MDI Proposal for P802.3cd D1.2

Nathan Tracy

TE Connectivity

March 13-16, 2017 Vancouver

Supporters

- Brad Booth, Microsoft
- Rob Stone, Broadcom
- Dave Lewis, Lumentum
- Fadi Daou, MultiLane
- David (Chan-Chih) Chen, AOI
- Yingo Lin, AOI
- George Tien, AOI
- Matt Davis, Hisense Broadband
- Weiping Huang, Hisense Broadband
- Vittal Balasubramani, Dell EMC
- Thananya Baldwin, Ixia
- Jerry Pepper, Ixia

- Jeff Maki, Juniper
- Gary Nicholl, Cisco
- Scott Kipp, Brocade
- Christophe Metivier, Arista
- Scott Sommers, Molex
- William Wang, Finisar
- Ed Cady, LUXSHARE-ICT
- Greg McSorley, Amphenol
- Josh Sechrist, Intel
- John Petrilla, FOIT
- Tom Palkert, Macom
- David Piehler, Dell EMC

Proposal to add microQSFP as an additional MDI

- microQSFP has been established by an MSA with 22 industry leading members
- Specification is available at www.microQSFP-MSA.com
- As an MDI, microQSFP provides:
  - Higher port density – Same width as SFP, but has 4 lanes
  - Better thermal management – Over 7 Watts power dissipation capacity demonstrated
  - Improved thermal allows up to 72 ports in 1RU
  - Supports both copper and optical
  - Newer connector design – superior performance over QSFP28
  - Single MDI for 50GBASE-CR, 100GBASE-CR2 and 200GBASE-CR4
  - Next generation density, electrical and thermal performance – enables new equipment
- Status:
  - MSA specification is published
  - Connectors and direct attach copper cables available
  - MM and SM optics coming to market

What is microQSFP?

Enables 72 200G ports in a 1RU linecard

- ## High density 4x50G solution

| High density design saves space on the PC board | 33% higher density than existing form factors such as QSFP |

| Increased thermal performance eases system design, increases port density | Significantly better thermal performance than QSFP28 solutions |

| Standardized form factor supports next generation designs | 56Gbps performance with backwards compatibility to 28Gbps |

Enables a new paradigm in equipment design:

- More ports but still allows face plate airflow to the equipment
- Each port helps with the equipment airflow
- Similar to QSFP28, supports copper, MMF and SMF applications

Industry MSA enables a multi-supplier ecosystem

www.microQSFP.com
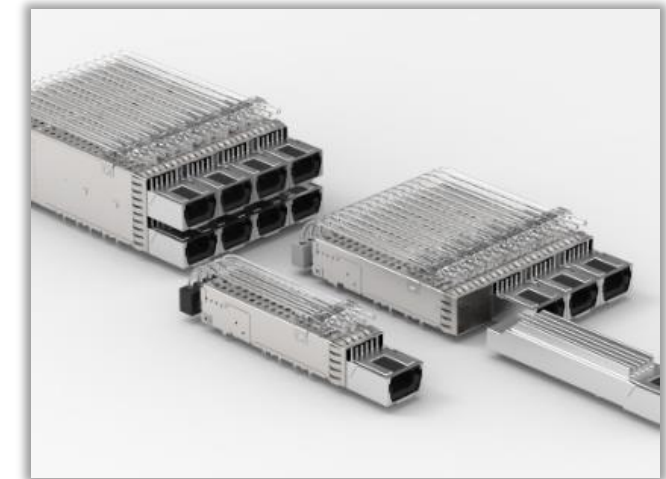
Design features (how it works)

Density:

Connector contacts are on 0.6mm pitch

Allows use of low cost card edge interface

SMT, Stacked, and Belly-to-Belly allows flexible, high density implementations

Port pitch is the same as SFP
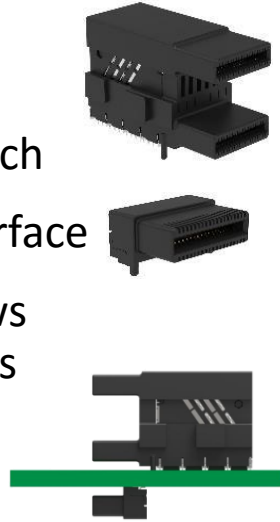
Thermal:

Elimination of riding heat sink eliminates a significant thermal resistance

Fins are integrated into module

Optimal for front-to-back airflow

Enables high density stacked ports
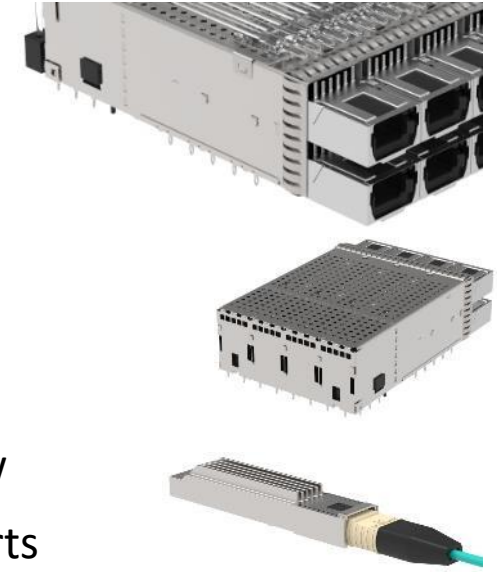
Signal Integrity:

Compliant to OIF-28G-VSR and IEEE 100G-BASE-CR4

Supports 50G PAM4

Plans for 50G NRZ

Media:

Supports DAC Copper, SMF, MMF

MPO and LC optical connection options

Up to 26AWG DAC is supported for maximum reach

Thermal Management

Optimize the module design

- Use improved thermal conductivity materials for higher power transceivers
- Include a finned surface
- One form factor
    - Copper/VCSELS
    - SM Optics
- Complies to PCIe envelope

Airflow Cross-Sectional View Stacked Cage

Optimize the cage design

- Front-to-back airflow through the port opening cools the module.

- No additional clips, heatsinks, etc. required.

