

MDI Proposal for P802.3cd D1.2

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TE Connectivity

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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
- Jeff Maki, Juniper
- Scott Sommers, Molex
- Ed Cady, LUXSHARE-ICT

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

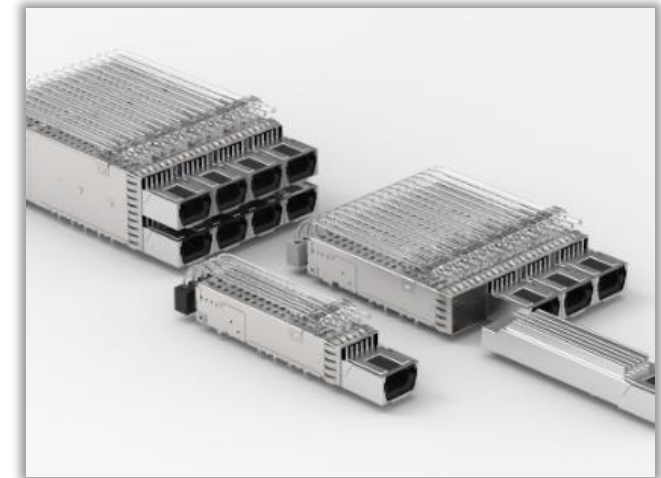
56Gbps performance with backwards compatibility to 28Gbps

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

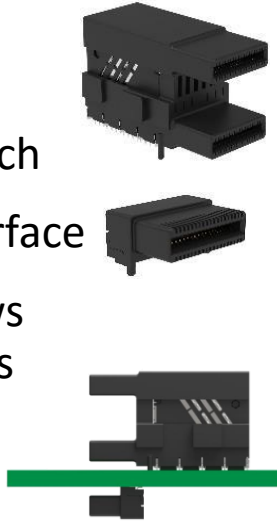
www.microQSFP.com



Design features (how it works)

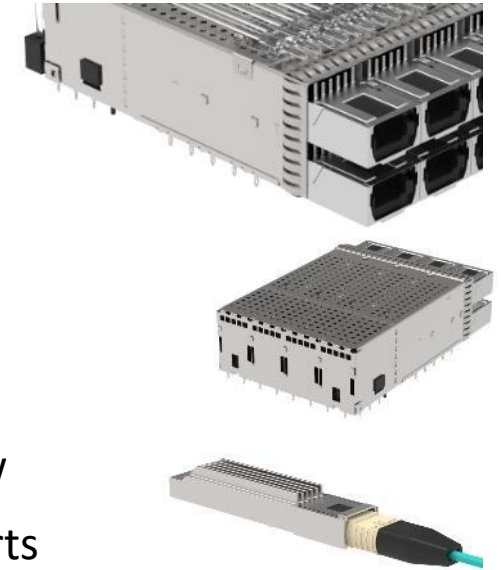
Density:

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



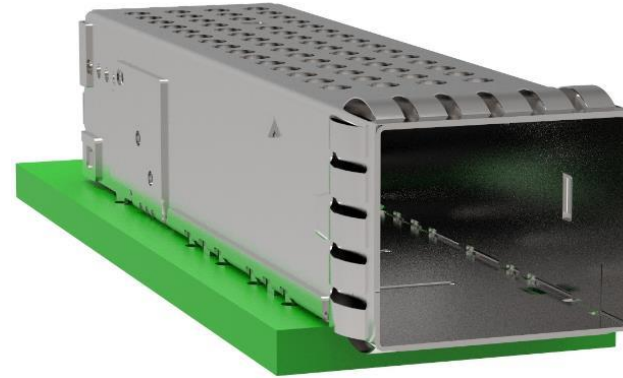
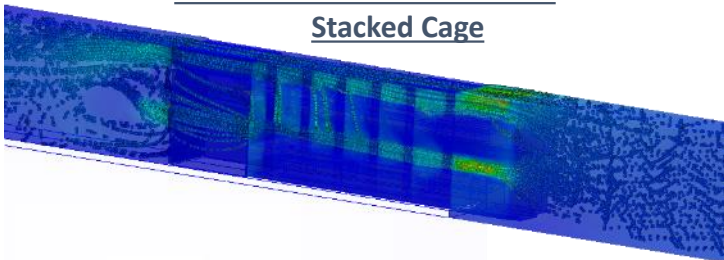
Thermal Management

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

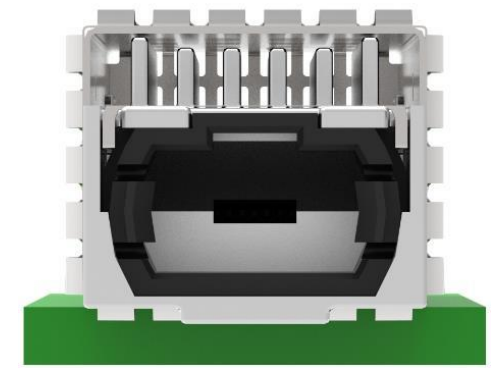
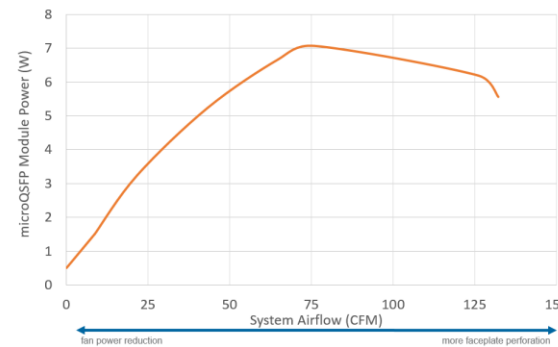


