

OAI High Speed and System Workstreams Update

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OAI High Speed and System Workstream Update

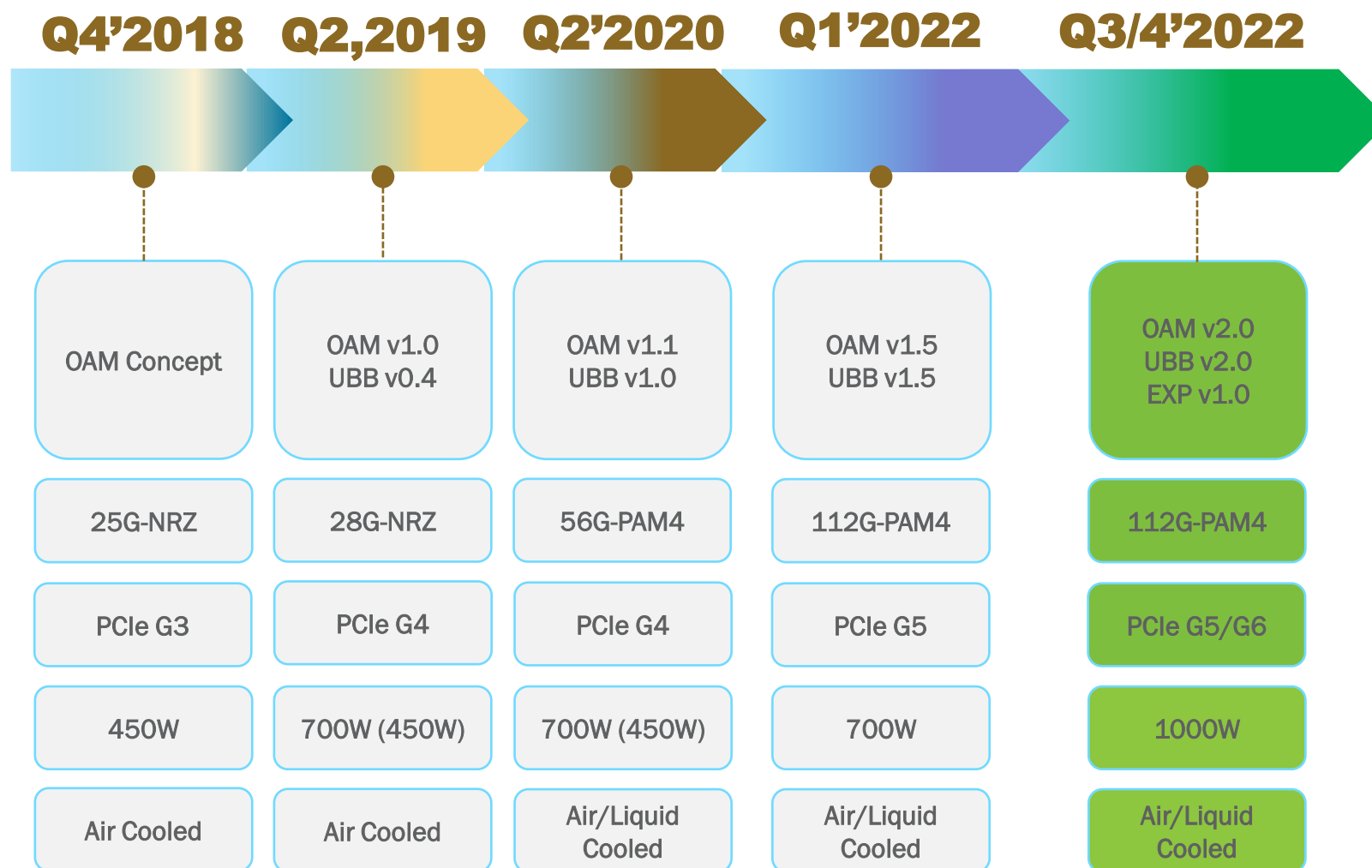
Song Kok Hang, Principal Engineer, Intel

