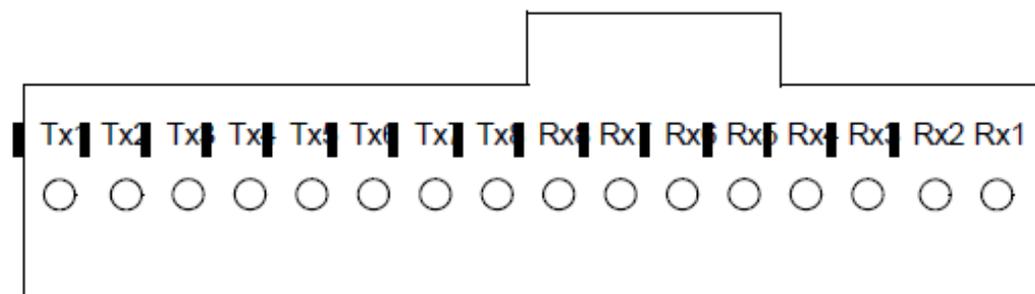
Figure 180–9—1.6TBASE-DR8 optical lane assignments

Background (Comment #342)

- The MDI for either single 400GBASE-DR2-2 or 800GBASE-DR4-2 and its requirements are specified in 182.8.3.3- 2 to 12 fibers
- Mapping DR2-2 and DR4-2 MDI lane assignments to the same connector
- For both assignments
  - Only single port of target PHY defined
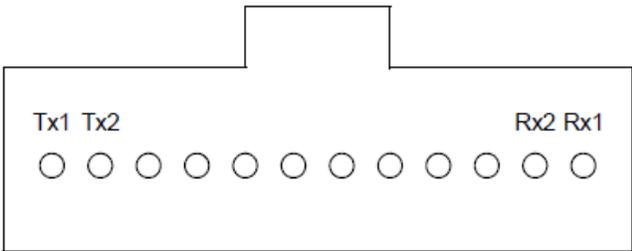
Figure 182–7—400GBASE-DR2-2 optical lane assignments
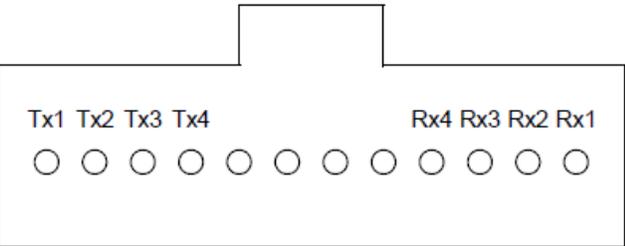
Figure 182–8—800GBASE-DR4-2 optical lane assignments

MPO female plug connector with down-angled interface

MDI as an active device receptacle with angled interface
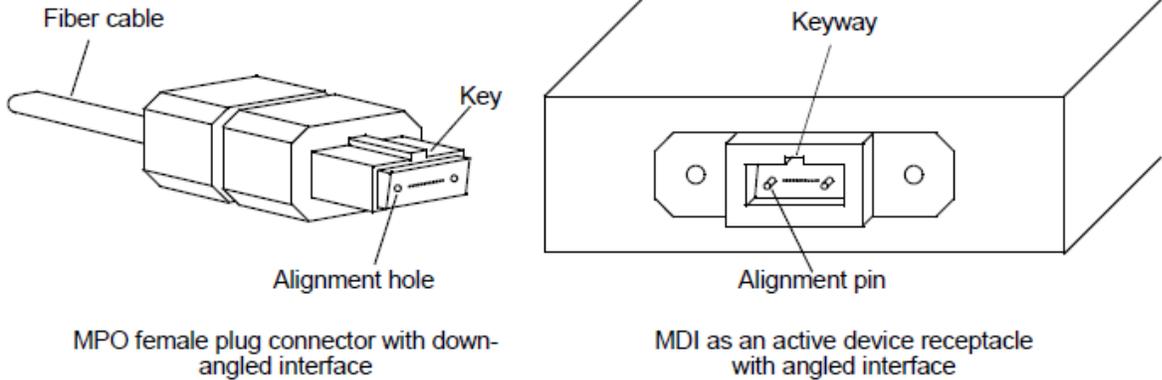
Figure 182–10—MPO female plug with down-angled interface and MDI active device receptacle with angled interface

Background (Comment #342) - continued

- **Only single port of target PMD implemented**

- **The MDI for a single 1.6TBASE-DR8 is specified in 182.8.3.4 for 16 fibers.**

- **Note – Caption to Fig 182-9 is incorrect – it should be 1.6TBASE-DR8-2**
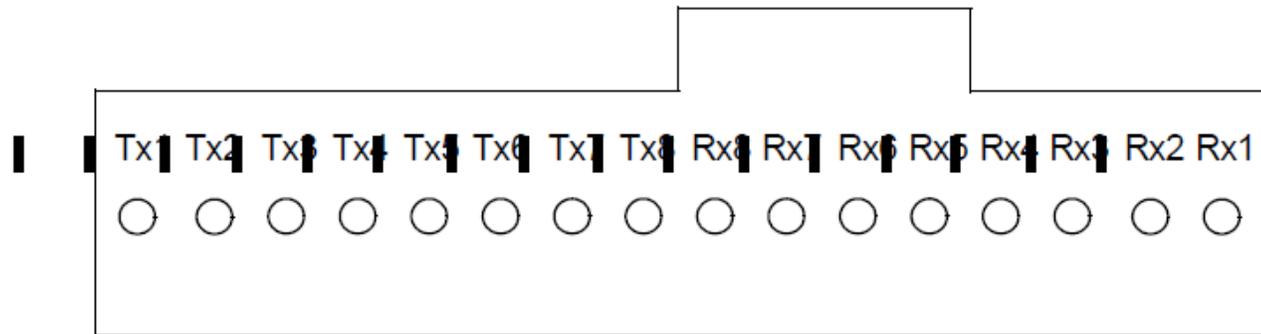
Figure 182–9—1.6TBASE-DR8 optical lane assignments