Airflow Cross-Sectional View
Stacked Cage



Optimize the cage design

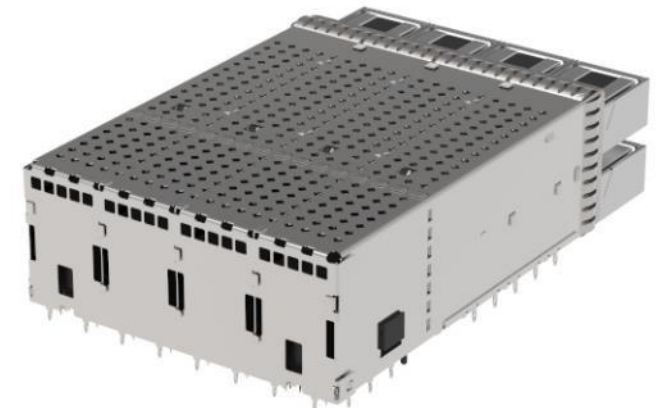
- Front-to-back airflow through the port opening cools the module.
- No additional clips, heatsinks, etc. required.
- Low cost
- Thermal performance only gets better with increasing the density of ports on the faceplate



Front view of cage with MPO module inserted



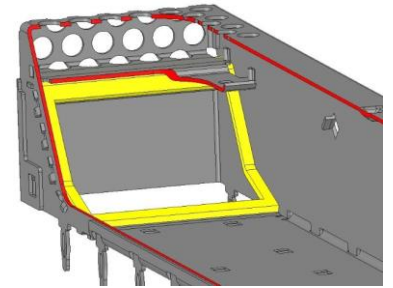
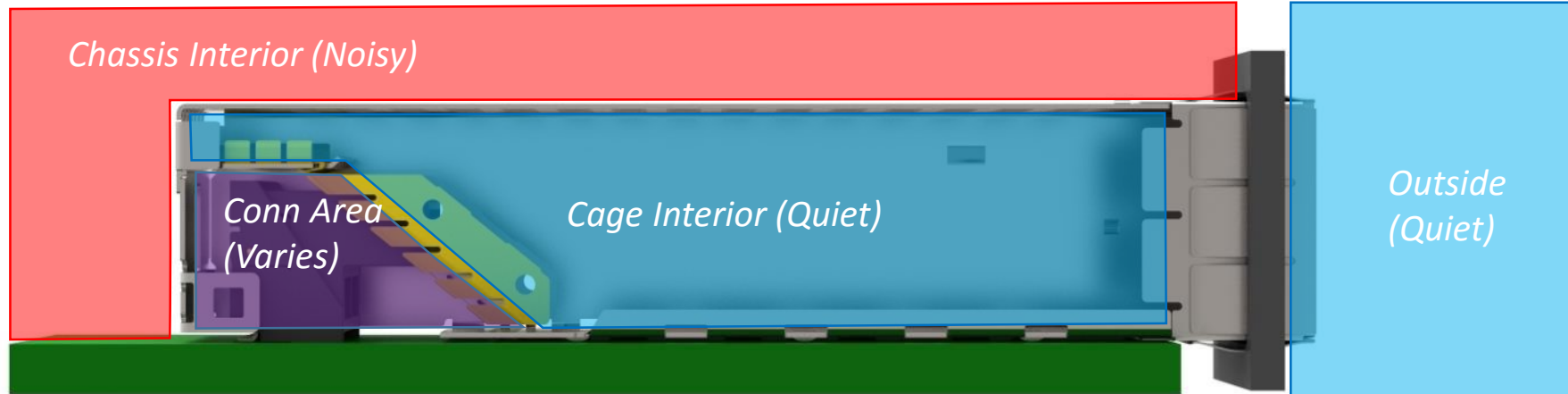
Rear view of 1x1 cage



