

In Support of a 500m objective for 200G Ethernet: Part II

Broad Market Potential, Distinct Identity, and Compatibility

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Caveats and Disclaimers

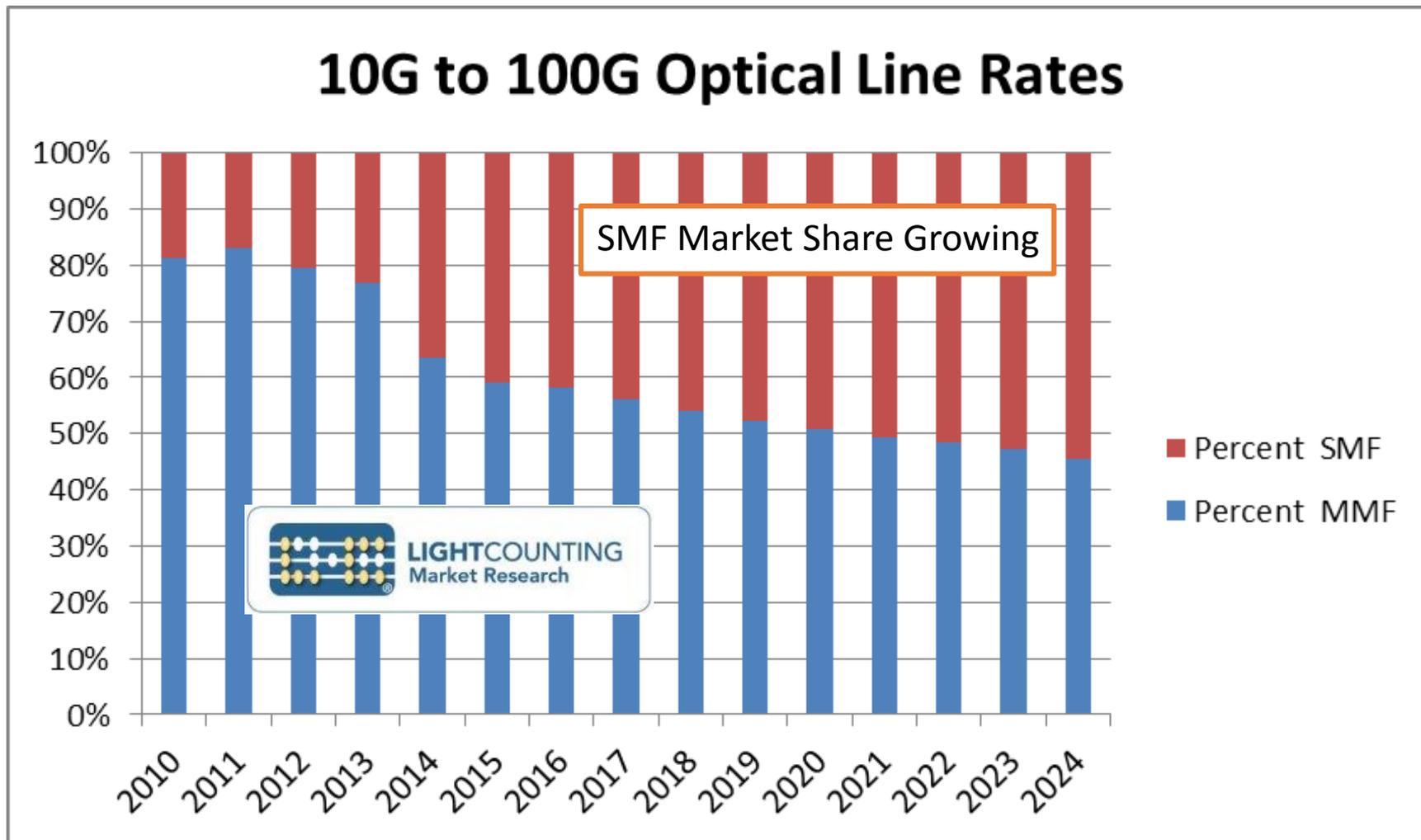
- The materials presented within assume a 200G-DR4/PSM4 type solution for a 500m reach