- Low cost

- Thermal performance only gets better with increasing the density of ports on the faceplate

7W at 75 CFM
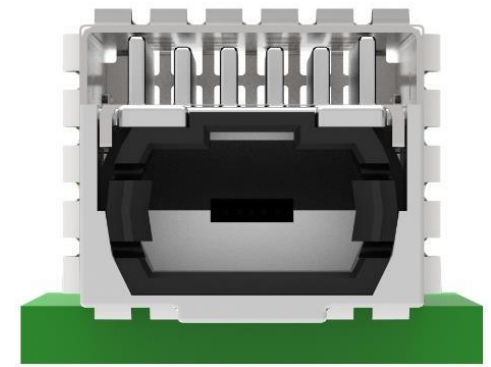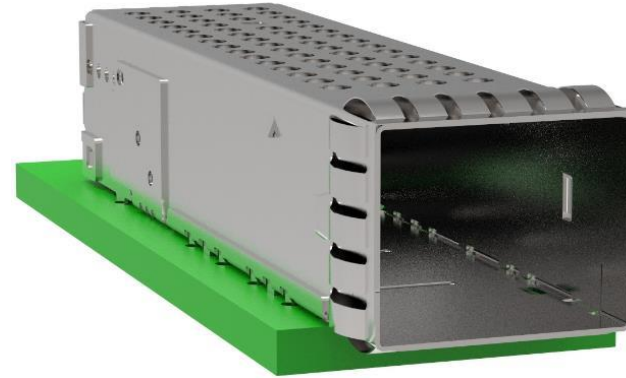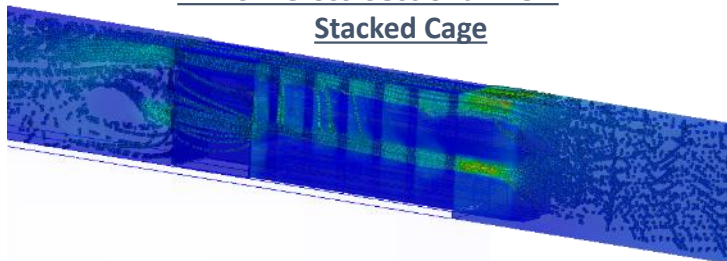
Front view of cage with MPO module inserted

Rear view of 1x1 cage
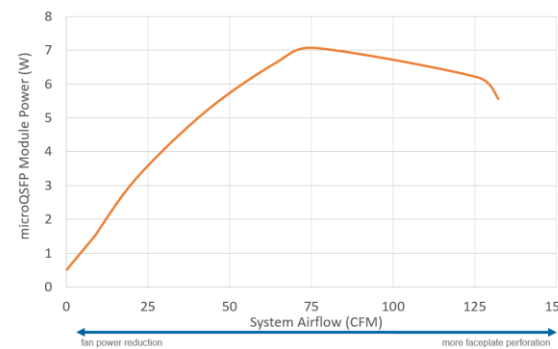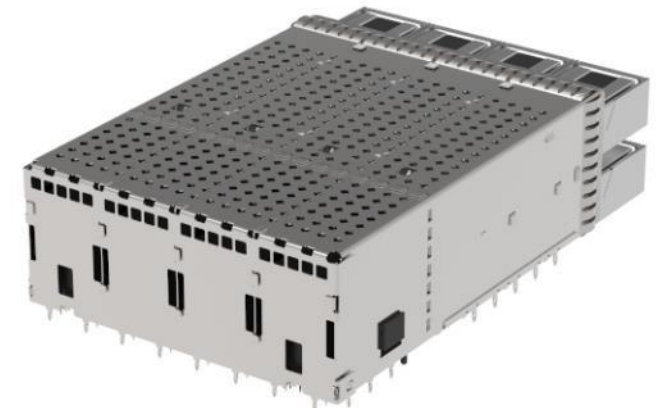
Rear view of stacked cage

# EMI Management

Noisy vs Quiet Zones
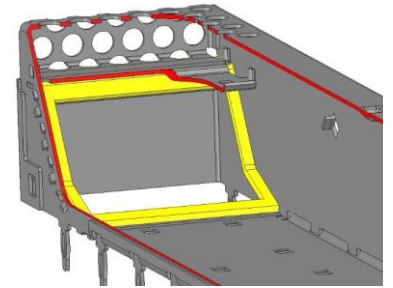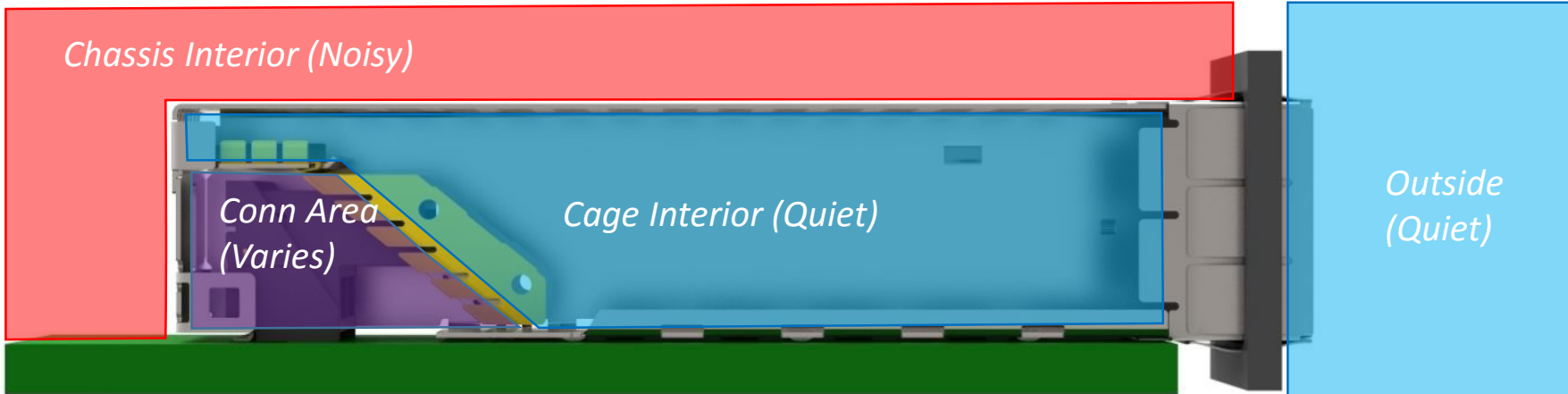