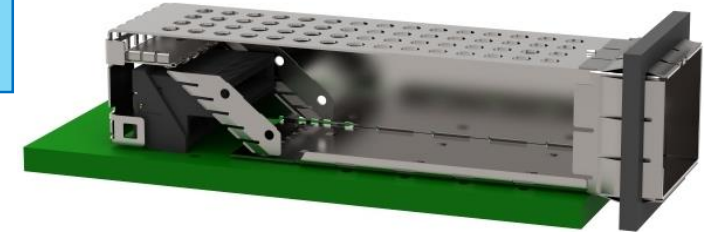
Rear view of stacked cage

EMI Management

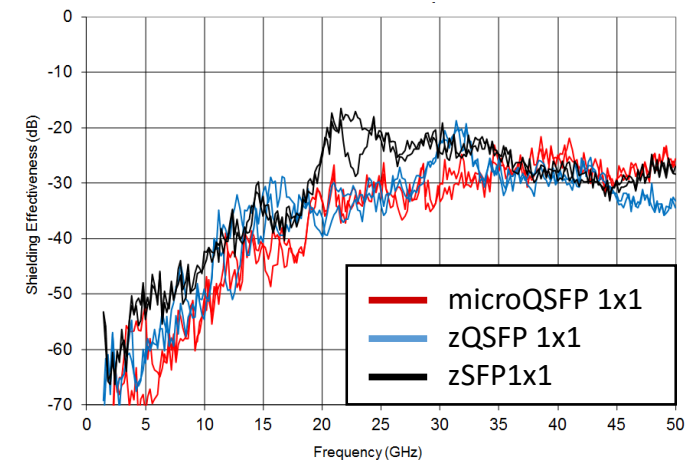
Noisy vs Quiet Zones



Cut away views



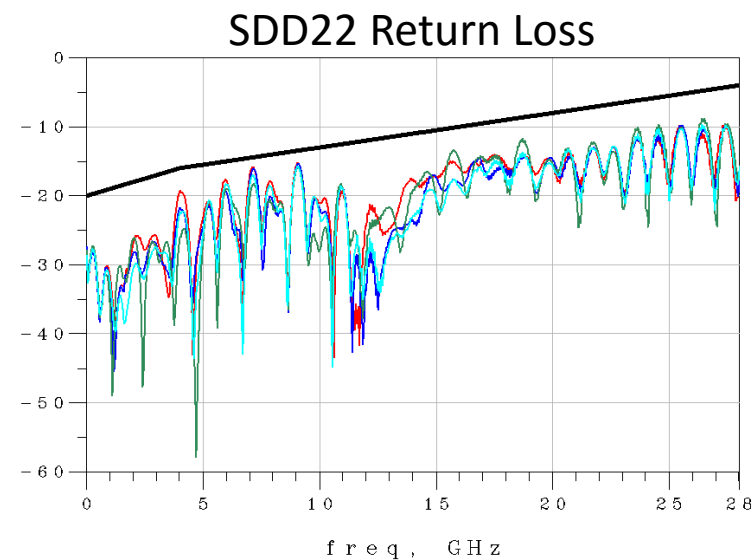
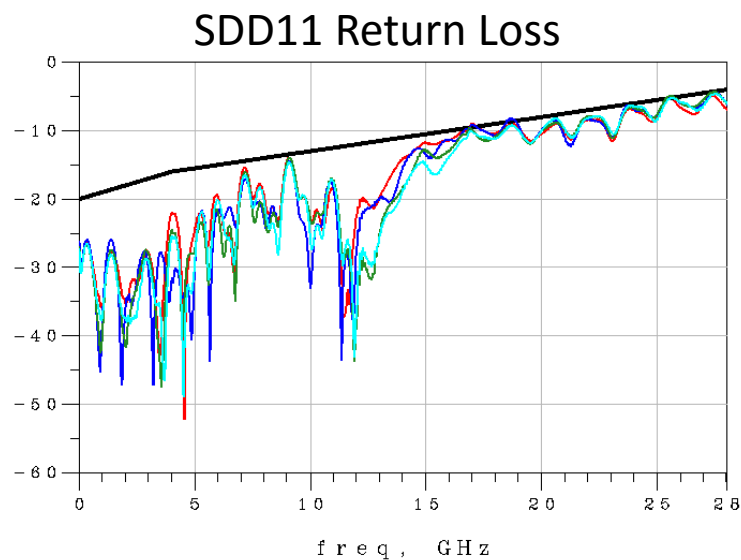
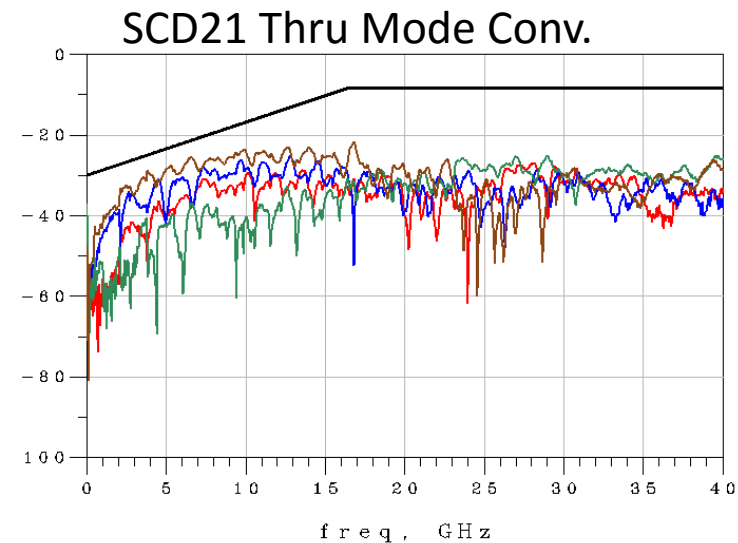
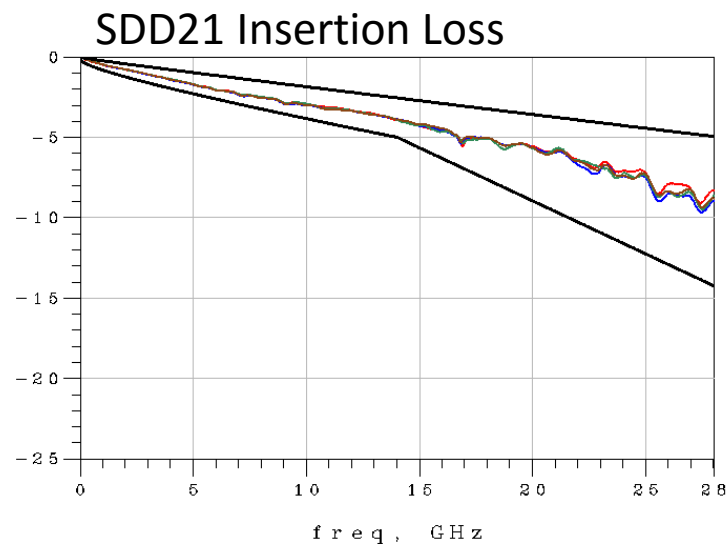
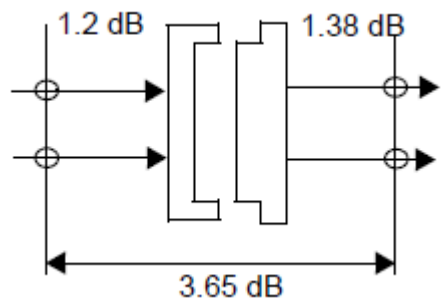
- Junction of noisy and quiet zones are sealed at key interface locations:
 - Faceplate / Bezel Seal
 - Internal Seal
 - Undermount PCB Seal - Optional
- The transceiver module is sealed to minimize leakage (CFP-like)
- Each EMI interface can be implemented with either spring or gasket designs
- Cage 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