Broad Market Potential

200G-PSM4/DR4 Broad Market Potential

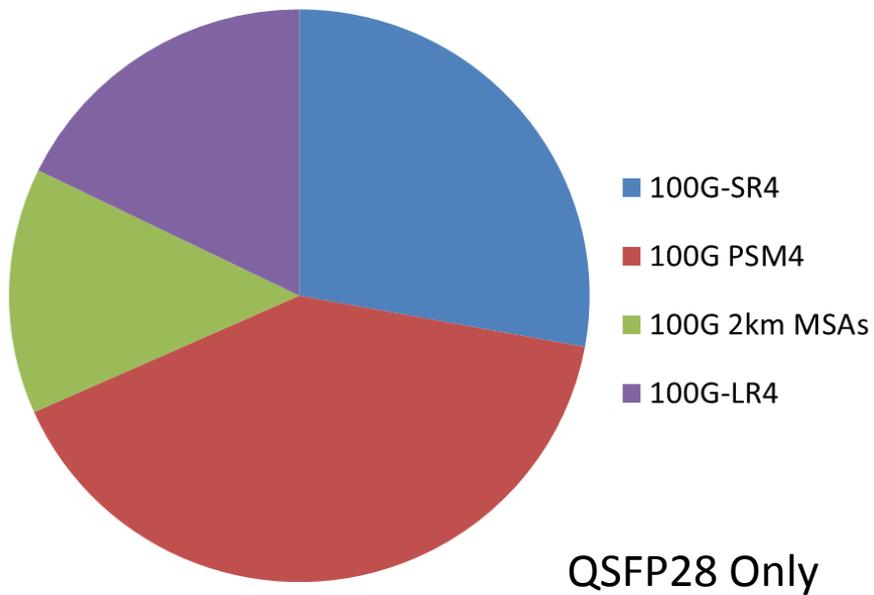
- Share of SMF is growing vs. MMF
- 100G-PSM4 Interconnects are a considerable volume compared to other 100G Ethernet reaches
- 200G-PSM4/DR4 fits well in a 40G-100G-400G evolution of PSM4 interconnects
- 200G-PSM4/DR4 may extend the lifespan of the QSFP from factor

Market Share by Medium



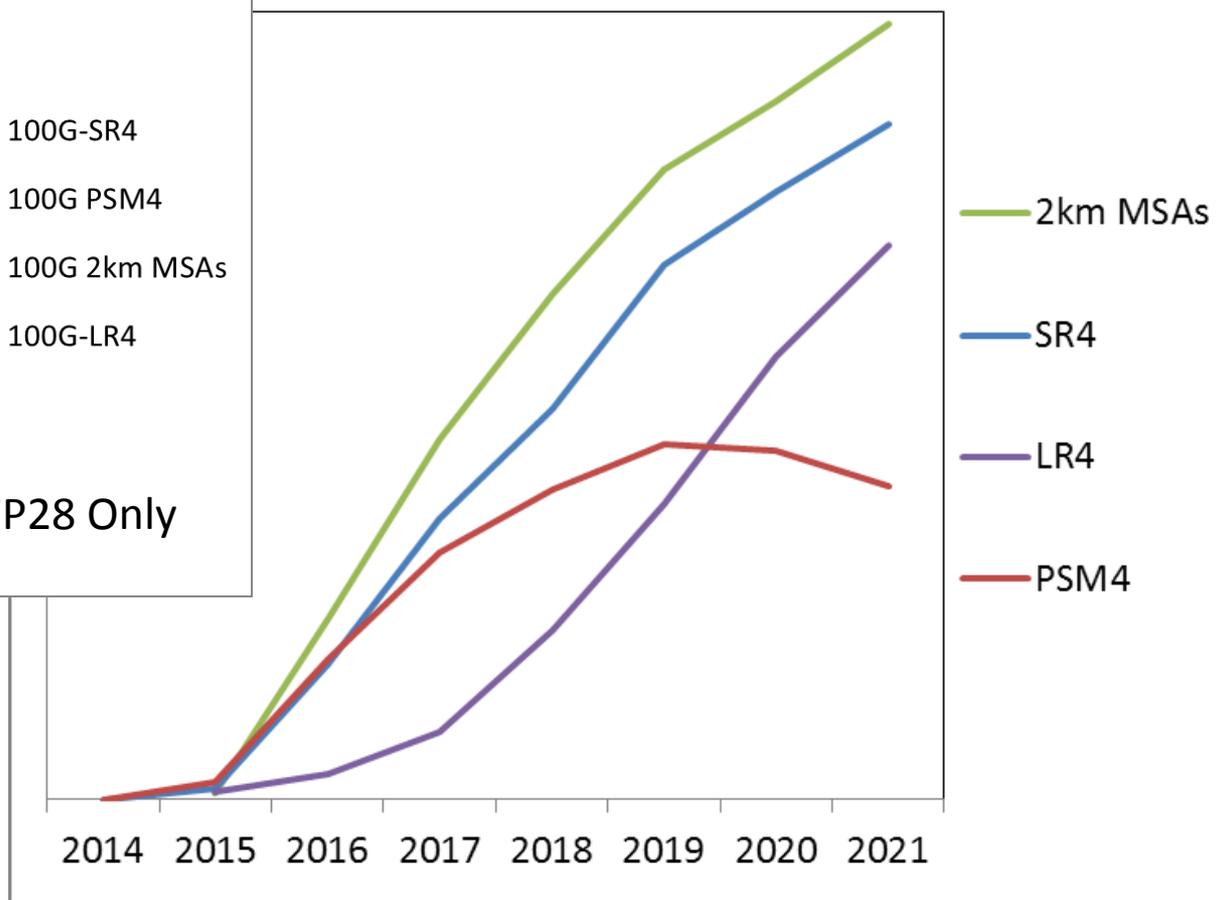
100G Market Share by Type (QSFP28)

