

400G and beyond

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Transceiver form factors

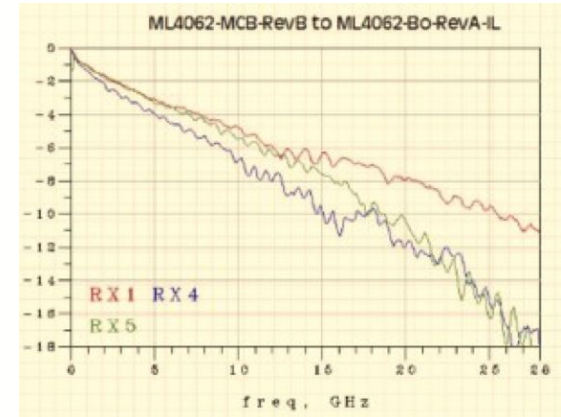
QSFP-DD 400G Optics

- QSFP-DD
 - Reduced power budget as harder to cool
 - » Options with 'extended optics' has been presented, but that means optic will stick further out of the port
 - Electrical AUI can be either 8x56G SERDES or 4x112G SERDES
 - QSFP-DD is backwards-compatible with QSFP28
 - High Port Density – 24 to 36x400G per 1U (depending on the ASIC)
 - » Up to 28.8Tbps with Nx112G Serdes
- Outlook to the future
 - Challenges for 800G on QSFP-DD
 - » Some constraints due to power/cooling
 - 76 pin AUI connector faces challenges around signal synchronicity at 112G-PAM4
 - Availability of 8 Lane and 4 Lane optical side (example LR4/LR8)

QSFP-DD 



QSFP-DD Type 1 and Type 2 Form Factors



<https://multilaneinc.com/s-parameter-data-qsfp-dd/>

OSFP 400G Optics



- OSFP

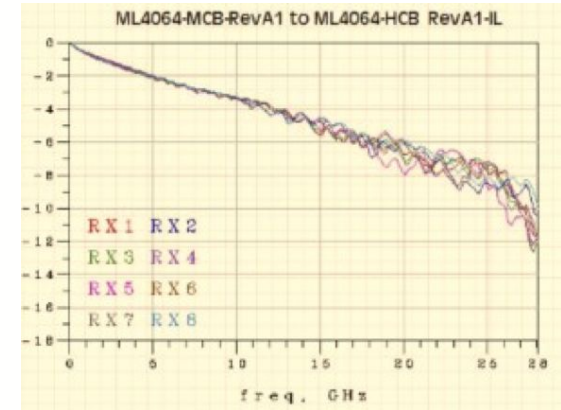
- Higher power budget, easier to cool
 - » Demonstrated 20W power envelope
- More options for high-power optics (like ZR 120km 400g)
- Eight Lanes at 56 or 112Gbps
 - » Supports 400G and 800G (2x400G)
 - » 60 pin AUI connector optimized for high bandwidth SERDES
- High Port Density – 24 to 36x400G per 1U (depending on the ASIC)
 - » Up to 28.8Tbps with Nx112G Serdes



OSFP Form Factor

- Outlook to the future

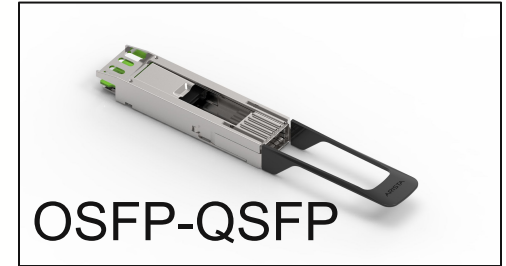
- Roadmap to 800G (2x400G)
 - » Outlook to 2020/2021
- Availability of 8 Lane and 4 Lane optical side (example LR4/LR8)



<https://multilaneinc.com/s-parameter-data-osfp/>

OSFP 400G Optics

- OSFP-to-QSFP Adapter for 100G compatibility
 - Inserts into an OSFP slot
 - Lets you deploy a 400G switch and run it at plain 100G!
 - Mechanical adaptor - purely passive





Optic types

400G Optics



- **Switch Silicon SERDES Transitions drives Optics Transitions**
 - 50G-PAM4 ramp starts in 2019, passes 25G-NRZ in 2020
 - 100G-PAM4 ramp starts in 2021, passes 50G-PAM4 in 2022
- **100G-DR1, 400G-DR4 and 400G-FR4 are forwards compatible**
 - Will work with Nx50G lanes (2019) and Nx100G lanes (2021)
 - 400G-FR8/LR8 not forwards compatible with 100G electrical lanes