Cut away views
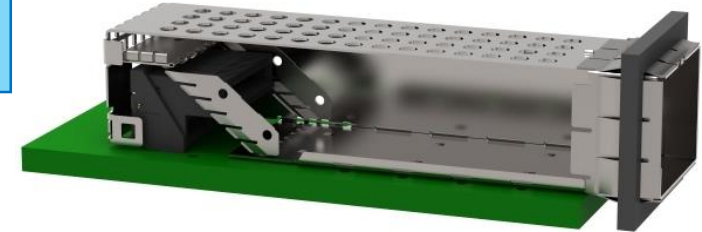
- Junction of noisy and quiet zones are sealed at key interface locations:
  - Faceplate / Bezel Seal
  - Internal Seal
  - Undermount PCB Seal - Optional

- The transceiver module is sealed to minimize leakage (CFP-like)

- Each EMI interface can be implemented with either spring or gasket designs

- Cage design is both EMI tight and allows for front-to-back airflow

- Cage retention pins not used for EMI containment
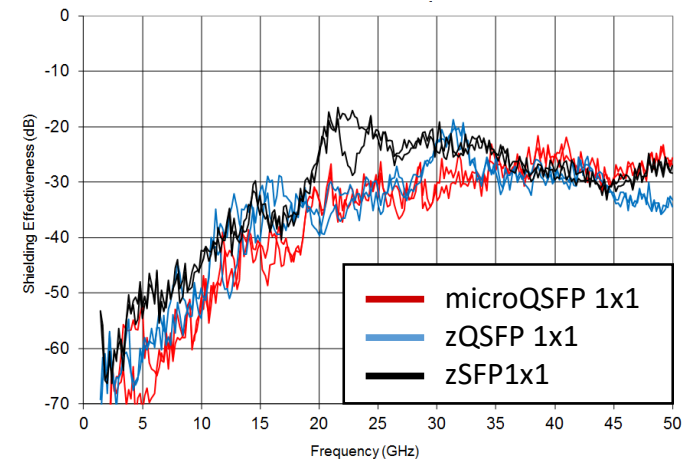
microQSFP EMI validation
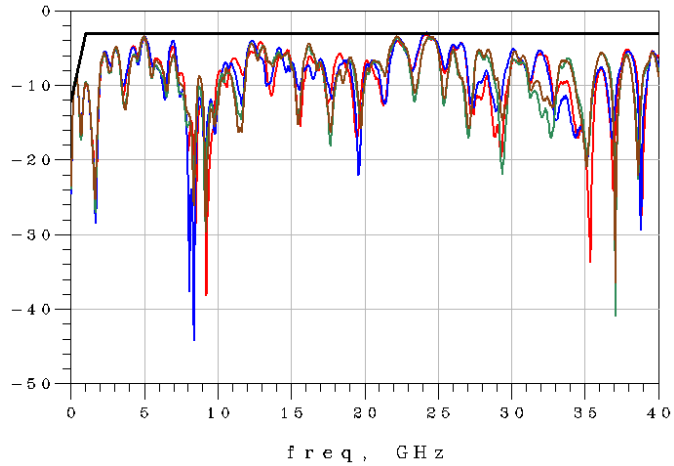
Mated microQSFP Compliance Board Testing
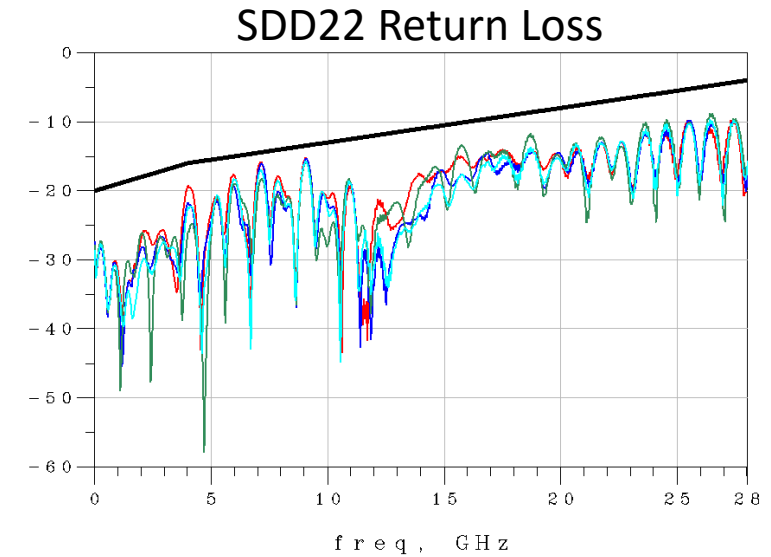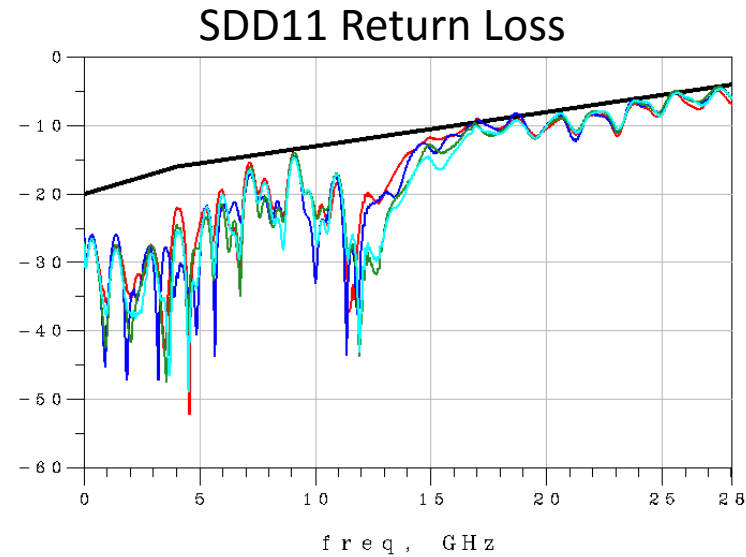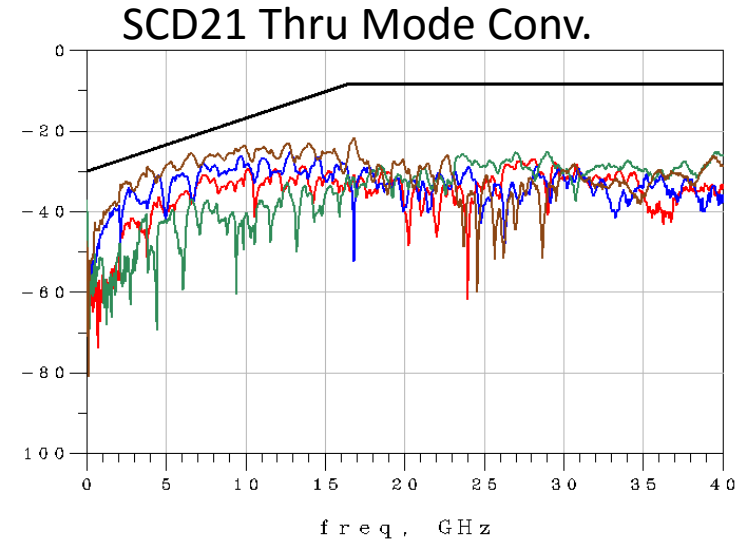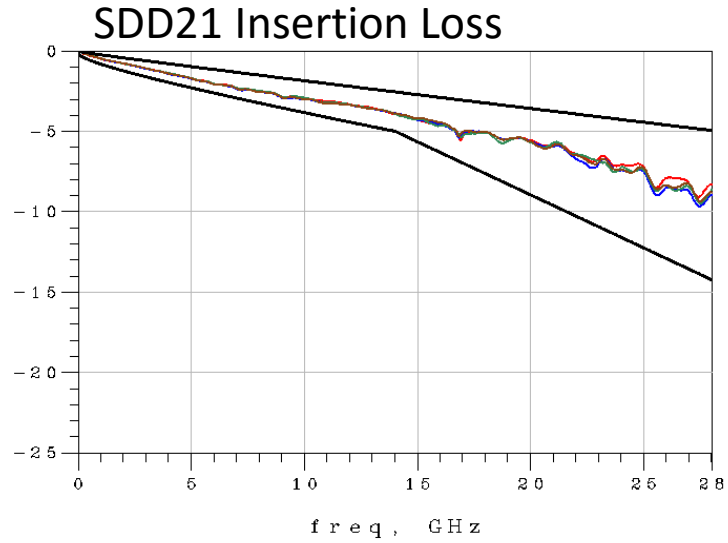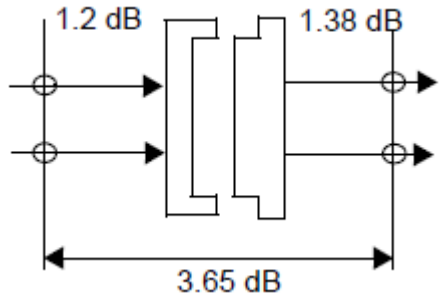
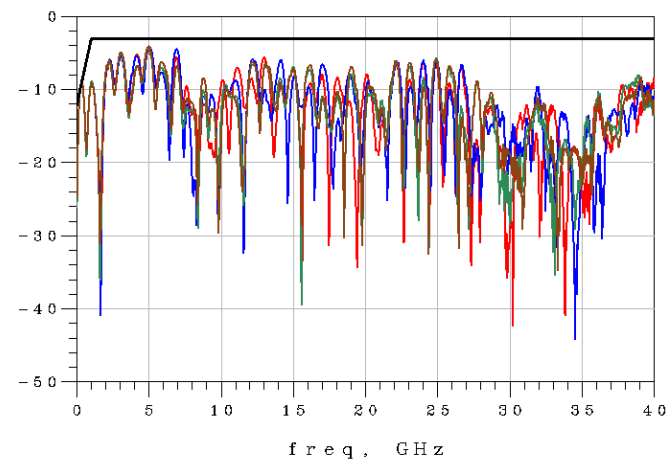IEEE-802.3cd-MASK