Bichen Chen, SI Engineer, Meta



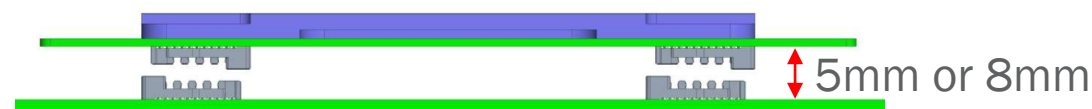
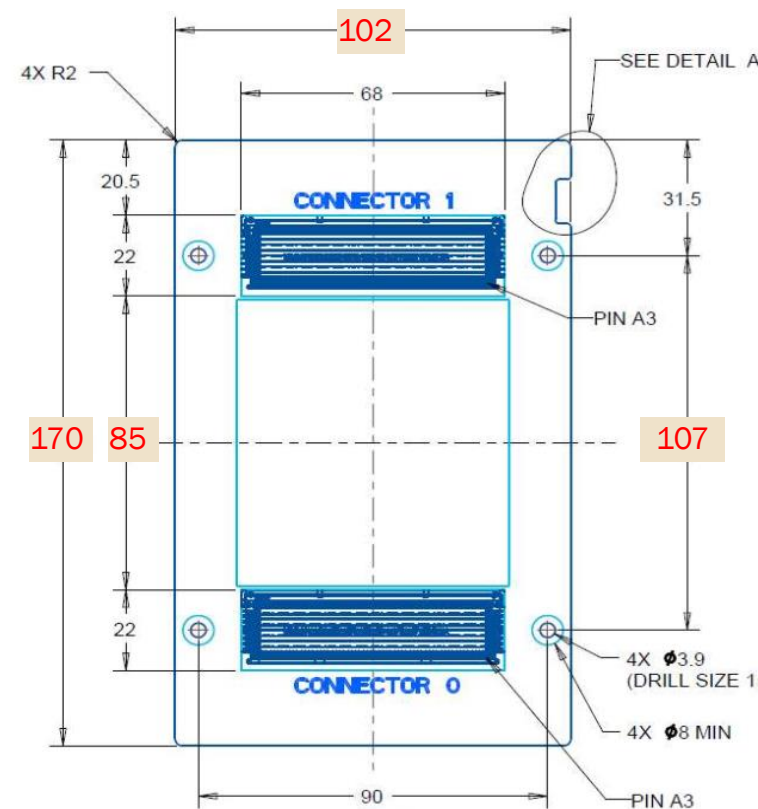
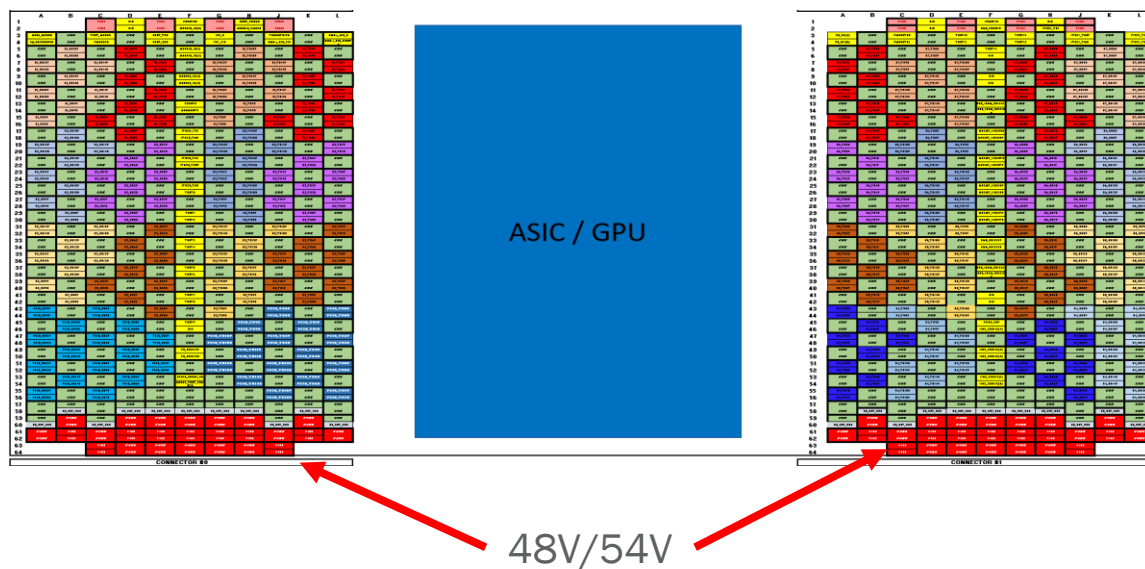
- OAI Workgroup 2022 Scope
- OAM v2.0 Update
- UBB v2.0 Update
- EXP v1.0 Update
- OAM/UBB/EXP SI Challenges

OAI Workgroup 2022 Scope



OAM v2.0 Update

- Dimension - 170mm (L) x 102mm (W)
- Two Input Voltages – 48V/54V and 3.3V
- TDP - 1KW with Dual Power Entries
- OAM/UBB Connector Stacking Height: 5mm or 8mm
- SerDes Speed – 112G-PAM4 (LR) and PCIe Gen6



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UBB v2.0 Update

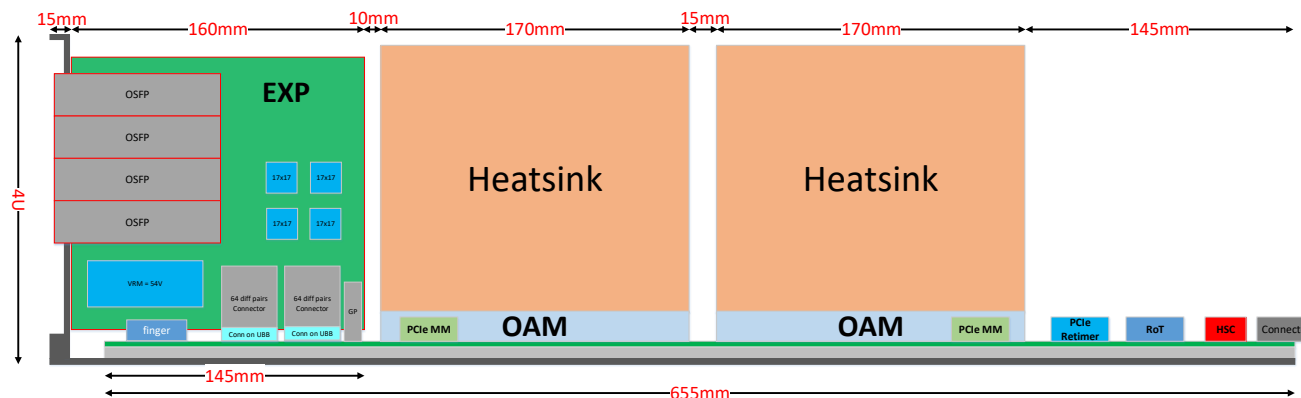
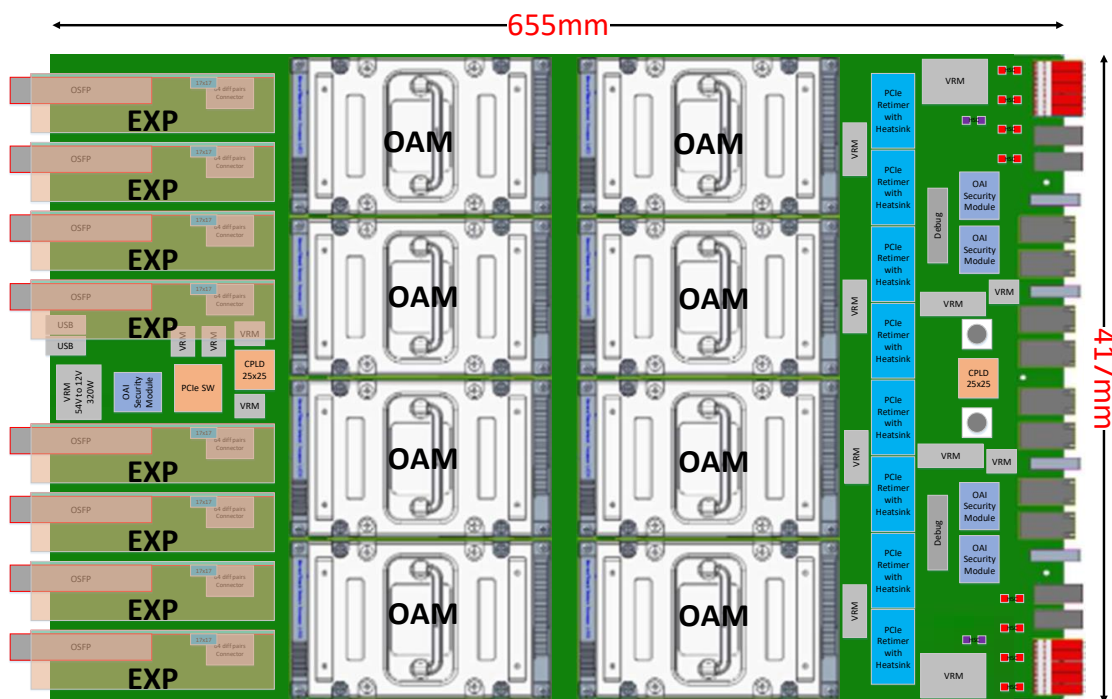
- Dimension ~ 655mm (L) x 417mm (W)
- Support 8x OAM and up to 8x EXP
- Support RoT Security Module
- End to End Loss Budget @28GHz – 28-30dB

