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

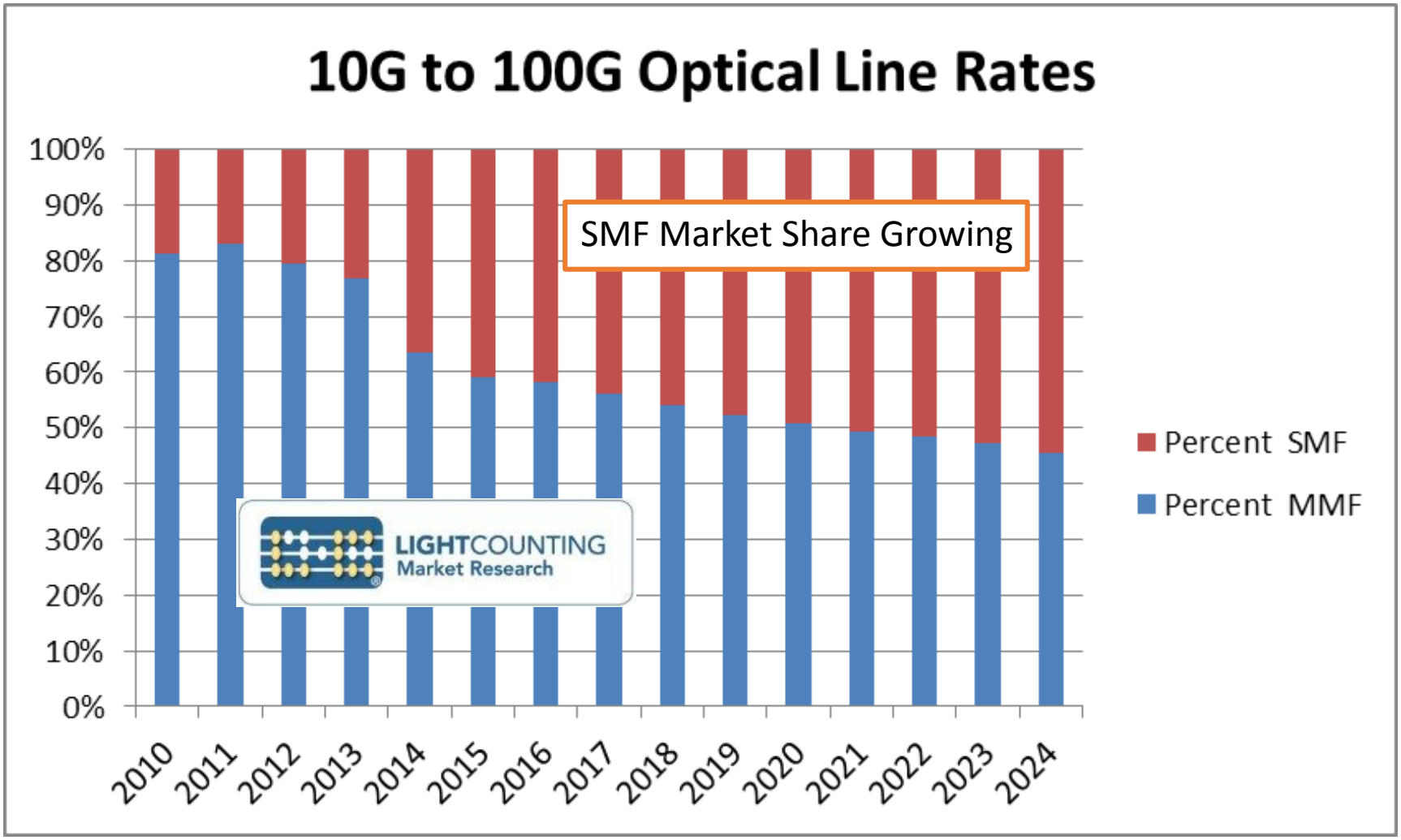
- The materials presented within assume a 200G-DR4/PSM4 type solution for a 500m reach

