

# MDI Proposals for 100 Gb/s Short Reach 200GBASE-SR2 and 400GBASE-SR4

David Malicoat  
Malicoat Networking Solutions  
Senko Advanced Components

802.3db Task Force Ad Hoc Teleconference  
July 9, 2020

# Overview

- Current status of MDIs in 802.3 specifications
- Market Need
- Why New MDI's
- Proposal for 200G-SR2
- Proposal for 400G-SR4

# 802.3 Definitions of serial MDI's

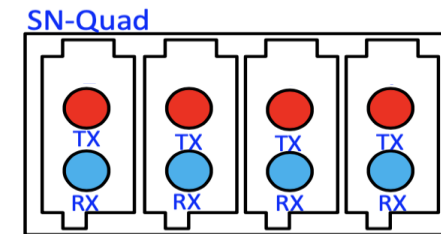
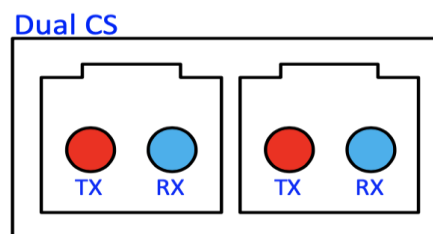
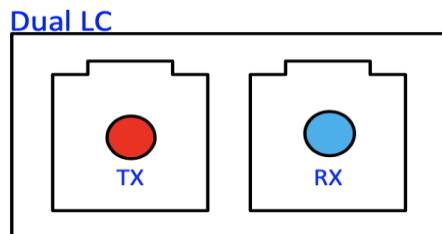
- Physical MDI for serial optical interconnect was defined in clause 38 1000BASE-LX and 1000BASE-SX
- *The 1000BASE-SX and 1000BASE-LX MDI optical receptacles shall be the duplex SC, meeting the following requirements:*

## Clause 38.11.3 Medium Dependent Interface (MDI)

- The 1000BASE-SX and 1000BASE-LX PMD is coupled to the fiber optic cabling through a connector plug into the MDI optical receptacle. The 1000BASE-SX and 1000BASE-LX MDI optical receptacles shall be the duplex SC, meeting the following requirements:
  - a) Meet the dimension and interface specifications of IEC 61754-4 [B37] and IEC 61754-4, Interface 4-2.
  - b) Meet the performance specifications as specified in ISO/IEC 11801.
  - c) Ensure that polarity is maintained.
  - d) The receive side of the receptacle is located on the left when viewed looking into the transceiver optical ports with the keys on the bottom surface.

## 802.3 Definitions of serial MDI's (cont.)

- The receive side of the receptacle is located on the left when viewed looking into the transceiver optical ports with the keys on the bottom surface.
- Newer duplex optical connectors have different geometries and do not all necessarily have left-right orientation with keys on the bottom.



# Market Need

- End customers have been asking for documentation in 802.3 specifications for parallel optical connections that can be broken out into serial duplex optical connections at the MDI interface
  - Current specs have only defined Tx and Rx positions, and lane ordering with MPO's
  - Breakout applications from switch to server are a primary driver behind this project
- Smaller than LC form factor ceramic ferrule duplex connectors have been introduced in the market to address performance and breakout directly at the MDI interface
  - Better return loss performance of ceramic ferrule duplex connectors
  - Easier cleaning and maintenance of ceramic ferrule connectors
  - Current definitions of the small form factor duplex MDIs have been defined in multiple MSA's