OAM to OAM Loss Budget – 28-30dB

OAM Tx (8dB) + UBB (12-14dB) + OAM Rx (8dB)

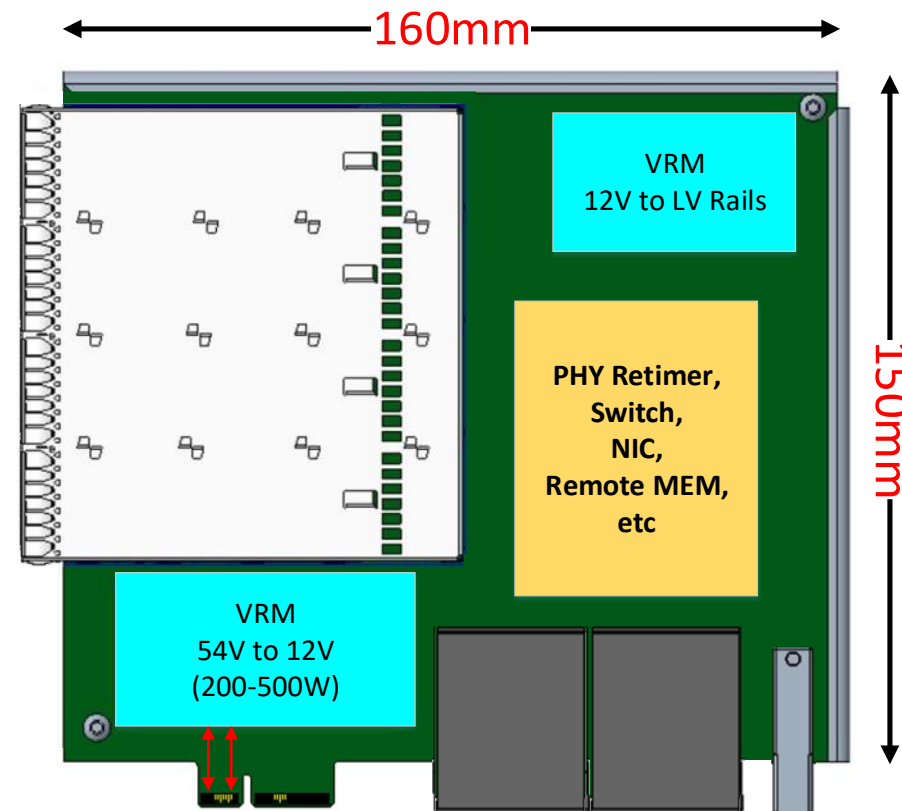
EXP to OAM Loss Budget – 28-30dB

EXP Tx/Rx (6dB) + UBB (16-18dB) + OAM Tx/Rx (8dB)



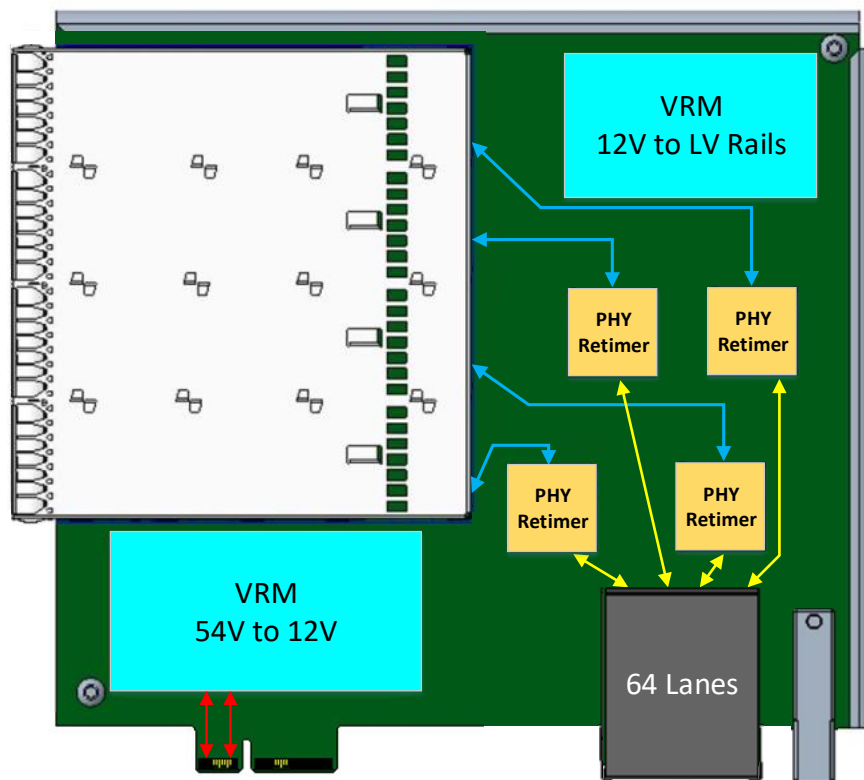
EXP v1.0 Update

- Dimension - 160mm (W) x 150mm (H)
- Two Input Voltages – 48V/54V and 3.3V
- TDP – up to 400W
- PHY Retimer Config
 - 200W
 - One HS Connector (4 x8 SerDes Input)
 - 4 x8 Scale Out Ports (OSFP or QSFP-DD)
- Switch Config
 - 400W
 - Two HS Connectors (8 x8 SerDes Input)
 - 4 x8 Scale Out Ports (OSFP or QSFP-DD)
- Other Configs Supported – NIC, Remote Memory and more