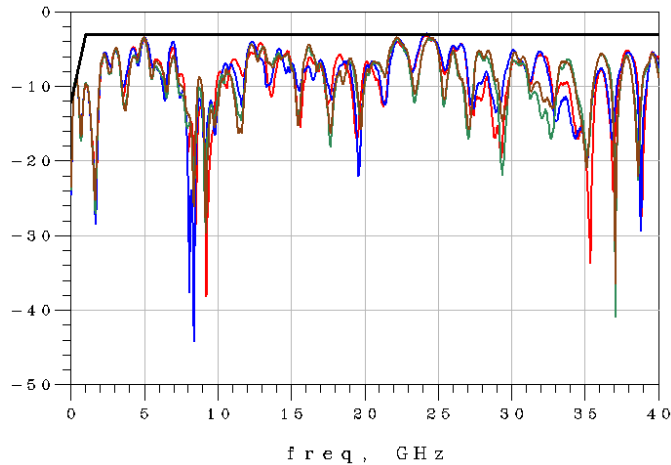
freq, GHz

multiLane

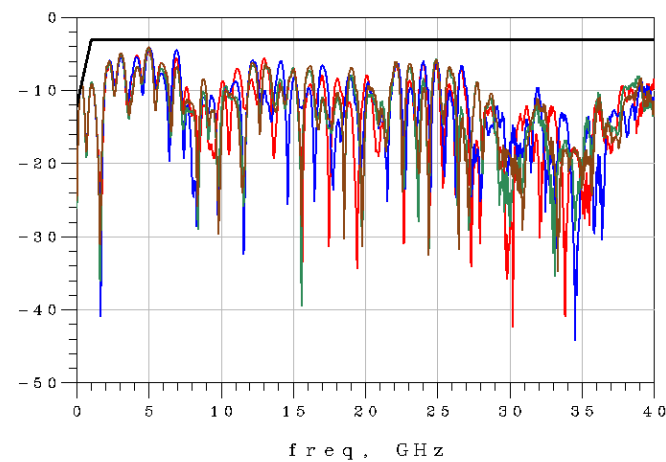
Mated microQSFP Compliance Board Testing

IEEE-802.3cd-MASK

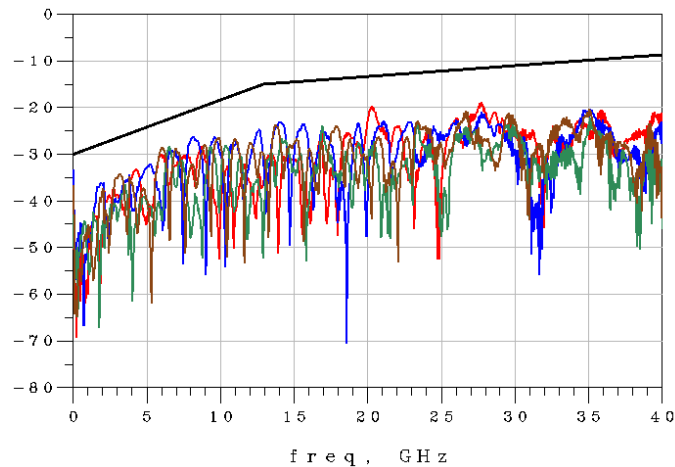
SCC11 Common Mode RL



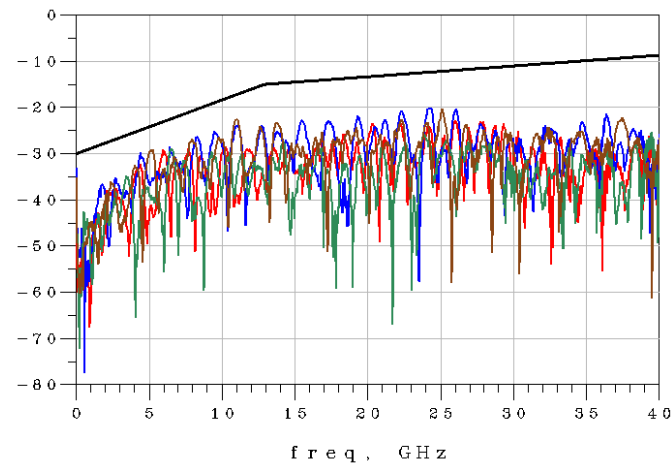
SCC22 Common Mode RL



SCD11 Reflected Mode Conv.



SCD22 Reflected Mode Conv.



Mated microQSFP Compliance Board Testing

ICN calculation results

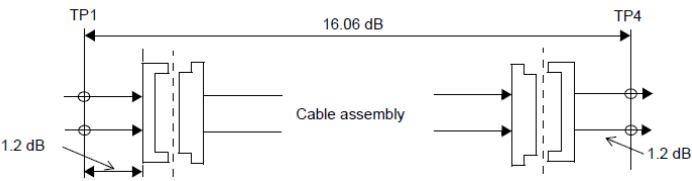
	RX1	RX2	RX3	RX4
MDNEXT ICN (mV)	0.57	0.53	0.57	0.57
MDFEXT ICN (mV)	3.24	2.43	2.99	2.32

	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

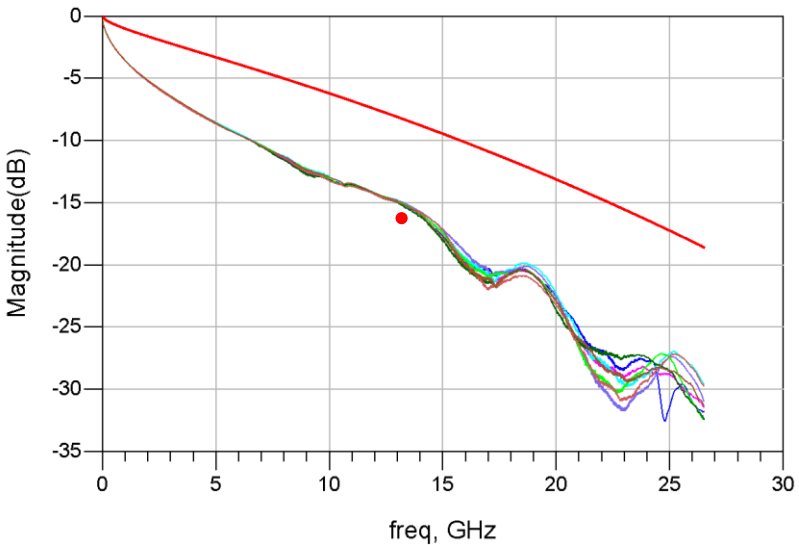
Table 92–13—Mated test fixtures integrated crosstalk noise