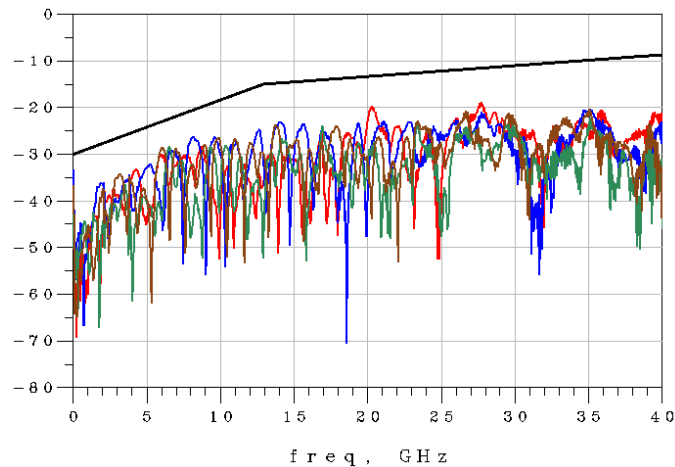# Mated microQSFP Compliance Board Testing

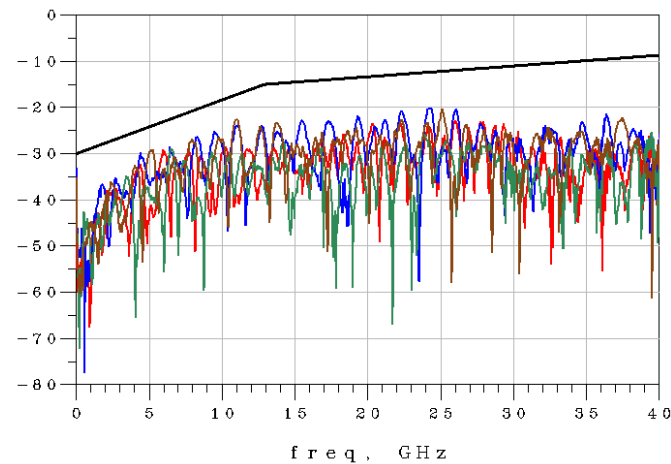IEEE-802.3cd-MASK

SCC11 Common Mode RL

SCC22 Common Mode RL

SCD11 Reflected Mode Conv.