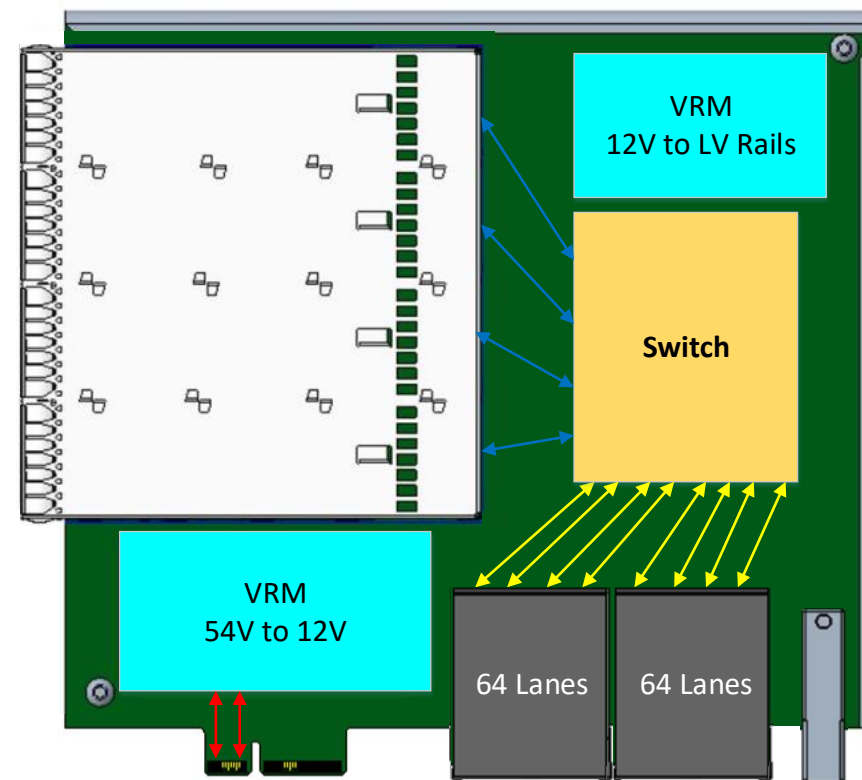


EXP v1.0 Update

PHY Retimer Config

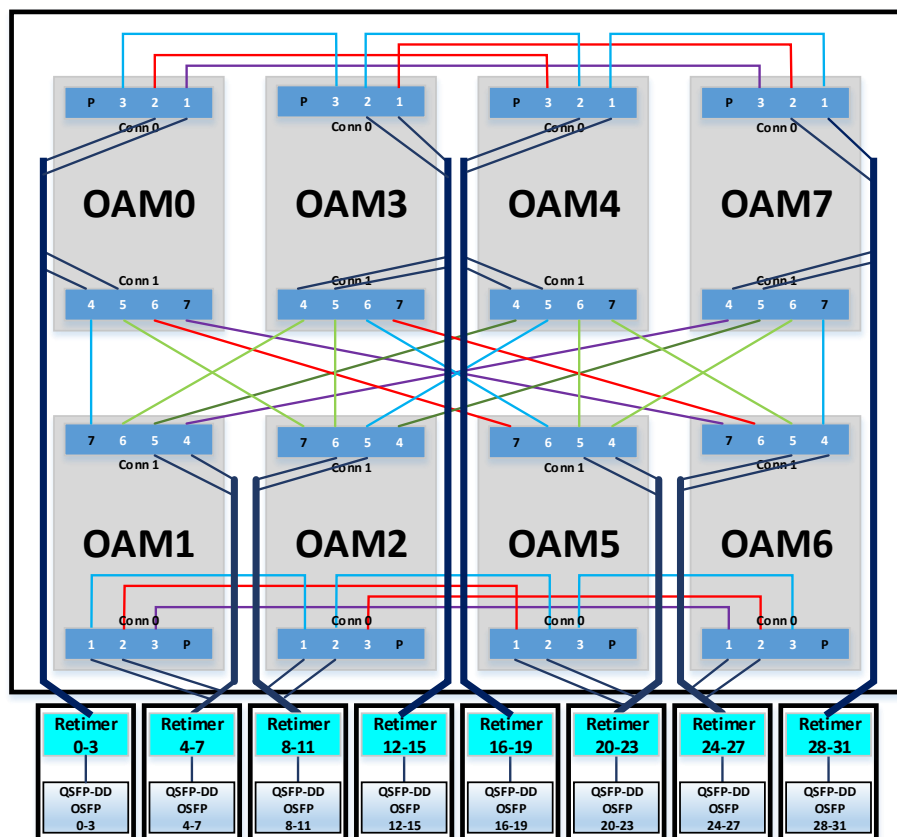


Switch Config

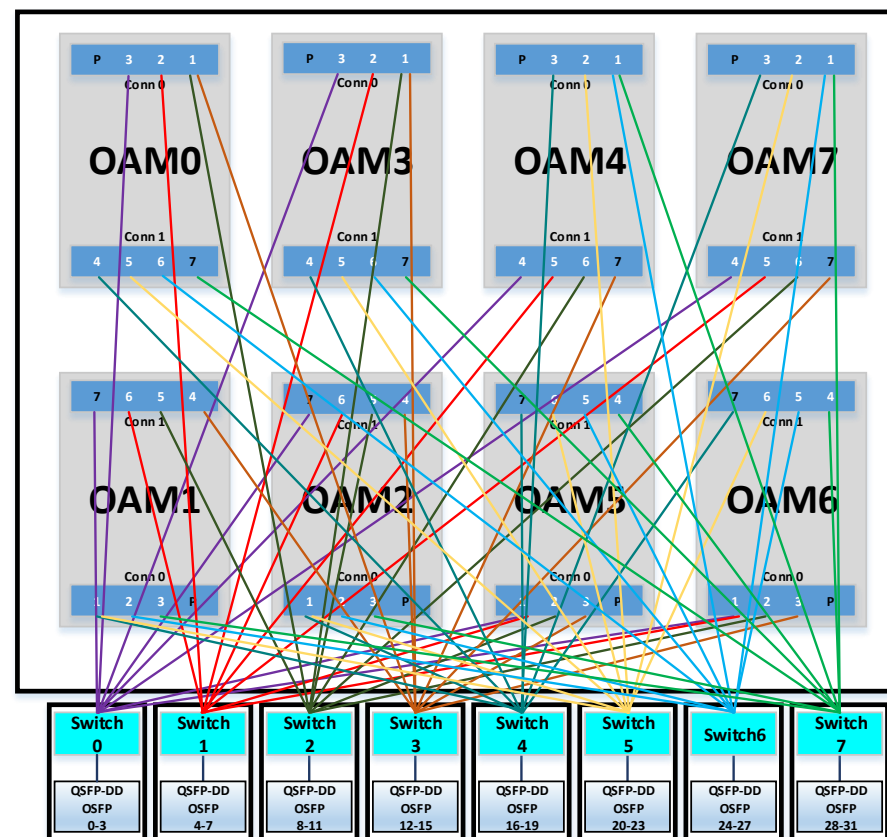


OAM/UBB/EXP SI Challenges

PHY Retimer Config



Switch Config



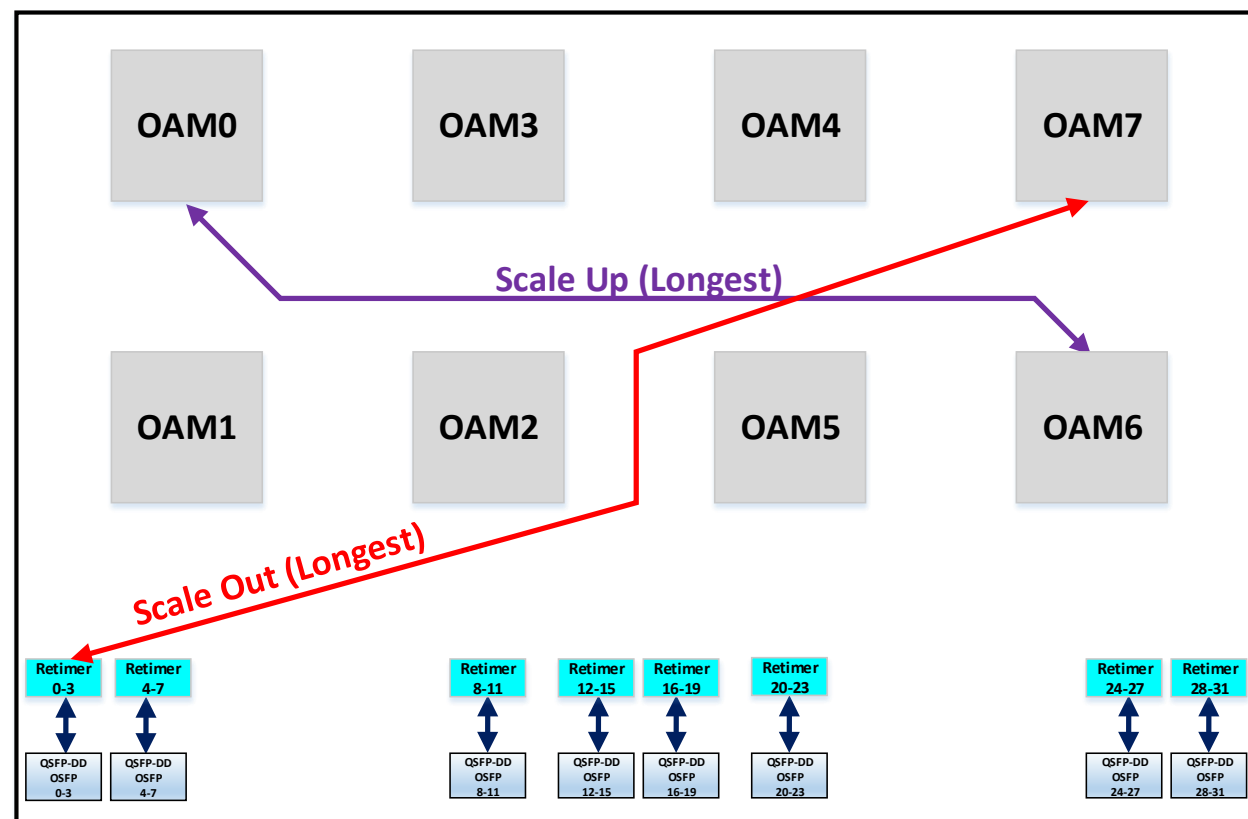