# Why do we need a new MDI's?

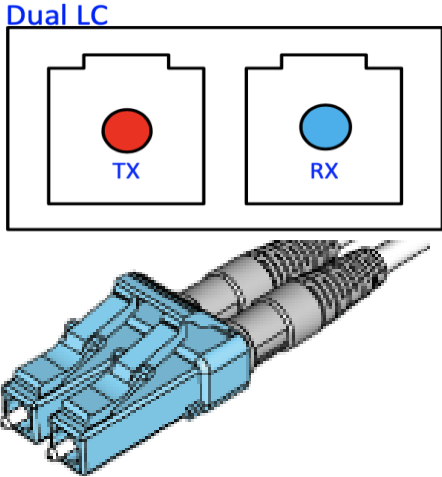
- Every IEEE 802.3 standard that has an MPO connector, explicitly assigns Tx and Rx.
  - The most recent ones are 400GBASE-SR8 (clause 138) and 400GBASE-SR4.2 (clause 150)
- Ceramic ferrule duplex connections have different performance characteristics from MPO's
  - Connector return loss impacts PAM4 signaling
  - We have defined tables for numbers of discrete reflectance's depending on interconnect type >-45 dB & <-35 dB vs. >-55 dB & <-45 dB (clause 140)
- Eliminate confusion of Tx and Rx location for multiple duplex optical connectors.
  - Last physical definition of Tx and Rx orientation with SC connector.
  - Clause 38
    - d) The receive side of the receptacle is located on the left when viewed looking into the transceiver optical ports with the keys on the bottom surface.

# 100 Gb/s Short Reach Break out Opportunities

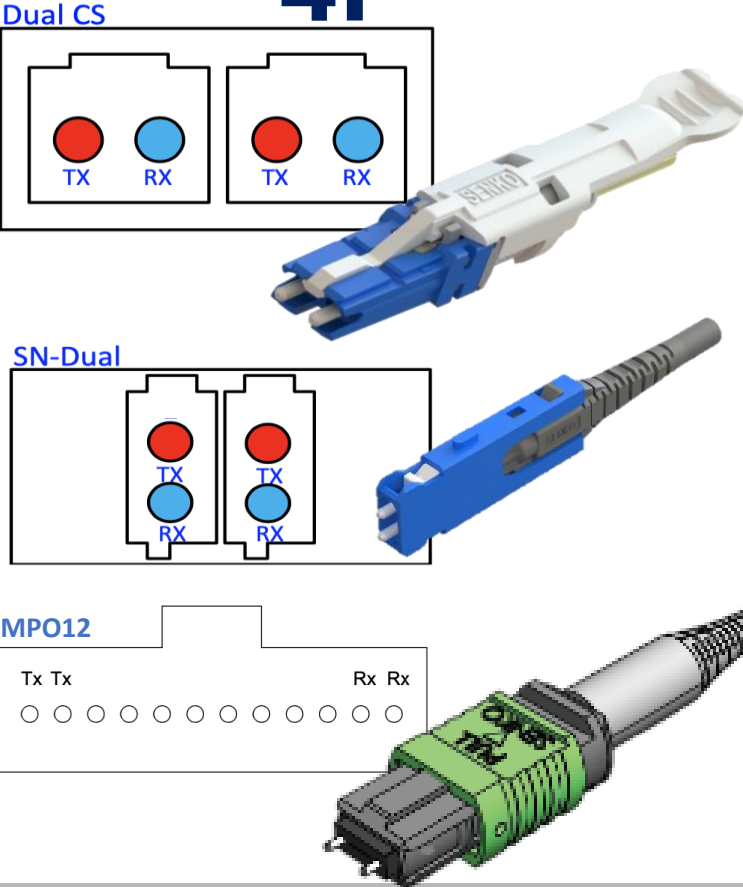
- 200GBASE-SR2
  - Allows for parallel fiber breakout into 2x 100GBASE-SR
  - MPO12
  - Dual CS
  - Dual SN
- 400GBASE-SR4
  - Allows for parallel fiber breakout into 4x 100GBASE-SR
  - MPO12
  - Quad SN