SCD22 Reflected Mode Conv.

multiLane sal

# Mated microQSFP Compliance Board Testing
ICN calculation results

	RX1	RX2	RX3	RX4
MDNEXT ICN (mV)	0.57	0.53	0.57	0.57
MDFEXT ICN (mV)	3.24	2.43	2.99	2.32

	TX1	TX2	TX3	TX4
MDNEXT ICN (mV)	0.78	0.48	0.67	0.65
MDFEXT ICN (mV)	2.79	3.07	2.98	2.93

Table 92–13—Mated test fixtures integrated crosstalk noise

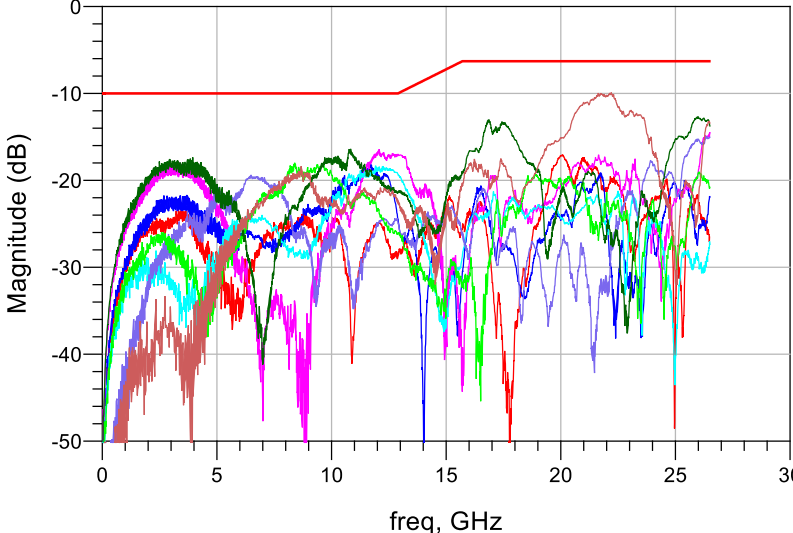| Parameter	100GBASE-CR4	Units
MDNEXT integrated crosstalk noise voltage	Less than 1.8	mV
MDFEXT integrated crosstalk noise voltage	Less than 4.8	mV

multiLane sal
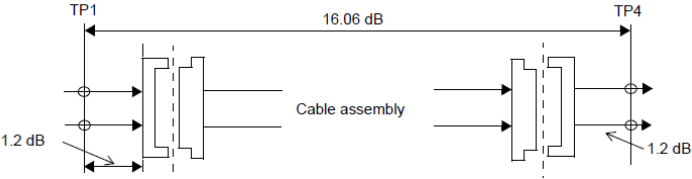
microQSFP Cable Assembly – 3m 28AWG

microQSFP Cable Assembly – 3m 28AWG

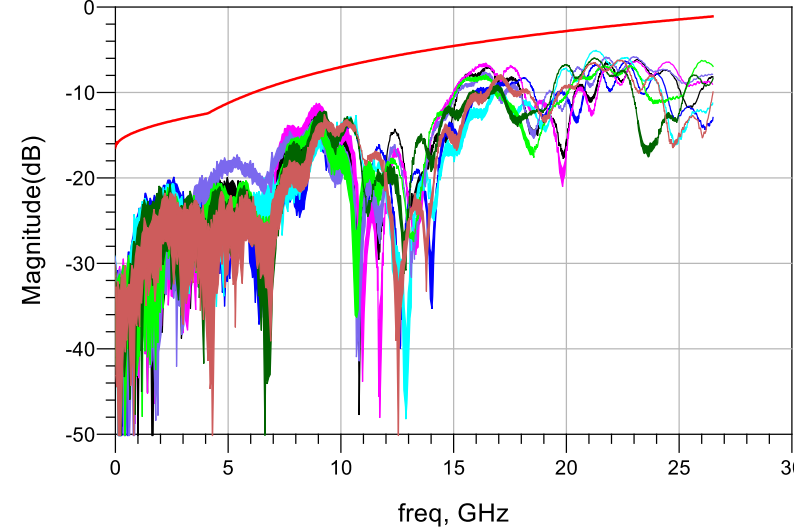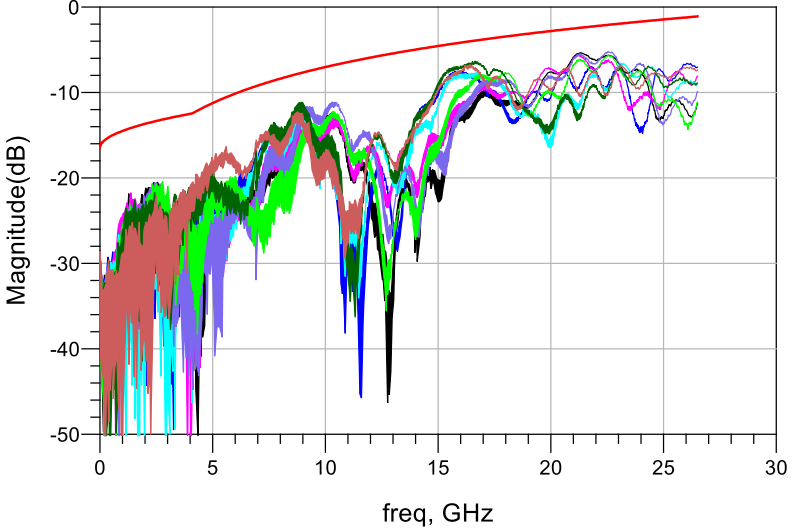
3m 28AWG - SCC11 - IEEE 802.3cd Limit Lines