PHY Mapping to MDIs

▣ **Multiple PHY types could be mapped to the fiber connector (1x 12 fiber) specified in 180.8.3.3 (182.8.3.3) (in different configurations)**

- **200GBASE-DR1 (DR1-2)**
- **400GBASE-DR2 (DR2-2)**
- **800GBASE-DR4 (DR4-2)**

▣ **Multiple PHY types could be mapped to the fiber connector (1x16 fiber) specified in 180.8.3.4 / 182.8.3.4 (in different configurations)**

- **200GBASE-DR1 (DR1-2)**
- **400GBASE-DR2 (DR2-2)**
- **800GBASE-DR4 (DR4-2)**
- **1.6TBASE-DR8 (DR8-2)**

Leverage IEEE 802.3 - CR – 1:1 mapping logical PMD/MDI lanes to to connector contacts

Source: IEEE Std 802.3ck-2022

Mapping of logical PMD lanes to physical connector lanes is explicitly defined for non-breakout and breakout cases. Therefore, for each Ethernet group, lane 0 is explicit.

Table 162C–2—PMD to connector signal assignments

PMD signal <PMD number>:<PMD signal>				Connector signal
100GBASE-CR1	200GBASE-CR2	400GBASE-CR4	800GBASE-CR8	
0:DL0n	0:DL0n	0:DL0n	0:DL0n	DL0n
0:DL0p	0:DL0p	0:DL0p	0:DL0p	DL0p
1:DL0n	0:DL1n	0:DL1n	0:DL1n	DL1n
1:DL0p	0:DL1p	0:DL1p	0:DL1p	DL1p
2:DL0n	1:DL0n	0:DL2n	0:DL2n	DL2n
2:DL0p	1:DL0p	0:DL2p	0:DL2p	DL2p
3:DL0n	1:DL1n	0:DL3n	0:DL3n	DL3n
3:DL0p	1:DL1p	0:DL3p	0:DL3p	DL3p
4:DL0n	2:DL0n	1:DL0n	0:DL4n	DL4n
4:DL0p	2:DL0p	1:DL0p	0:DL4p	DL4p
5:DL0n	2:DL1n	1:DL1n	0:DL5n	DL5n
5:DL0p	2:DL1p	1:DL1p	0:DL5p	DL5p
6:DL0n	3:DL0n	1:DL2n	0:DL6n	DL6n
6:DL0p	3:DL0p	1:DL2p	0:DL6p	DL6p
7:DL0n	3:DL1n	1:DL3n	0:DL7n	DL7n
7:DL0p	3:DL1p	1:DL3p	0:DL7p	DL7p
0:SL0n	0:SL0n	0:SL0n	0:SL0n	SL0n
0:SL0p	0:SL0p	0:SL0p	0:SL0p	SL0p
1:SL0n	0:SL1n	0:SL1n	0:SL1n	SL1n

Table 162C–4—MDI connector contact mapping for QSFP112 and QSFP-DD800

QSFP112	QSFP-DD800	Connector signal name	Description
1	1	GND	Ground
2	2	SL1n	Transmitter inverted data input
3	3	SL1p	Transmitter non-inverted data input
4	4	GND	Ground
5	5	SL3n	Transmitter inverted data input
6	6	SL3p	Transmitter non-inverted data input
7	7	GND	Ground
13	13	GND	Ground
14	14	DL2p	Receiver non-inverted data output
15	15	DL2n	Receiver inverted data output
16	16	GND	Ground
17	17	DL0p	Receiver non-inverted data output
18	18	DL0n	Receiver inverted data output
19	19	GND	Ground
20	20	GND	Ground
21	21	DL1n	Receiver inverted data output
22	22	DL1p	Receiver non-inverted data output

Proposed Remedy

- Create annex for "Multi-MDI Per Connector" (w / editorial license)
  - Create Optical Lane Assignments to address multiple configurations for 1x 12 row fiber, based on:
    - 200GBASE-DR1 (DR1-2)
    - 400GBASE-DR2 (DR2-2)
    - 800GBASE-DR4 (DR4-2)
  - Create Optical Lane Assignments to address multiple multiple configurations for 1x 16 row fiber, based on:
    - 200GBASE-DR1 (DR1-2)
    - 400GBASE-DR2 (DR2-2)
    - 800GBASE-DR4 (DR4-2)
    - 1.6TBASE-DR8 (DR8-2)

- Use suggested mapping in issenhuth_3dj_02_2409

- Question for the CRG – should the annex be normative or informative?