Broad Market Potential

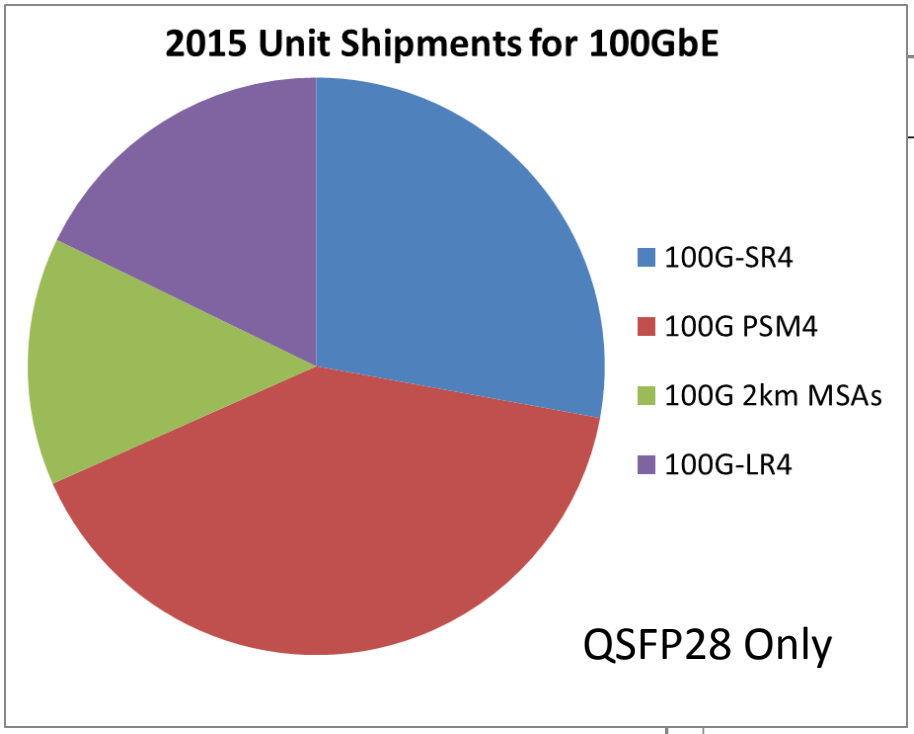
200G-PSM4/DR4 Broad Market Potential

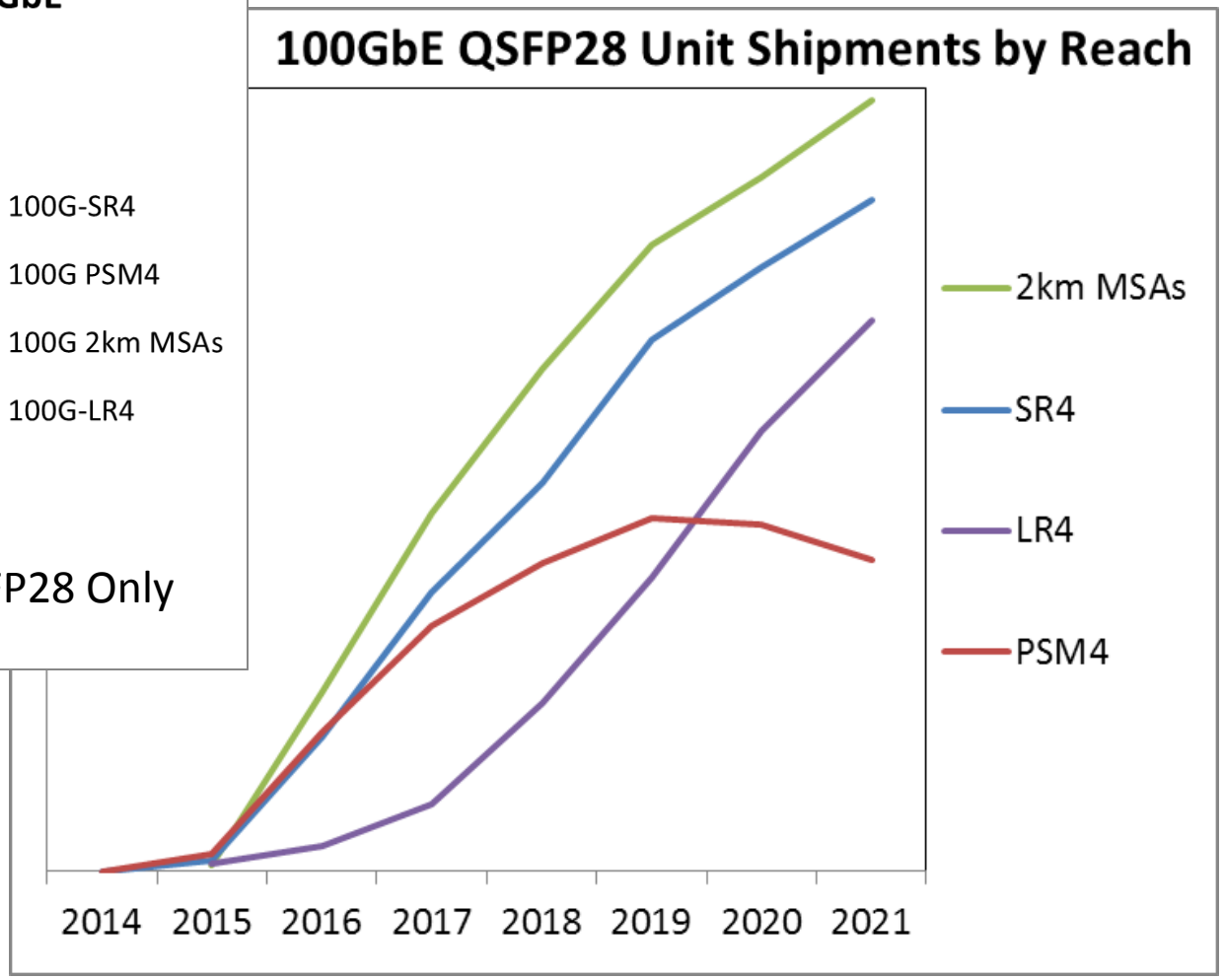
- Share of SMF is growing vs. MMF
- 100G-PSM4 Interconnects are a considerable volume compared to other 100G Ethernet reaches
- 200G-PSM4/DR4 fits well in a 40G-100G-400G evolution of PSM4 interconnects
- 200G-PSM4/DR4 may extend the lifespan of the QSFP from factor