3m 28AWG - SCC22 - IEEE 802.3cd Limit Lines
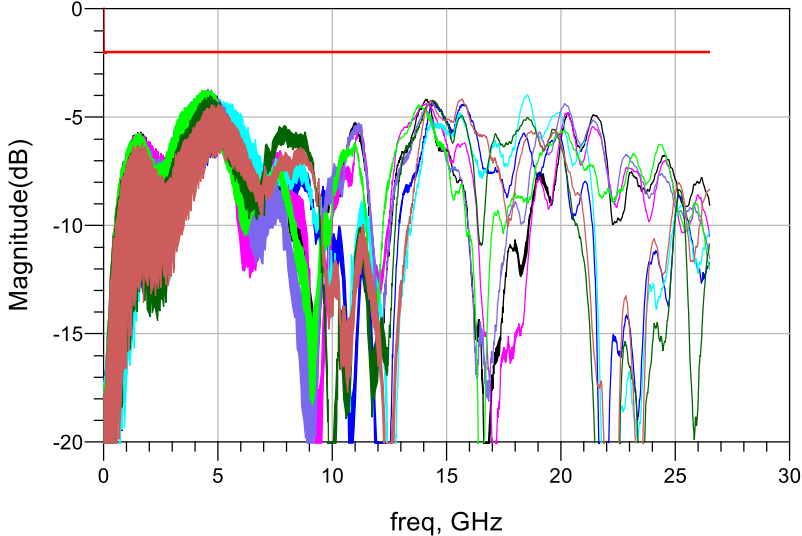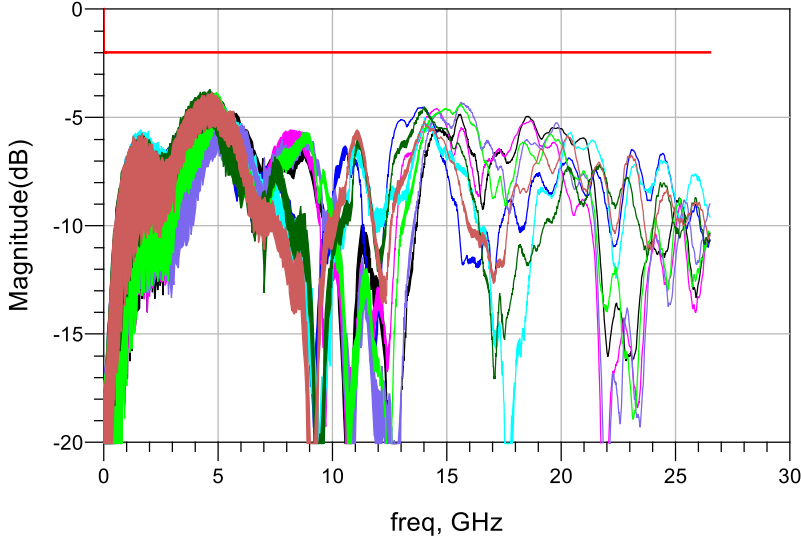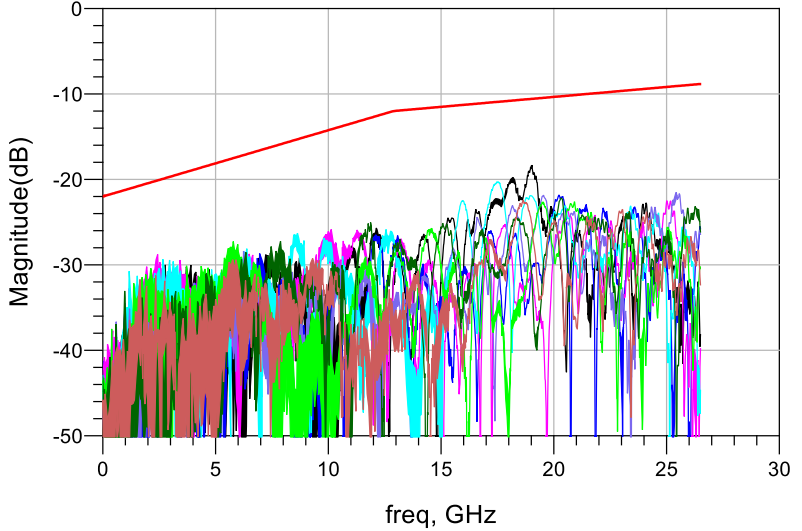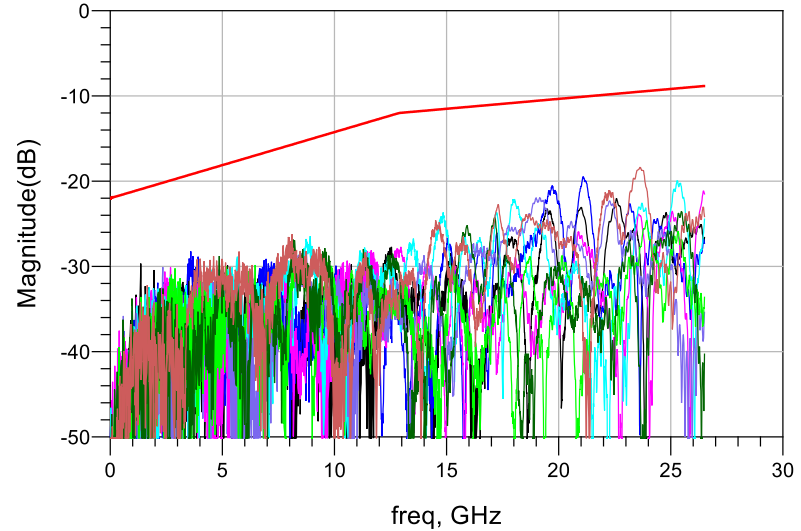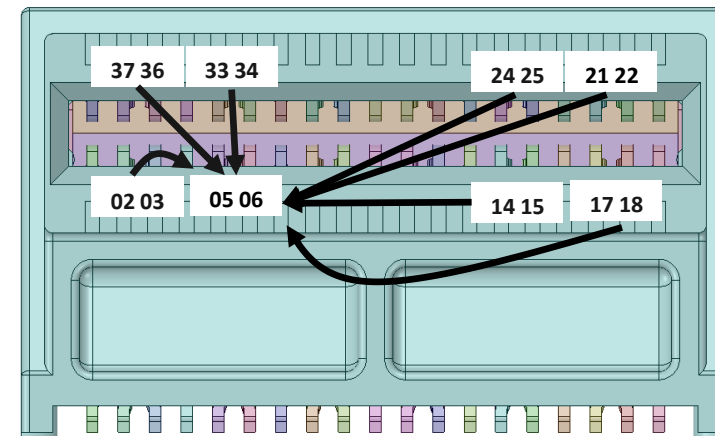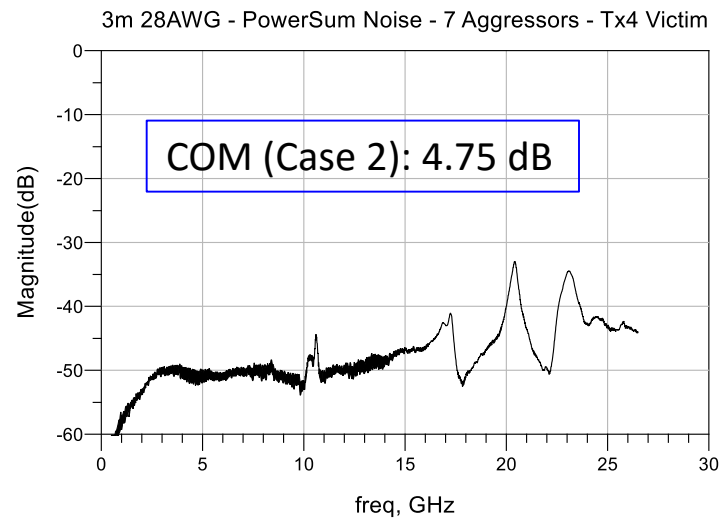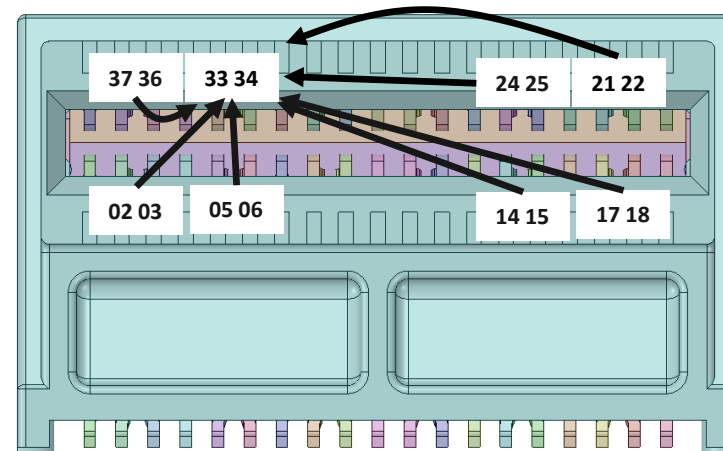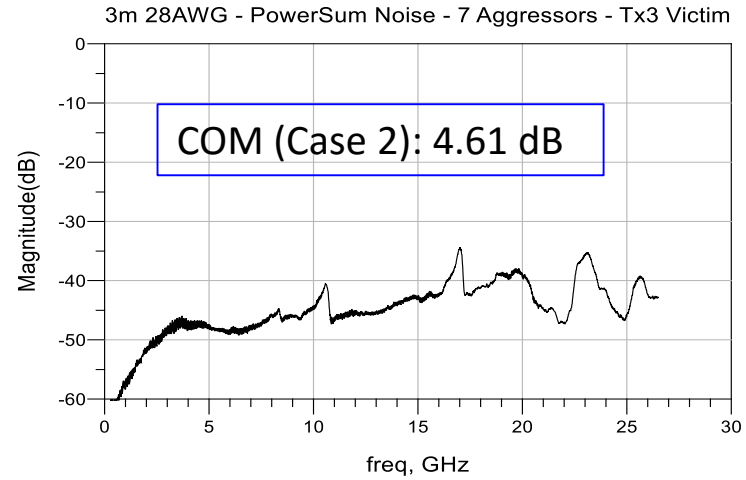
3m 28AWG - SCD11 - IEEE 802.3cd Limit Lines

