Big Ticket Items for 10km DMT

Sacha Corbeil, Ying Jiang, David Lewis, Brandon Collings

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Big Ticket Items – 10km SMF PMD

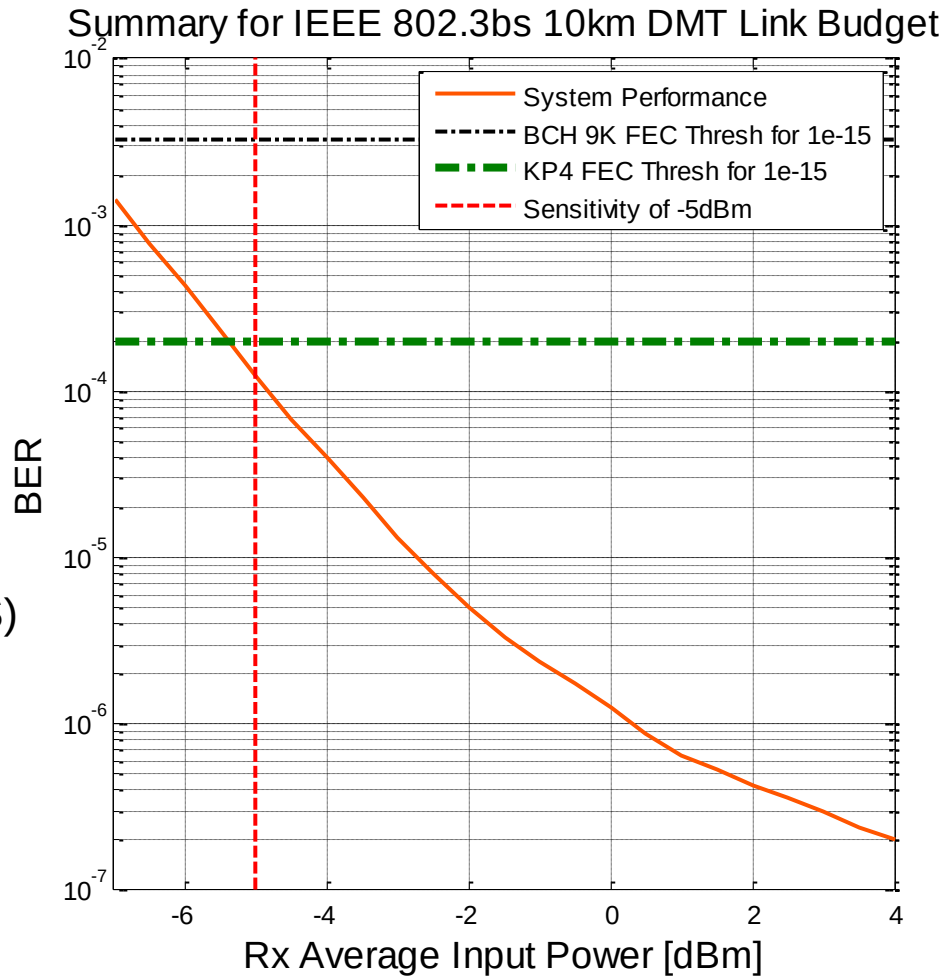
- Proposals
  - takahara_3bs_01_1114 (DMT)
  - corbeil_3bs_01_0115 (DMT)
- Actions
  - Evaluate Coupling between electrical and optical interfaces **– update by May interim**
  - RX Technical feasibility **– this presentation (simulations) – by May interim (measurements)**
  - Dispersion penalty worst case **– tanaka_01_0215_smf & this presentation (simulations) – more measurements by May interim**
  - TDP. MPI **– this presentation (simulations) – tanaka_3bs_01a_0115 (measurements)**
  - RX sensitivity **– this presentation (simulations) – by May interim (measurements)**
  - Optical loss budget model **– update at May interim**
  - Interoperability **– update at May interim**

400G DMT Simulation Results

10km 400GE using DMT and KP4 FEC (host-based)