# MDI Connector Variants for 100/200/400GBASE-SR

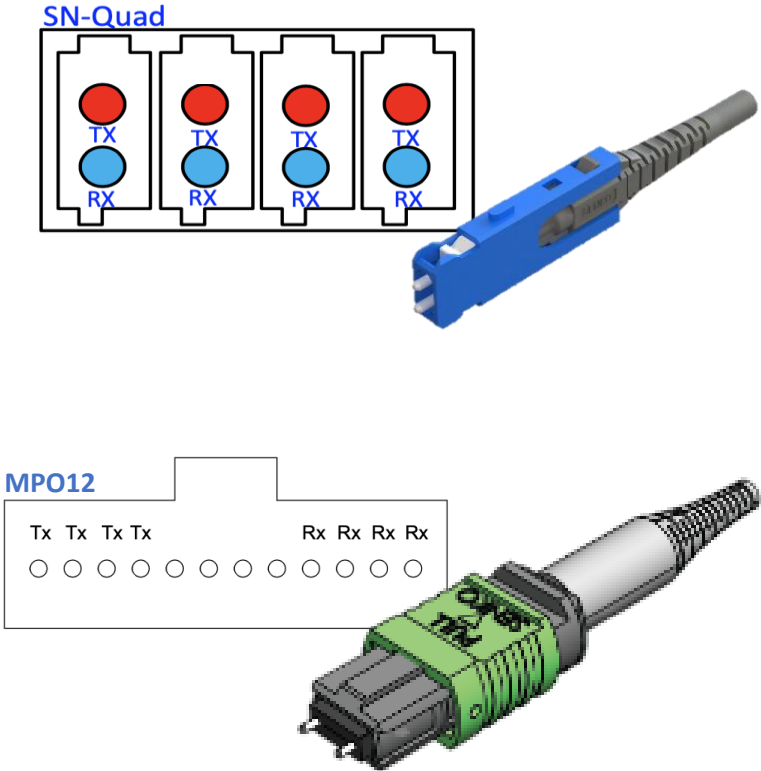
## 100GBASE-SR 2F



## 200GBASE-SR2 4F



## 400GBASE-SR4 8F



- Notes:
- LC, CS, and SN MDIs from QSFP-DD specification
  - MPO MDIs from clause 138



# Summary

- For consistency and readability of our standards, we should explicitly document Tx and Rx positions in the PMD for duplex optical connectors
  - Do not not leave it to the user to back track through our specs down to 1G optics for the definition of a SC connector
  - Provide similar level of documentation for duplex optical connections in the PMD that we have provided for MPO's.
- Adopt additional MDI's for ganged serial duplex optical connectors for 200GBASE-SR2 and 400GBASE-SR4 PMDs.
- Adopt Tx and Rx position definitions for duplex optical connectors that can be ganged together into a single MDI interface.
  - Permutation details of how breakouts are managed is beyond the scope of 802.3 and should be left to CMIS (Common Management Interface Specification) type documentation.

backup slides

# Nomenclature terms used across published MSAs and other standards bodies

QSFP-DD / OSFP / SFP-DD MSA	TIA-604-19	IEC 61754-36
CS	SEN FOCUS 19	
SN		SAC

# CS (SEN FOCIS 19)

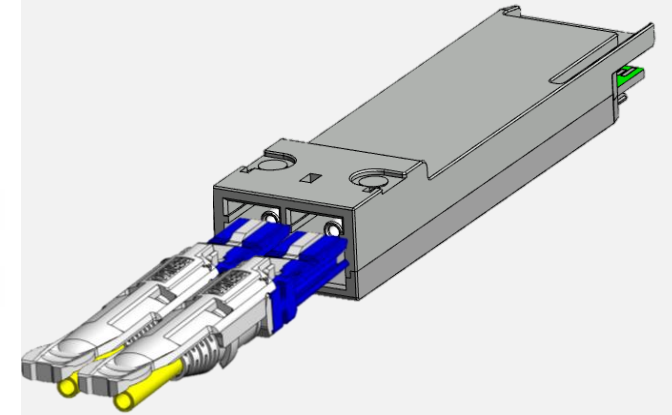
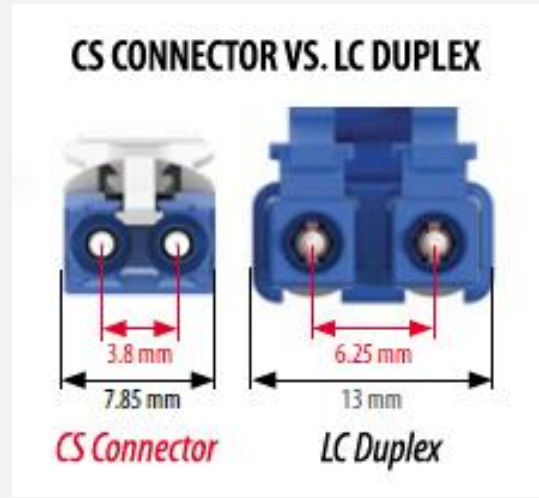
2 x LC  
Ferrule