Market Share by Medium

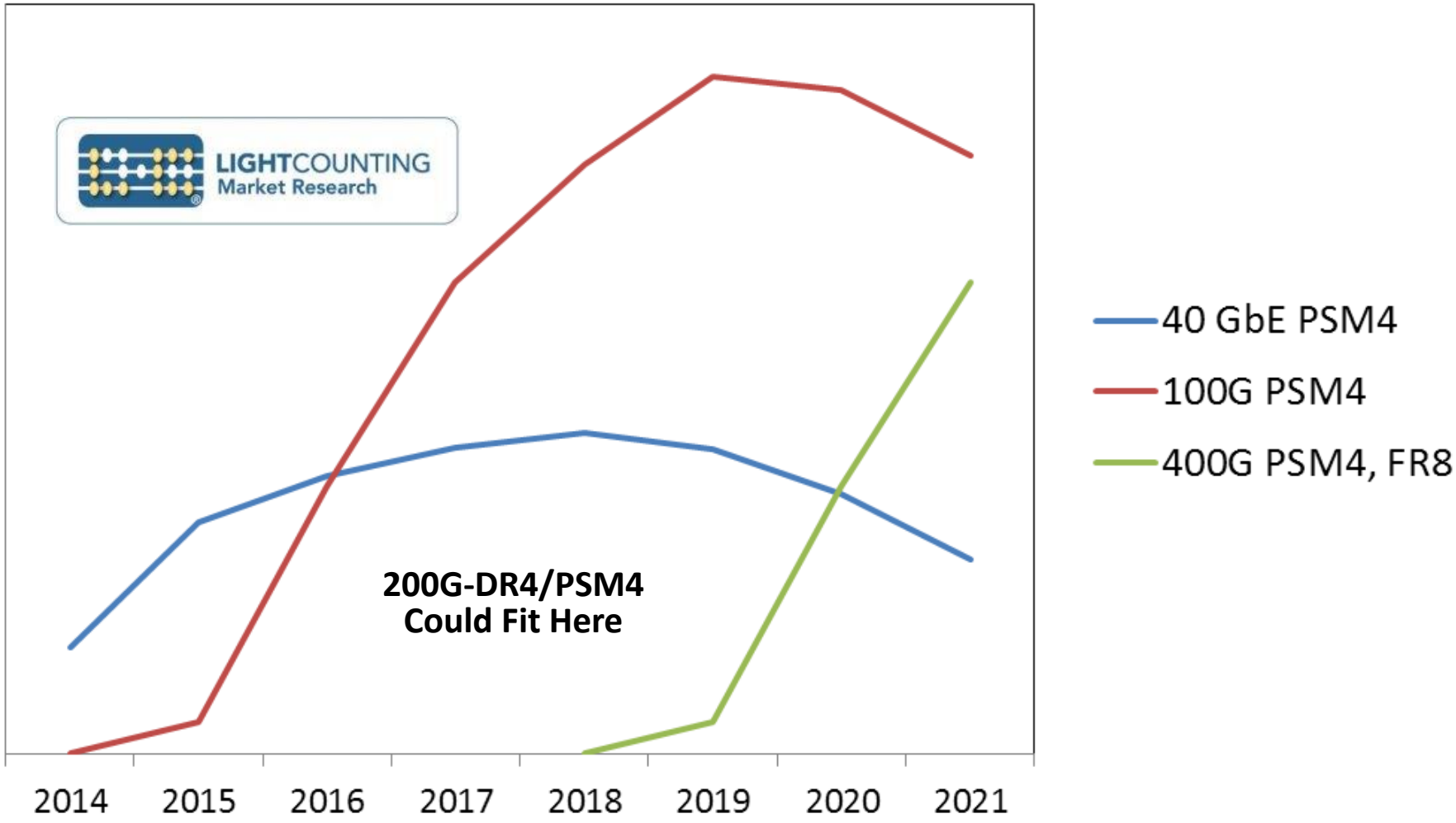


100G Market Share by Type (QSFP28)