OAM/UBB/EXP SI Challenges

- **Scale Up**

- Longest Trace Length - 13.5"
- 800G PCB Material - 0.85dB/in
- UBB WC Channel Loss - 11.5dB

- **Scale Out**

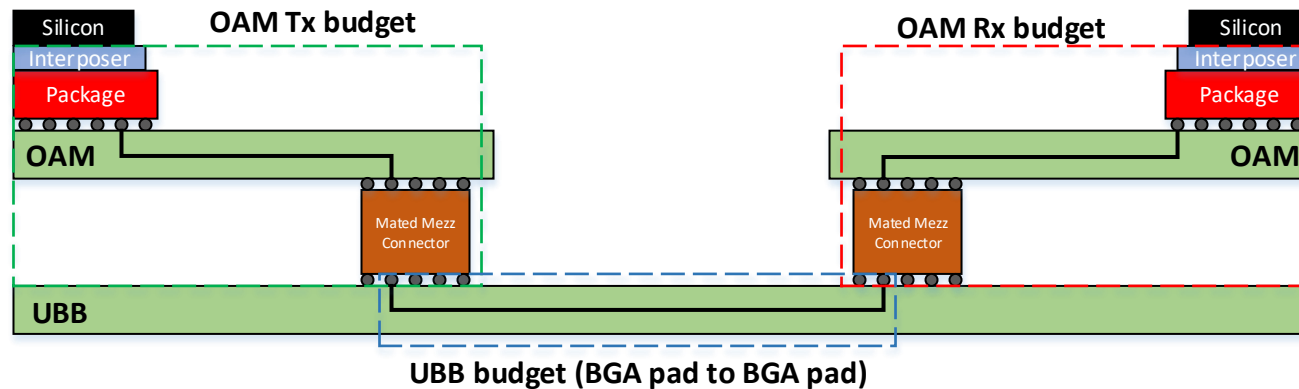
- Longest Trace Length - 20"
- 800G PCB Material - 0.85dB/in
- UBB WC Channel Loss - 17dB