2015 Unit Shipments for 100GbE

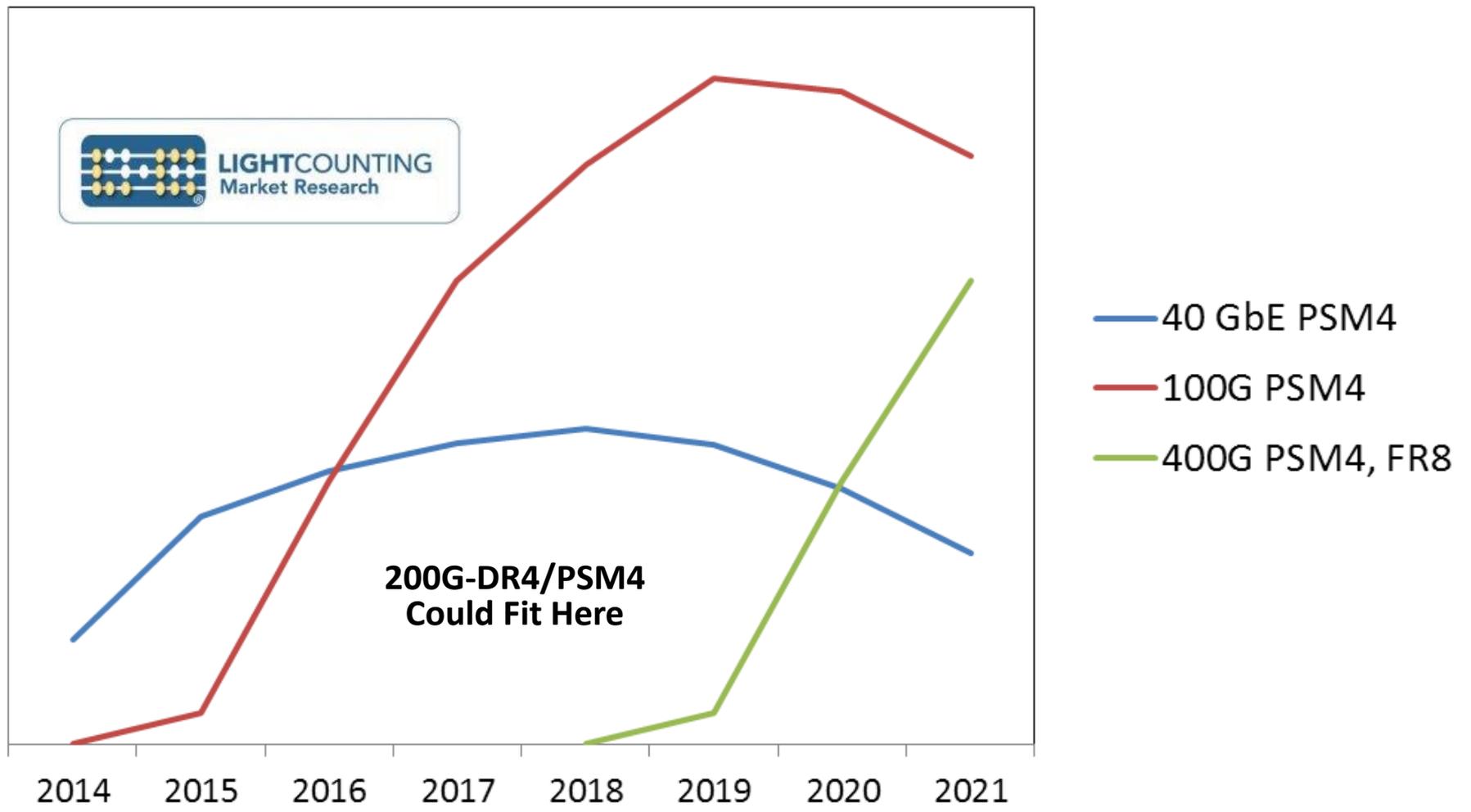


QSFP28 Only

100GbE QSFP28 Unit Shipments by Reach

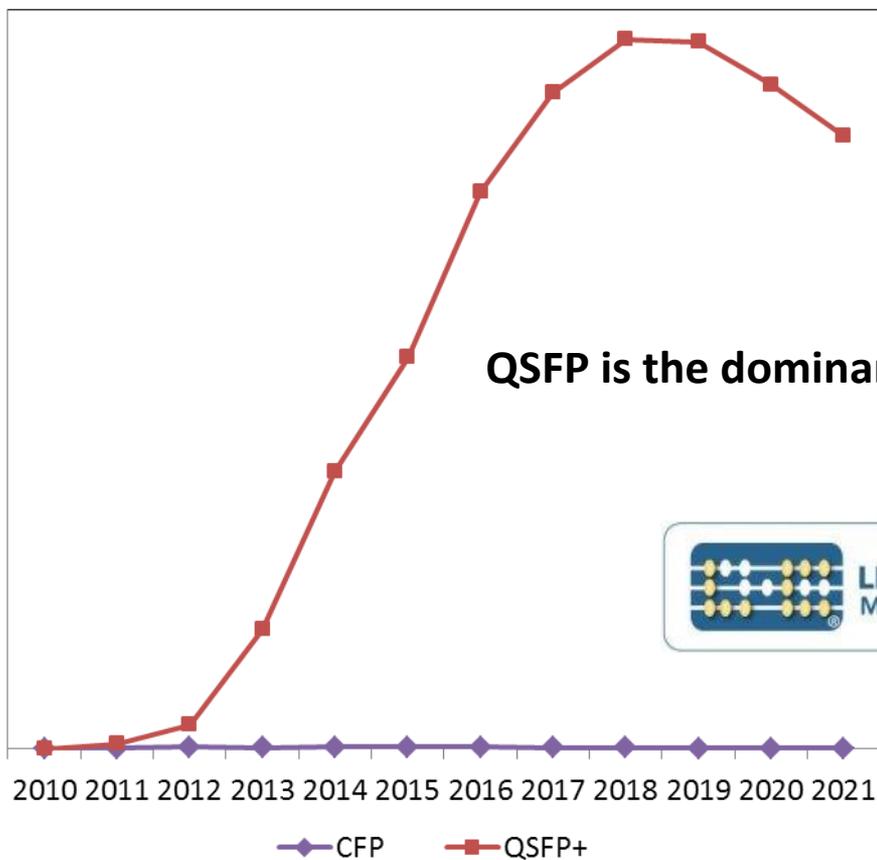


Mid-Reach SMF Market Share by Rate

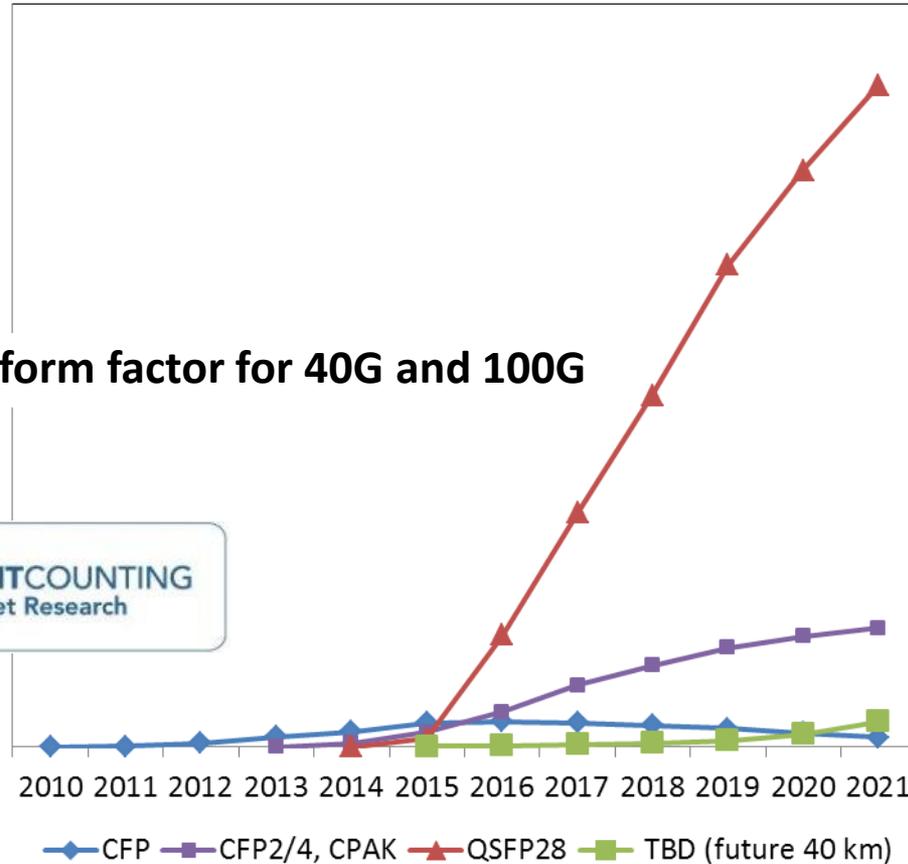


Market Share by Form Factor

40GE



100GE



QSFP is the dominant form factor for 40G and 100G



Observations

- SMF share of optical interconnects accounts for > 40% of the market
 - Expected to reach 50% around 2020
 - Supported by the move to “all SMF DC” seen by many hyperscale DC operators
 - Supports the need for more targeted SMF standards
- 100G-PSM4 market share is considerable when compared to other 100G Ethernet reaches
 - Comparable volumes in early deployment
 - Approximately 60-70% the annual volume of 2km and 100m reaches after three years
- Deployment of 200G-PSM4/DR4 could fit well between 100G and 400G
 - Approximately 2 year cadence from 40G to 100G
 - Current market projections show a 3-4 year cadence from 100G to 400G
- 200G-PSM4/DR4 could extend the lifespan of QSFP