Adopted by



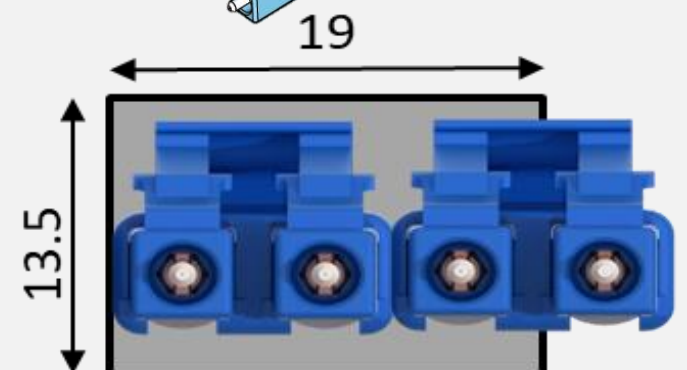
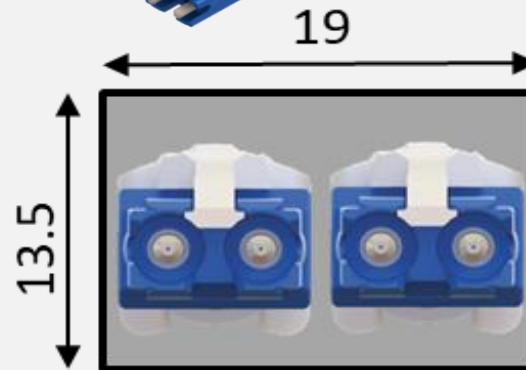
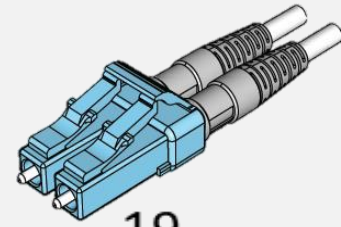
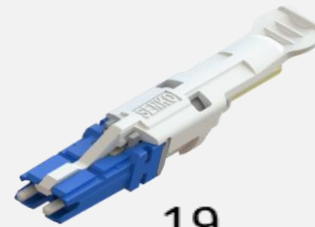
Standard under development  
as TIA-604-19 FOCIS 19