OAM/UBB/EXP SI Challenges

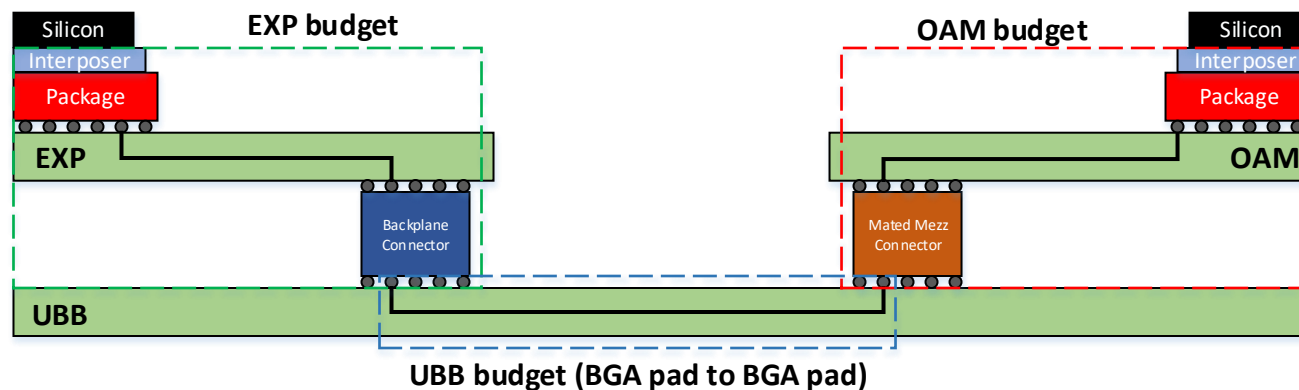
OAM to OAM Loss Budget – 28-30dB

OAM Tx (8dB) + UBB (12-14dB) + OAM Rx (8dB)



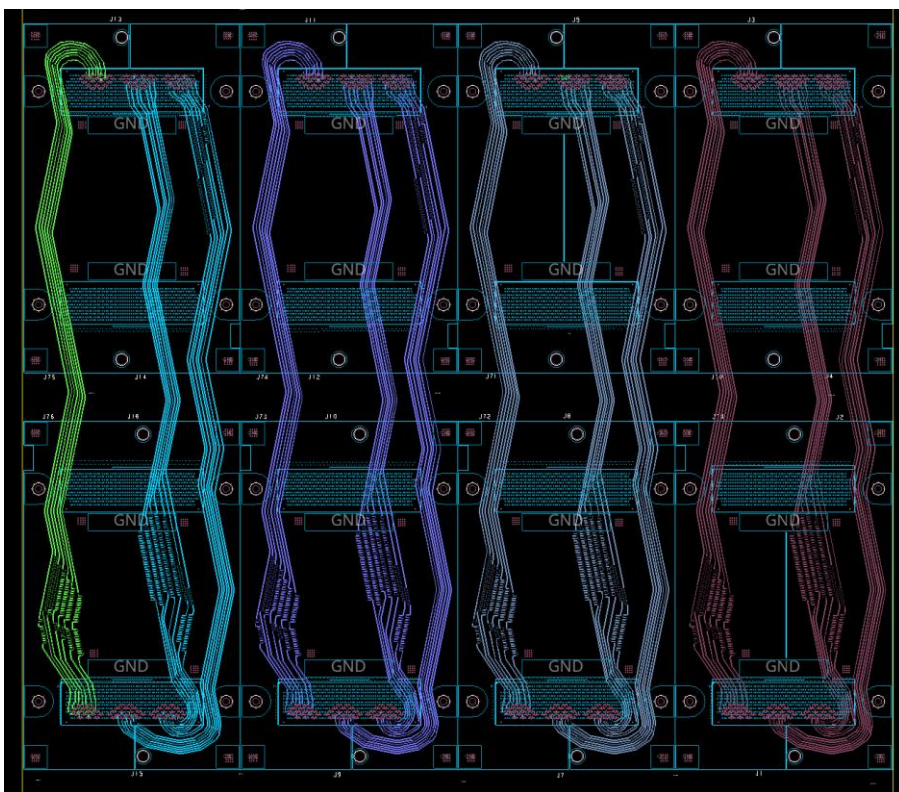
EXP to OAM Loss Budget – 28-30dB

EXP Tx/Rx (6dB) + UBB (16-18dB) + OAM Tx/Rx (8dB)