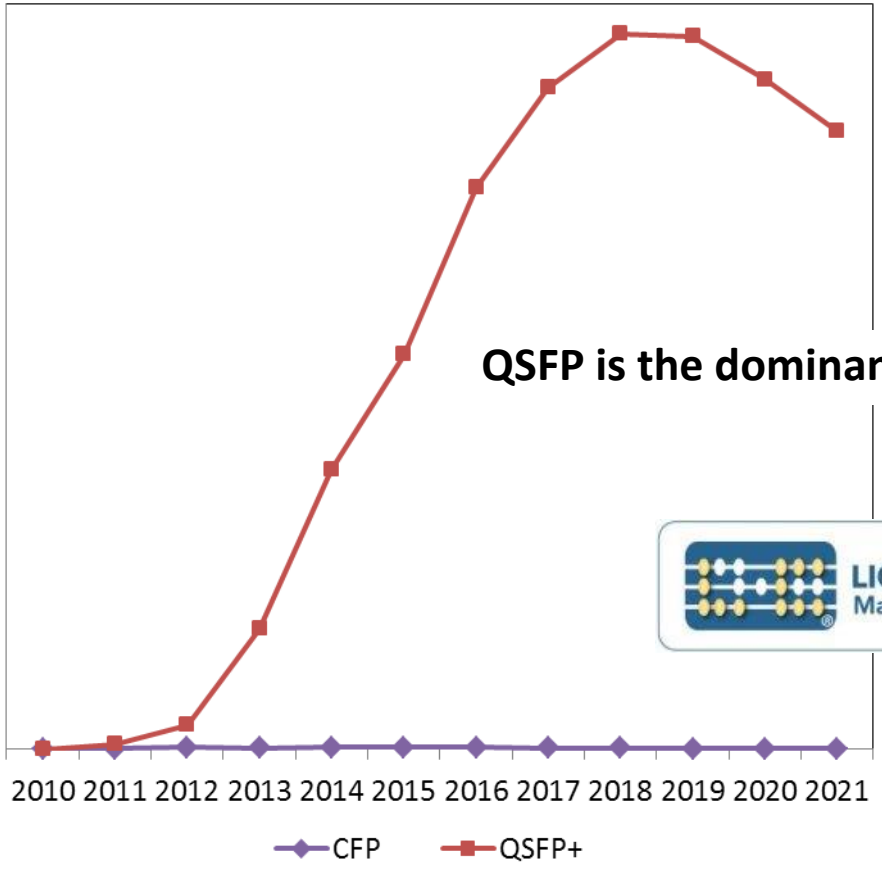


Mid-Reach SMF Market Share by Rate

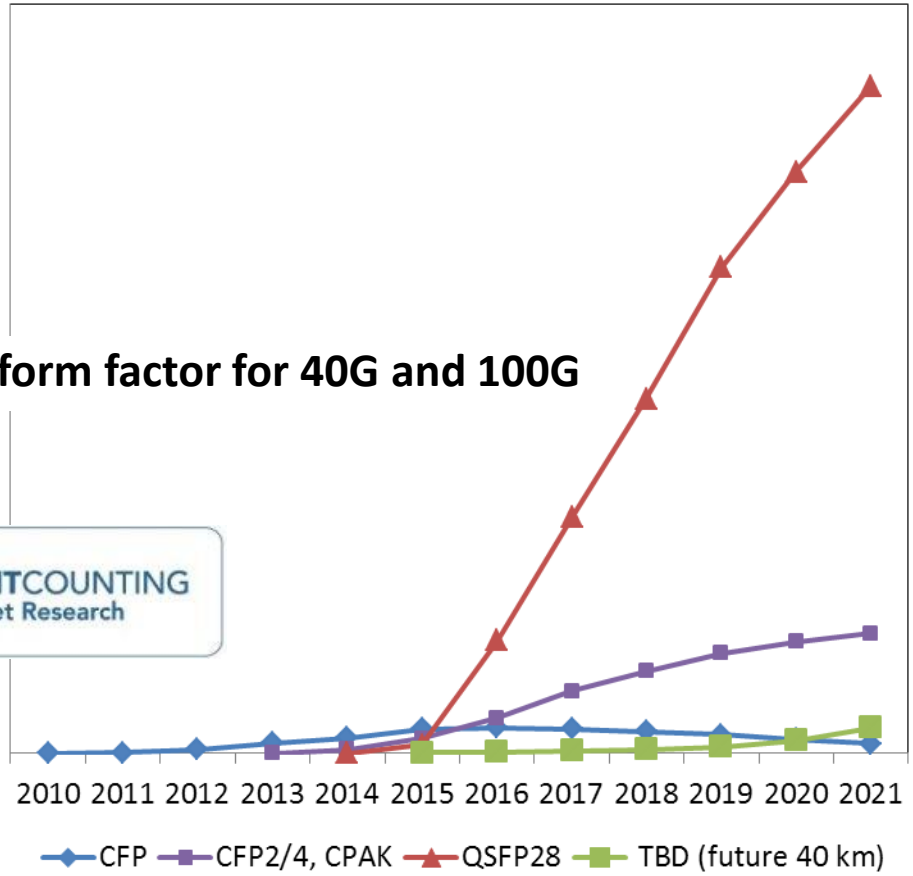


Market Share by Form Factor

40GE



100GE



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

LIGHTCOUNTING Market Research

Observations

- SMF share of optical interconnects currently 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

- 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
  - Uses same fiber plant

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 vs. 2km and 100m markets
- 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