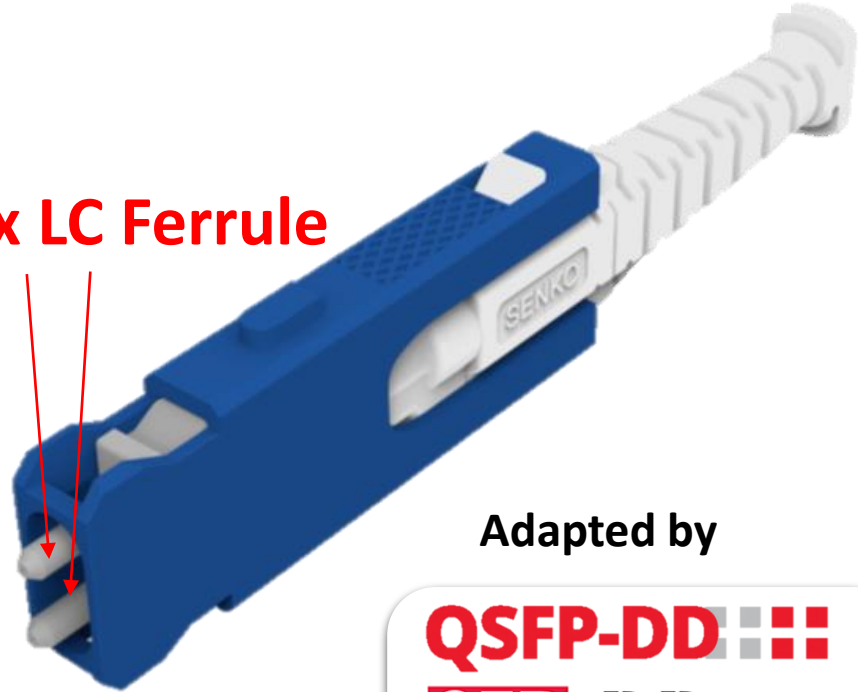
## 2x CS and LC in QSFP footprint

CS

LC



# SN (SAC)

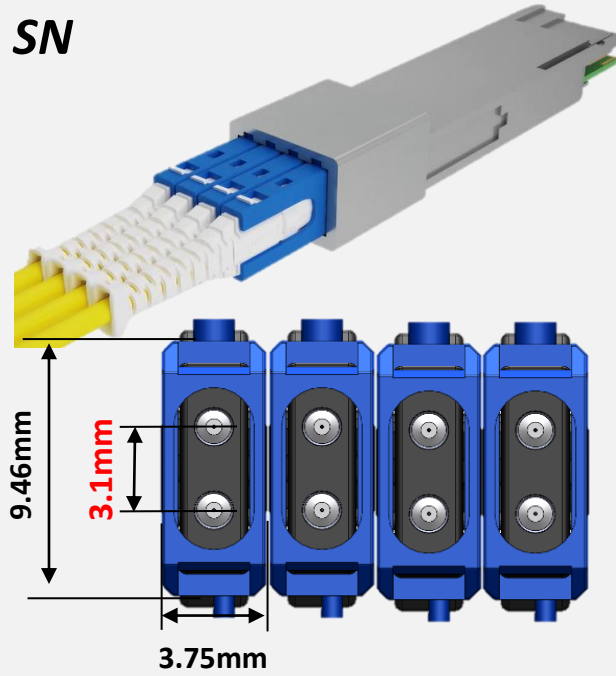


Adapted by

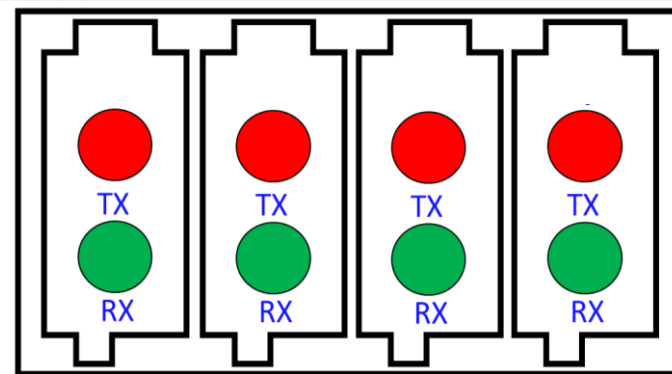


Standard under development  
as IEC 61754-36

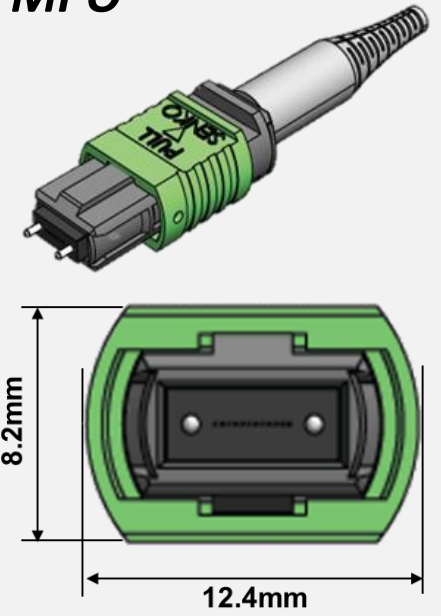
SN



**QSFP-DD**  
**OSFP**



MPO



**SFP-DD**