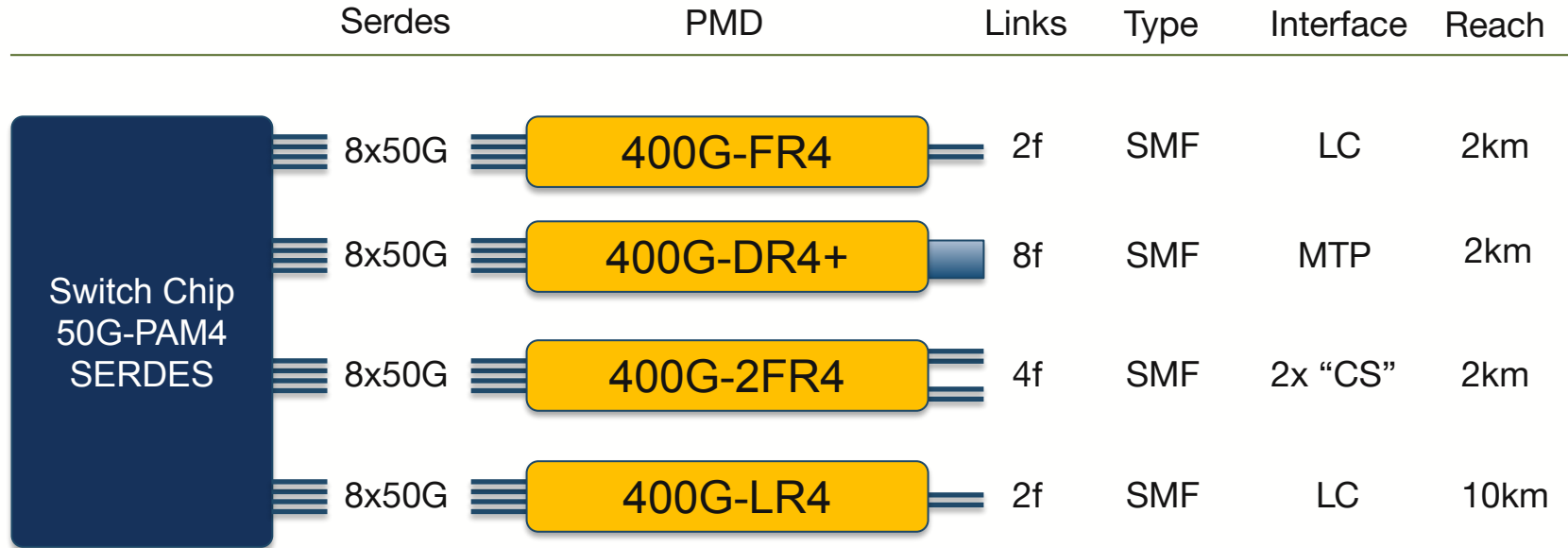
SMF 400G Standards

Standard	Reach	# Fiber	Fiber Type	Power
400G-ZR/ZR+	100km+	2	SMF	15 W+
400G-FR8/LR8	2/10km	2	SMF	12 W
400G-FR4/LR4	2/10km	2	SMF	10 W
400G-DR4+	2km	8	SMF	10 W

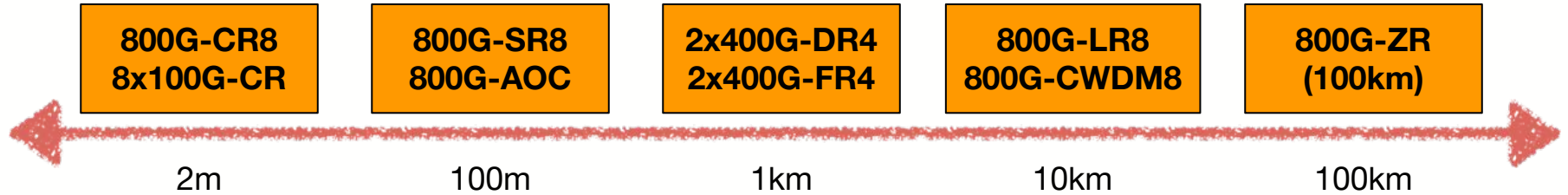
Forward Compatible with 100G SERDES

Not Compatible with 100G SERDES

400G Optics

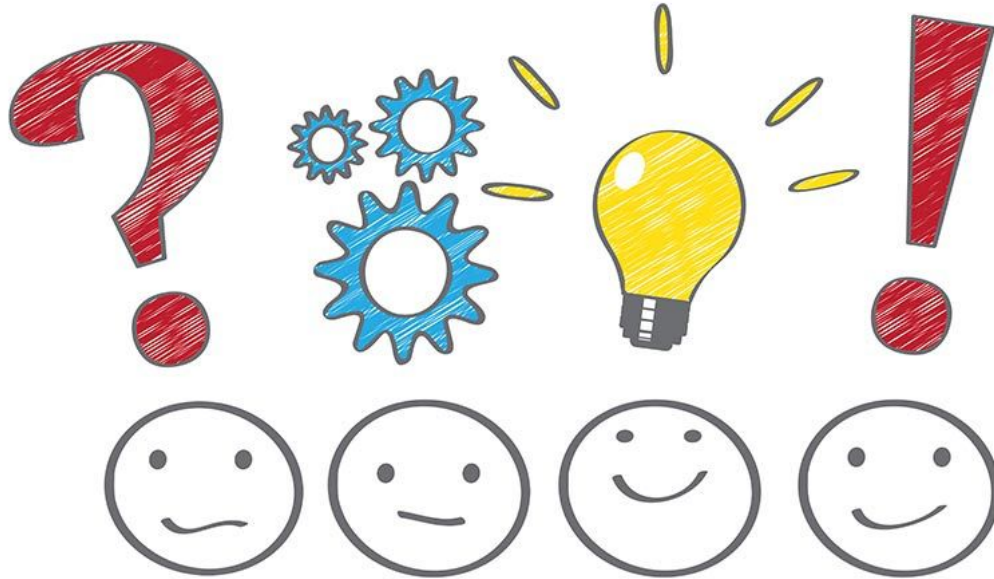


Looking forward ...



- 112G Electrical Performance needed
- Thermal Performance should be kept an eye on
 - Required for 800G and Dual 400G Optics (20W)
- Optical Interoperability with 100G Lambda Optics
 - Interoperability for 400G-DR4/FR4/LR4/etc

Questions?



Thank You For Your Attention

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