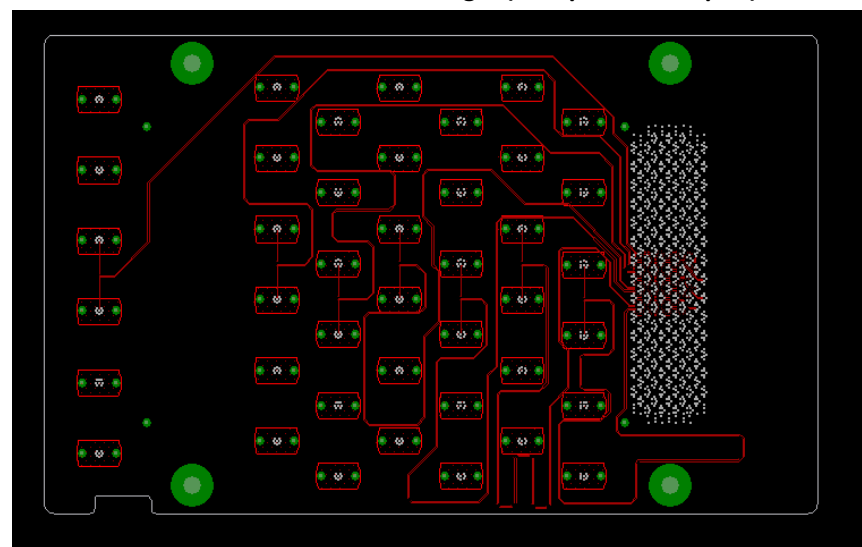
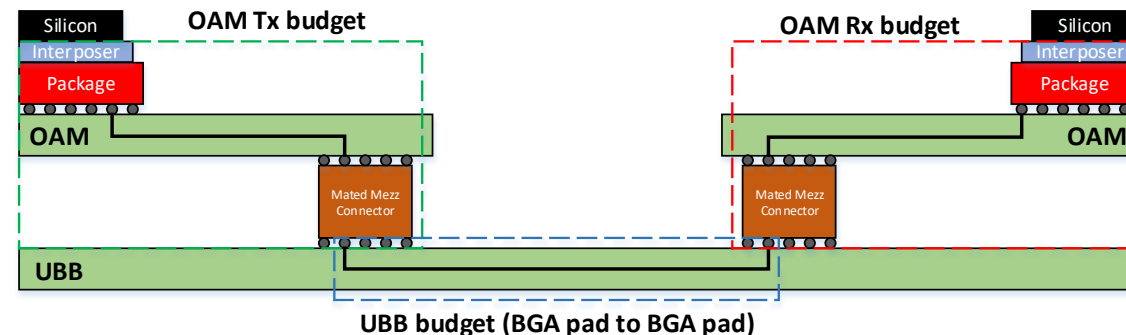


OAM/UBB/EXP SI Challenges

- SI performance of scale up channels with longest possible routing were studied by using post-layout simulation