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

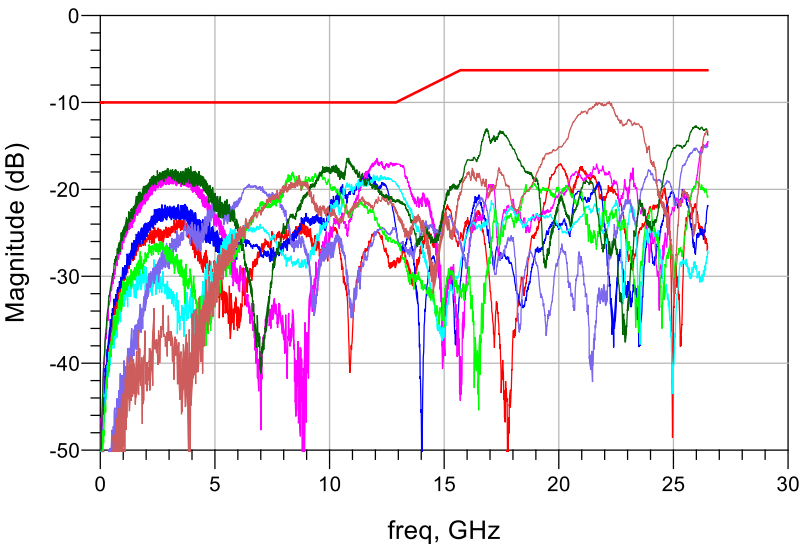
microQSFP Cable Assembly – 3m 28AWG



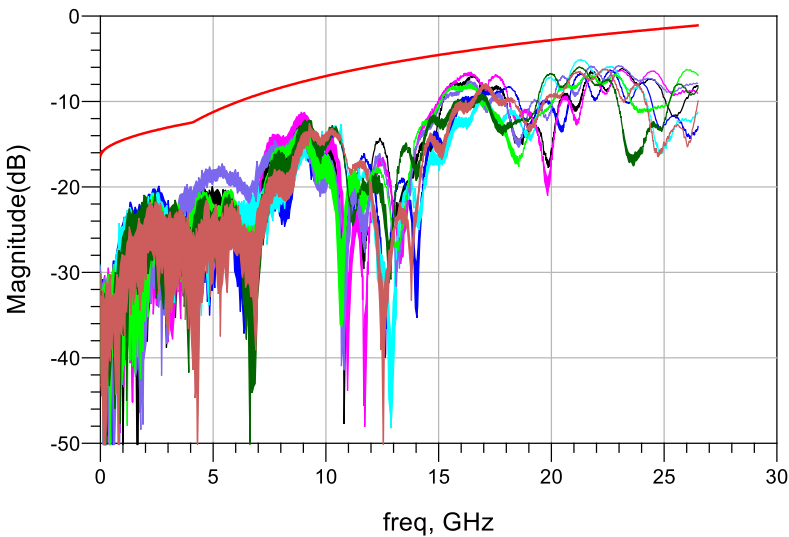
3m 28AWG - SDD21 - IEEE 802.3cd Limit Lines



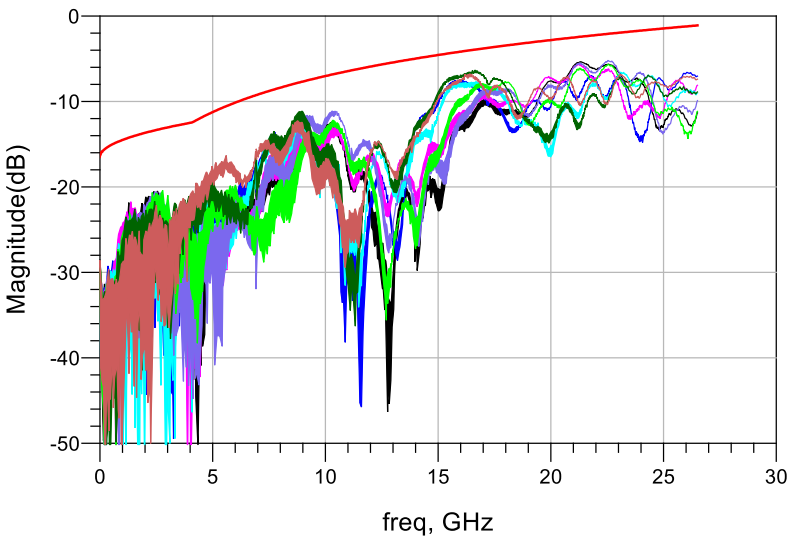
3m 28AWG - SCD21-SDD21 - IEEE 802.3cd Limit Lines