3m 28AWG - SCD22 - IEEE 802.3cd Limit Lines

microQSFP Cable Assembly – 3m 28AWG

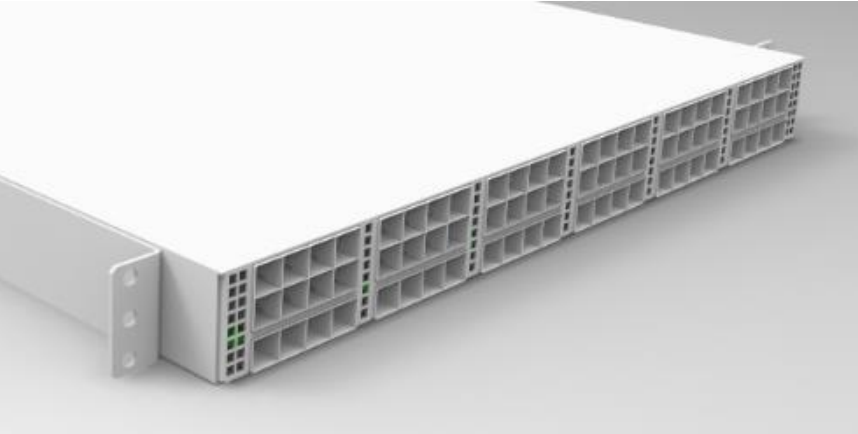3m 28AWG - PowerSum Noise - 7 Aggressors - Tx3 Victim

COM (Case 2): 4.61 dB

3m 28AWG - PowerSum Noise - 7 Aggressors - Tx4 Victim

COM (Case 2): 4.75 dB

COM calculated per IEEE 802.3cd Draft 1 with Matlab script 'com_ieee8023_93a_165.m'