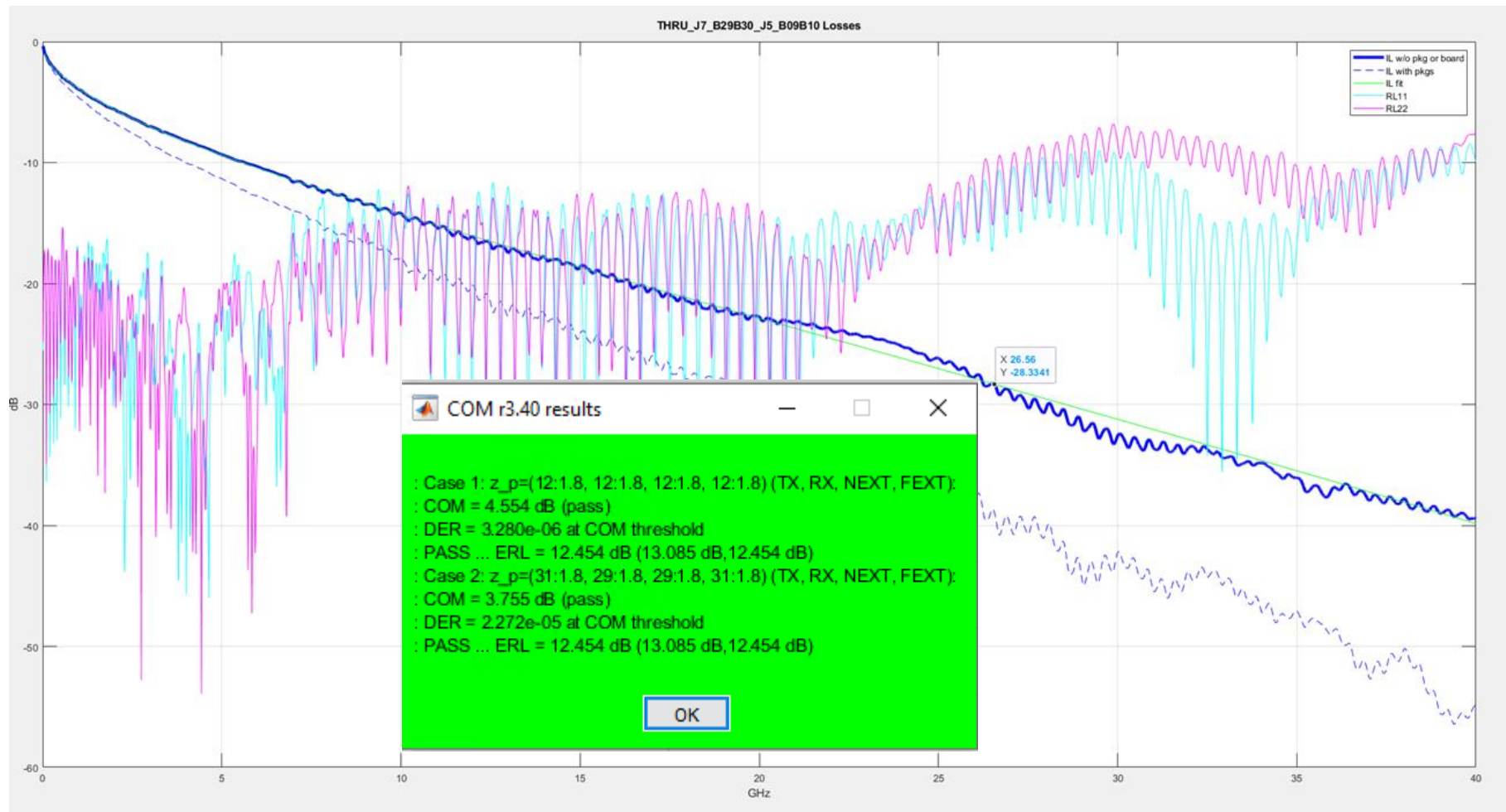
Mimicking UBB layout



Mimicking OAM layout with 2.4mm coaxial connectors

OAM/UBB/EXP SI Challenges

- SI performance of scale up by using IEEE 802.3.ck COM



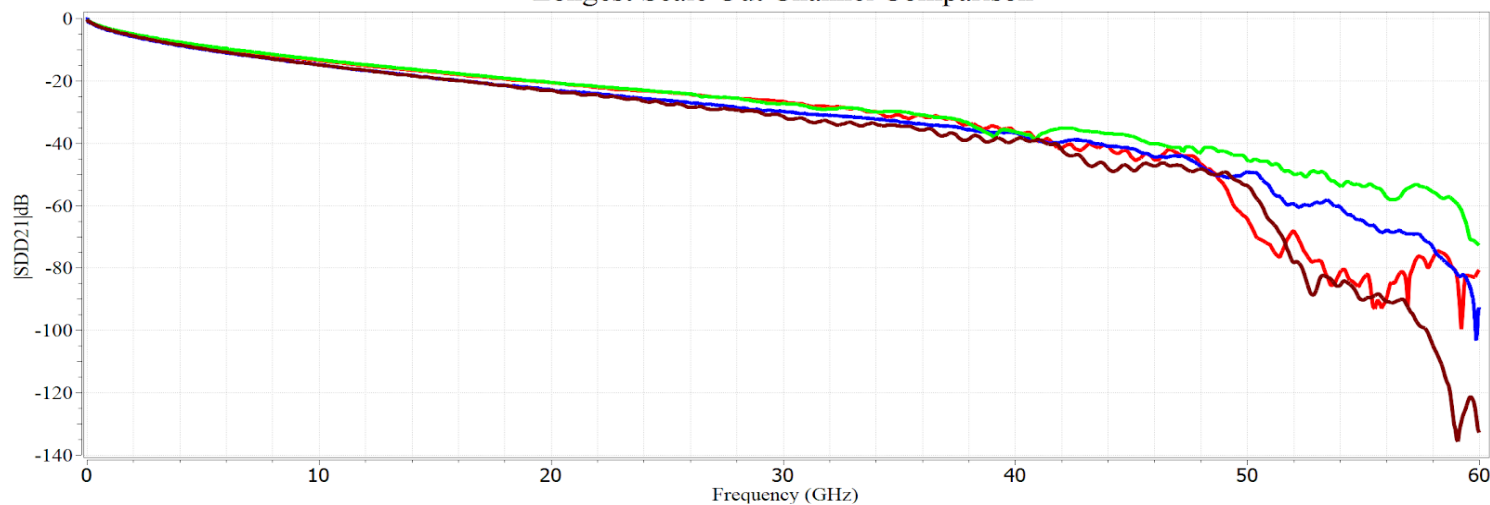
OAM/UBB/EXP SI Challenges

- SI performance of scale out channels with PHY retimer configuration were studied
- EXP cards were routed and simulated (post-layout) by 4 participants, and cascaded with longest scale out routings on the UBB (post-layout)
- The cascaded channel were quantified SI metric of using IEEE 802.3.CK COM (CEI-112G LR equivalent)

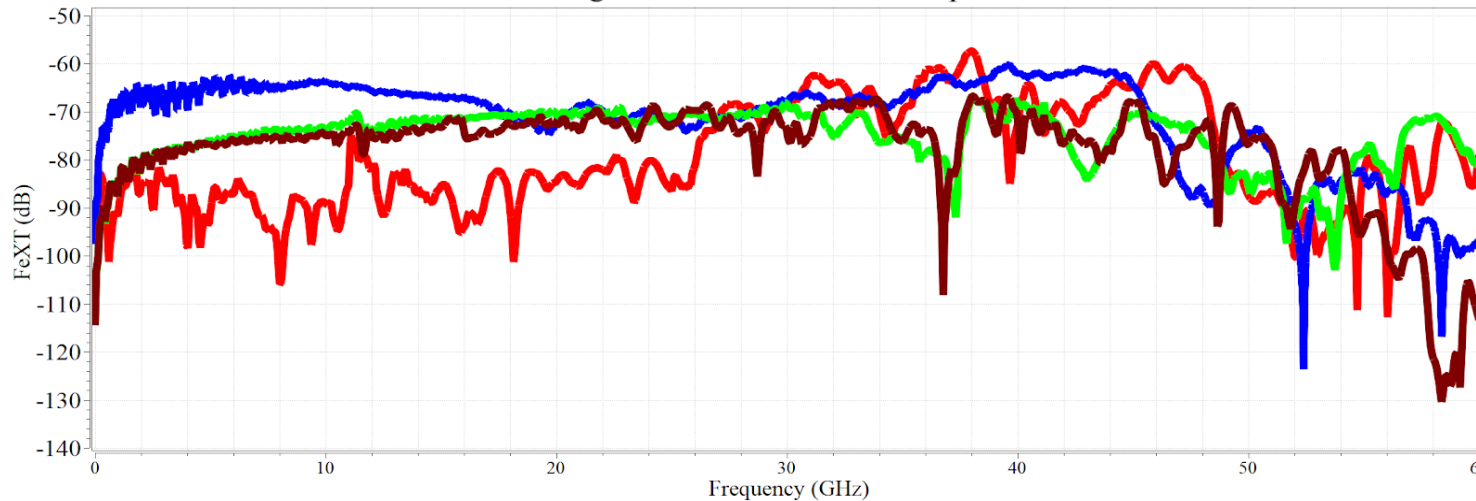


scale out channel's cascaded S-parameters comparison with PHY retimer configuration

Longest Scale Out Channel Comparison



Longest Scale Out Channel Comparison



OAM/UBB/EXP SI Challenges

scale out channel's comparison with PHY retimer configuration by using IEEE 802.3.CK COM

Connector Vendor	HS layer counts	Longest routing on the EXP	COM (>3dB)	ERL (>9.7dB)	FOM ILD
A	4	3in – 4in	4.627dB 3.375dB	13.144dB	0.159
B	4	3in – 4in	6.448dB 5.417dB	13.3998dB	0.1081
C	4	3in – 4in	5.368dB 4.166dB	16.969dB	0.081
D	6	3in – 4in	4.852dB 3.96dB	16.032dB	0.1317

Call to Action

Get involved in the project:

OCP Server Project: <https://www.opencompute.org/projects/server>

OAI Subgroup: <https://www.opencompute.org/wiki/server/OAI>

OAI Mailing List: <https://oc-all.goup.io/g/OCP-OAI>

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