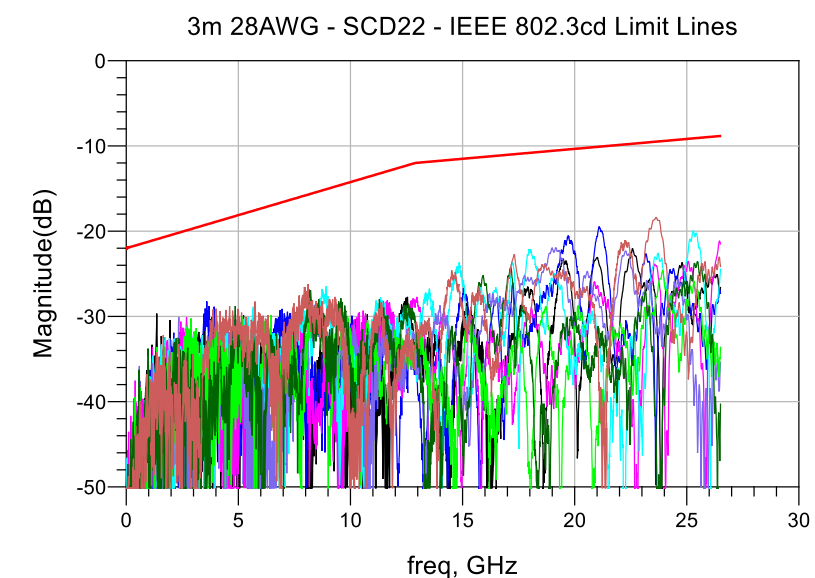
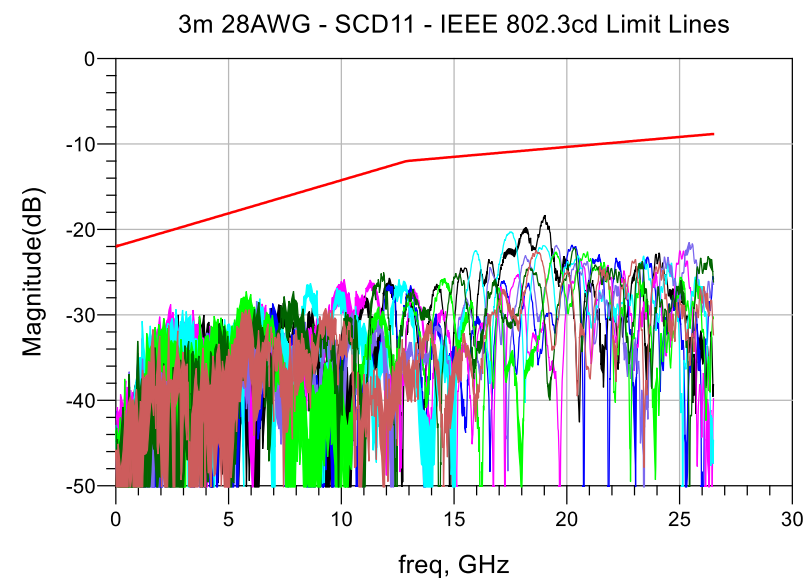
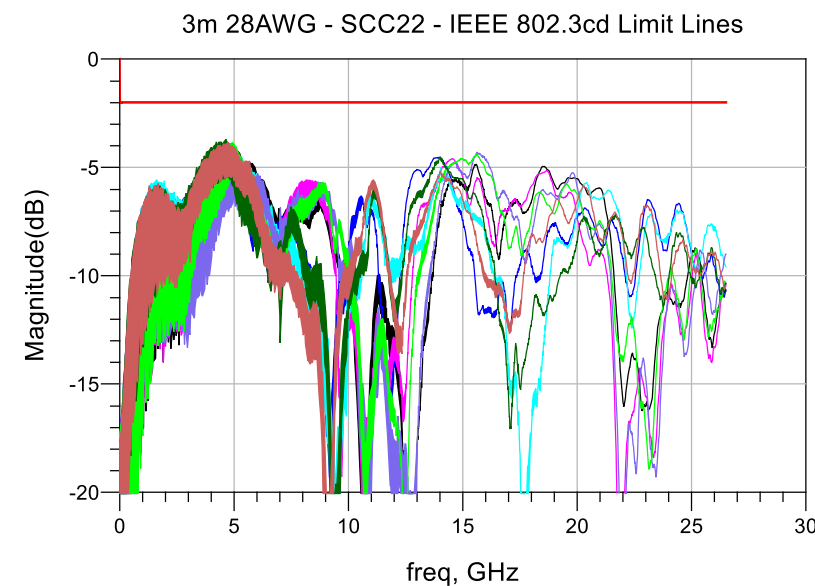
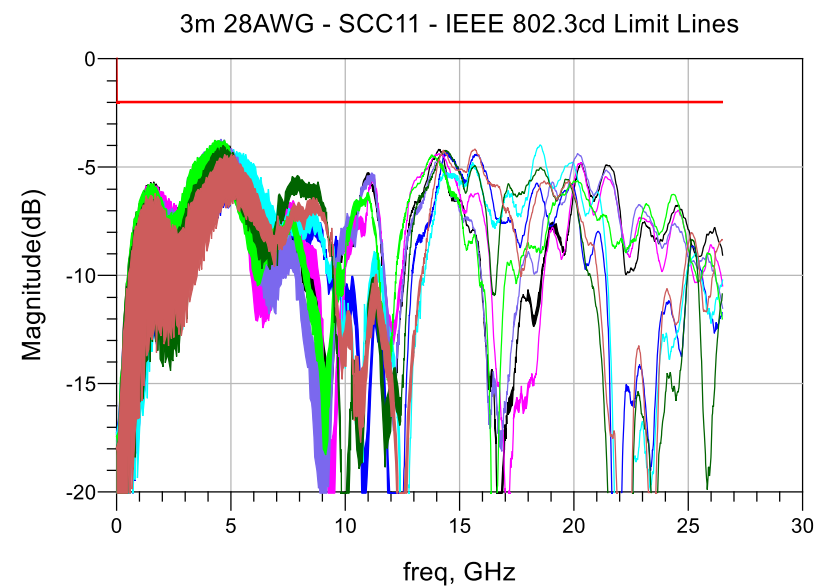
3m 28AWG - SDD11 - IEEE 802.3cd Limit Lines