Example Use Cases

More room on the NIC
Allows additional functions on the NIC

QSFP28
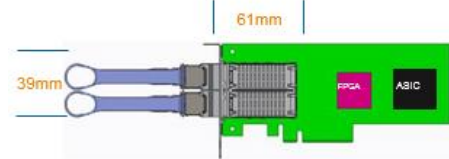
microQSFP – similar size as SFP

High density switch use cases
Use more of the face plate for IO
Improved airflow

Stacked assembly

SMT cage / connector

X4 Lanes	
QSFP	microQSFP

QSFP: 19.3, 9.7, 58.3, 18.4, 8.5, 72.4, 19.0, 12.9

microQSFP: 14.5, 12.0, 57.0, 13.8, 11.1, 64.4, 14.1, 10.4
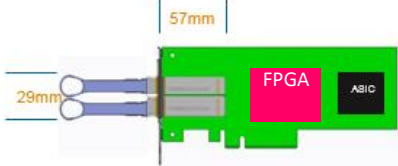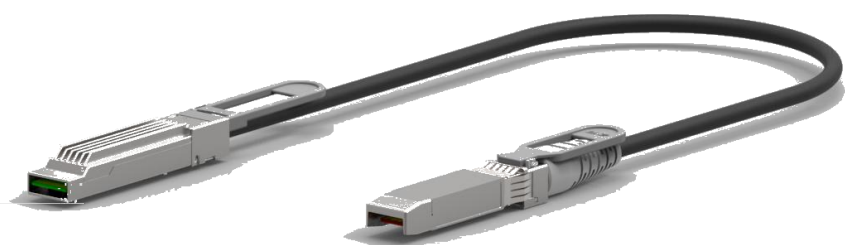
Note: Blue dimensions represent sizing outside of faceplate
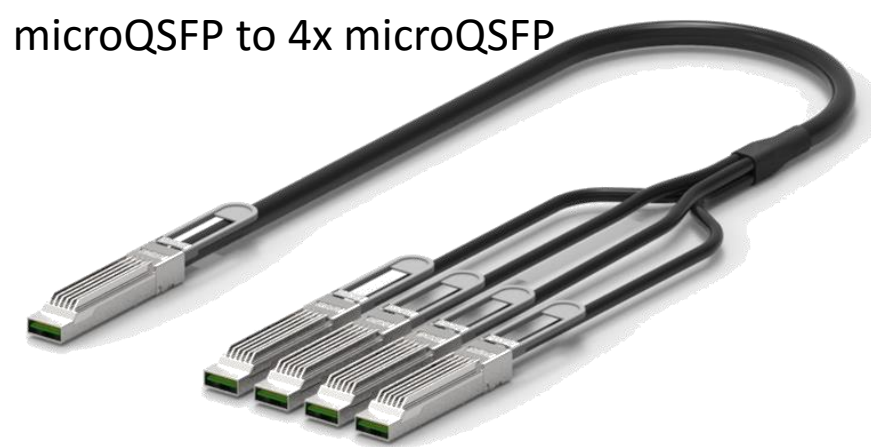
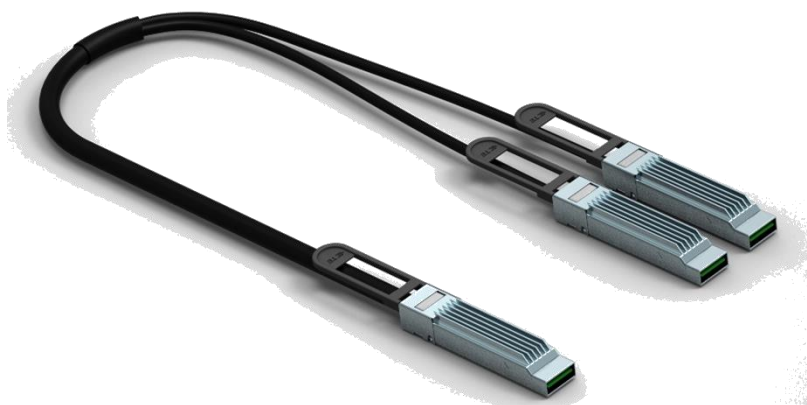# Cable Assemblies Supported
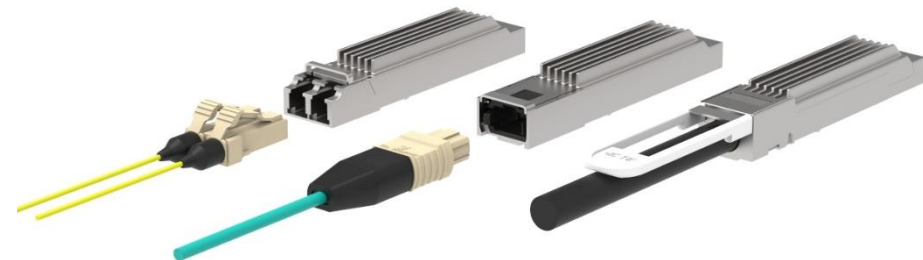
QSFP28 to microQSFP
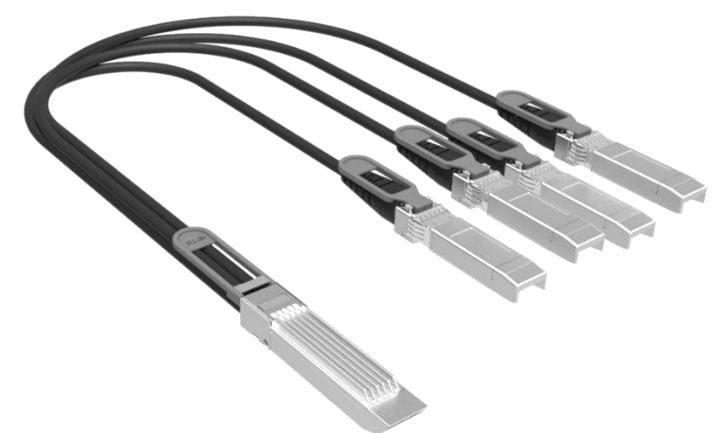
microQSFP to SFP28

microQSFP to microQSFP

microQSFP to 4x microQSFP

microQSFP to 2x microQSFP

microQSFP to 4x SFP28

Adding microQSFP MDI to P802.3cd

Formal comments with proposed language, figures and tables have been submitted during task force review recirculation

- Modify clause 136.12 to describe there are 3 MDIs (SFP28, QSFP28, microQSFP)
- Add new MDI clause 136.12.1 for microQSFP (mechanical figures, contact assignment table)
- Modify 136.11 to add microQSFP to cable descriptions
- Modify 136C to add detailed microQSFP cable assembly descriptions and figures

Summary

- microQSFP interoperability is available to all: published document
- microQSFP S-Parameters have been contributed to IEEE: 23-Jun-14
  - http://www.ieee802.org/3/bs/public/channel/TEC/TEC_C2M_Channel_Next_Gen_28Gbps_press_fit_stacked_IO.zip
  - Cited by Ali Ghiasi for superior performance, see page 7 http://www.ieee802.org/3/bs/public/adhoc/elect/20Feb_17/ghiasi_01_022017_elect.pdf
- Delivers port density – width of SFP, but has 4 lanes.
  - Meets market need for 50GBASE-CR, 100GBASE-CR2, 200GBASE-CR4 in a single form factor
- Addresses thermal challenges of equipment and optics
- Provides P802.3cd with a "next gen form factor"