 - And enable a common port type with a prospective 200G-SR4 solution

Distinct Identity & Compatibility

Distinct Identity

- A 500m objective allows for solutions that are distinctly different than those expected from the current set of adopted objectives
- 500m over SMF is distinct from MMF
 - SMF fiber type can enable longer reaches than MMF
 - SMF fiber type can enable longer useful fiber plant life than MMF
- 200G-PSM4/DR4 type 500m over SMF is distinct from 2km and 10km over SMF
 - High deployment of PSM4 type fiber plants for 500m reaches (vs. duplex for 2km and 10km)
 - 500m fiber plant more likely to be factory terminated vs. field terminated
 - 500m solutions may be more optimized for cost/power sensitive markets

Compatibility

- 200G-PSM4/DR4 type 500m solutions expected to be compatible with:
 - Potential 200G PMA standards based on 8x25 Gbps or 4x50 Gbps signaling
 - Potential 200G MAC and PCS standards
- 200G-PSM4/DR4 type solutions can have lower rate modes to be compatible with:
 - 100G PMA standards including CAUI-4 C2M electrical interface standards
 - 100G MAC and PCS standards

Additional Considerations

- 200G-PSM4/DR4 could leverage work done for 50G-FR
 - This is easier (more likely) with a standard than a 200G-PSM4 MSA
- 200G-PSM4/DR4 product could see additional volumes with 4x50G modes of operation
 - Expanded link budget (4x50G-FR) for breakout over long reach
 - Reduced link budget for breakout over short reach
 - Ie, Intra-row server to switch interconnects
- 200G-PSM4/DR4 product could be backward compatible with a 100G-PSM4 mode of operation
 - Operating in PAM2/NRZ mode

Summary

- 500m objectives and solutions have broad market potential
 - PSM4 market has seen healthy (and increasing) volumes from 40G-100G
 - PSM4 market shows considerable volume
- 500m objectives and solutions have distinct identity
 - Longer reach than MMF solutions
 - Different fiber plant and cost/power optimization than longer reach SMF solutions
- 500m objectives and solutions are compatible with other anticipated 200G standards
 - PMA and MAC

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Thank You