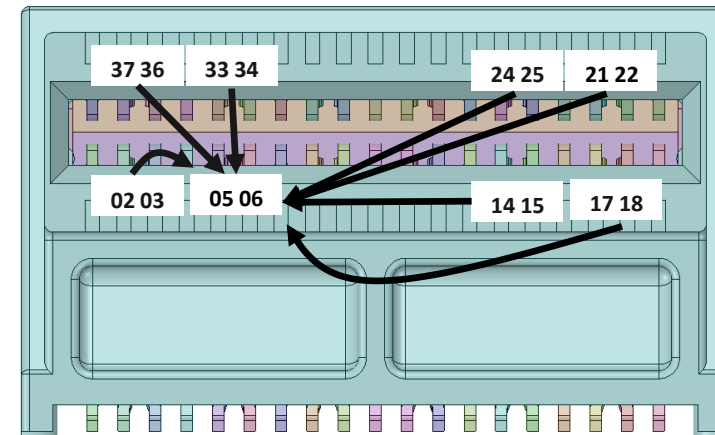
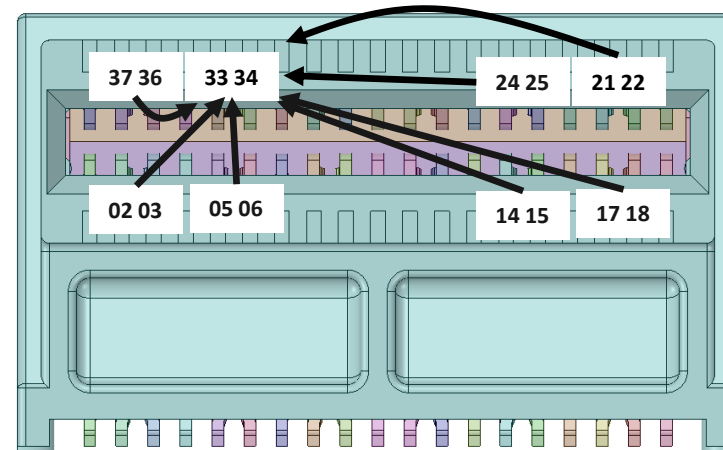
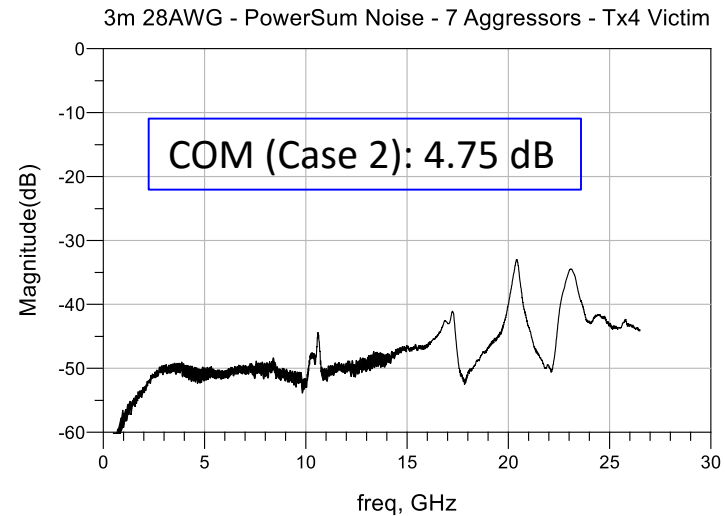
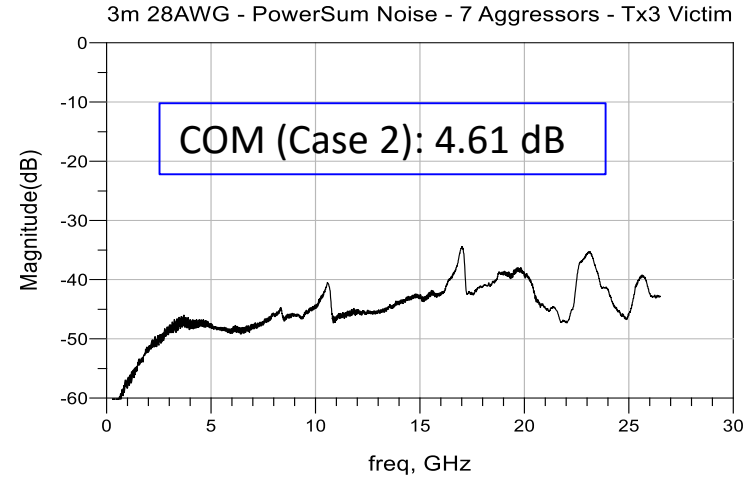
3m 28AWG - SDD22 - IEEE 802.3cd Limit Lines



microQSFP Cable Assembly – 3m 28AWG



microQSFP Cable Assembly – 3m 28AWG

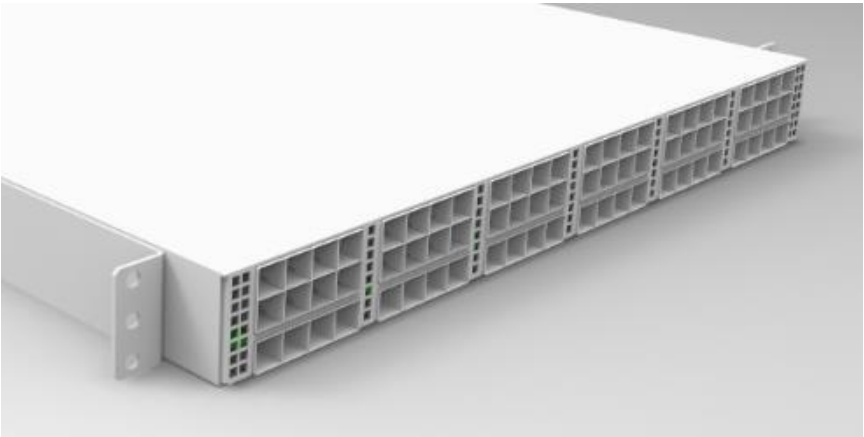


COM calculated per IEEE 802.3cd Draft 1 with Matlab script 'com_ieee8023_93a_165.m'

Example Use Cases

High density switch use cases

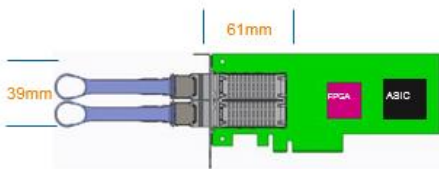
- Use more of the face plate for IO
- Improved airflow



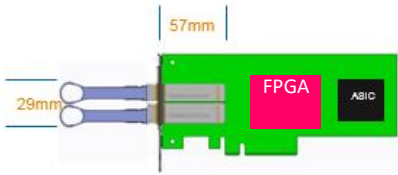
More room on the NIC

Allows additional functions on the NIC

QSFP28



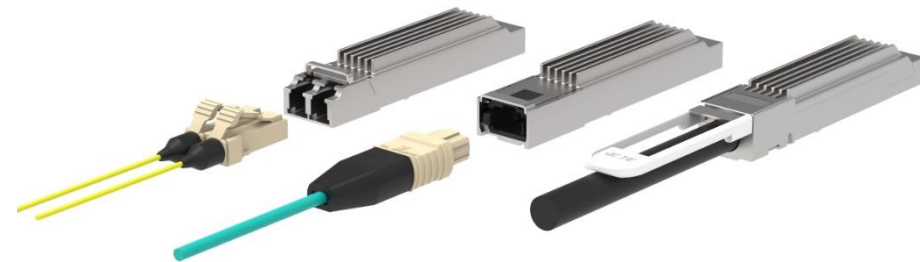
microQSFP – similar size as SFP



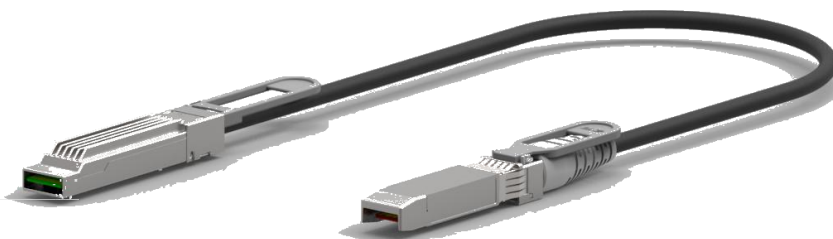
X4 Lanes	
QSFP	microQSFP

Note: Blue dimensions represent sizing outside of faceplate

Cable Assemblies Supported



QSFP28 to microQSFP

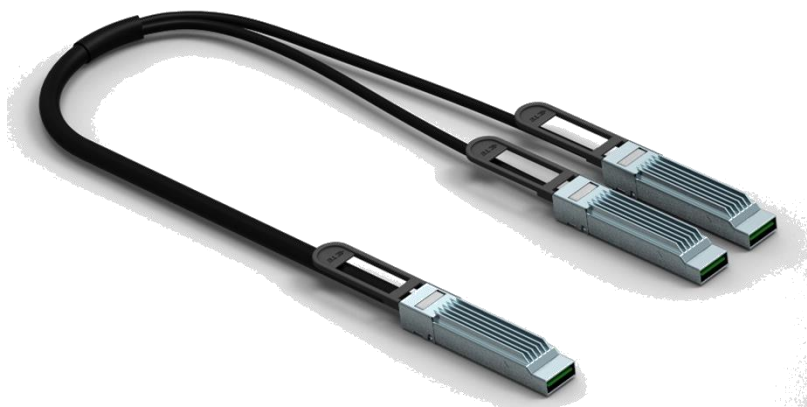
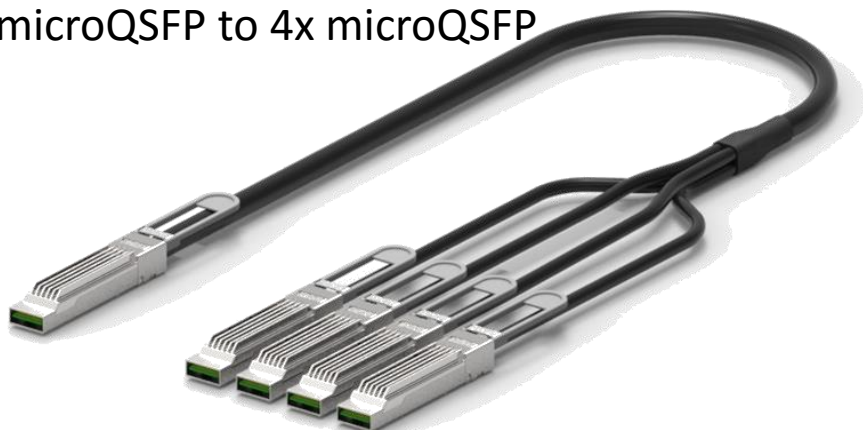


microQSFP to SFP28

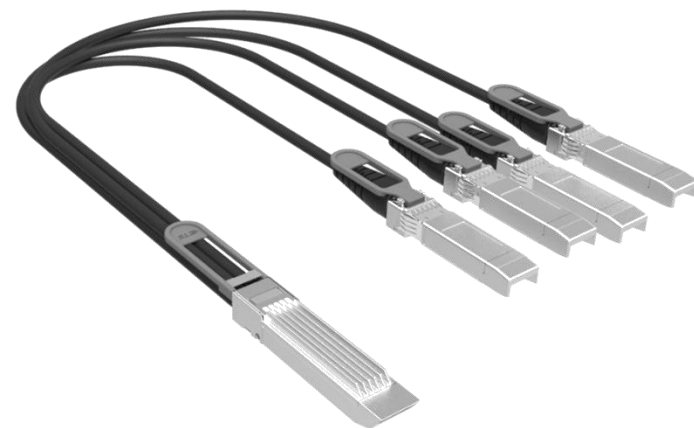


microQSFP to microQSFP

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_2_8Gbps_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”