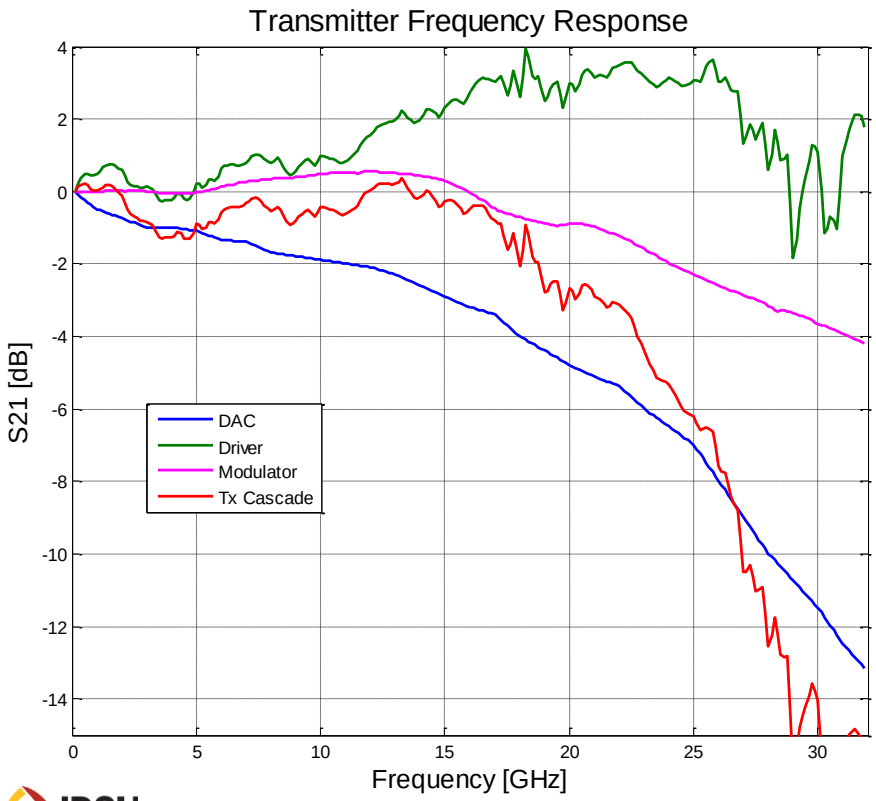
KP4 Feasibility

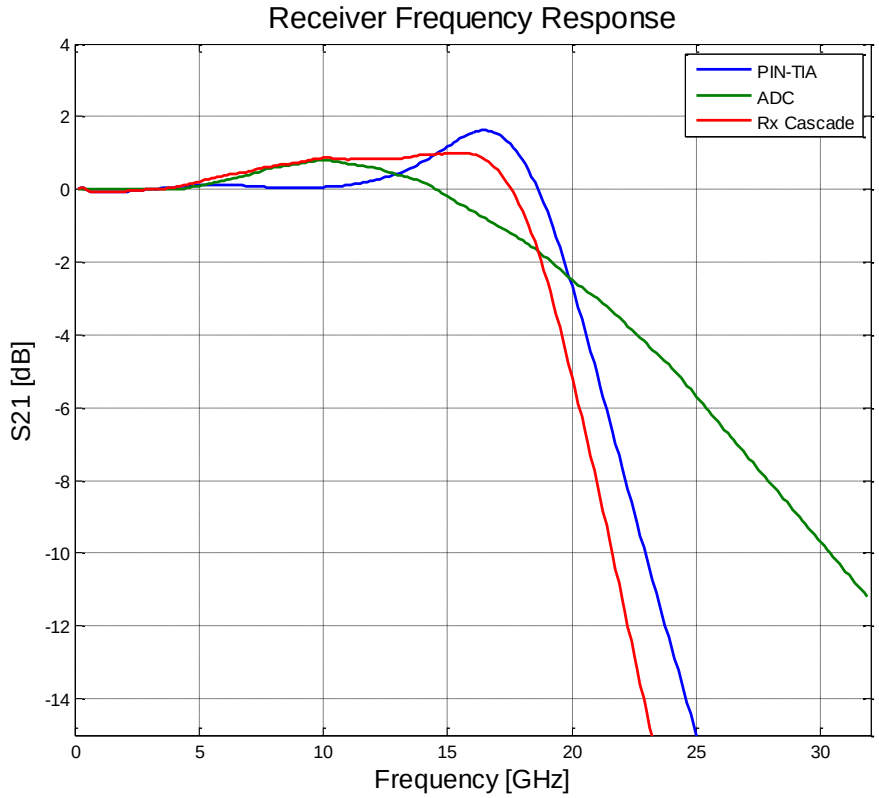
- Using same realistic component parameters as for Nov'14 proposal, and selecting an OMA equivalent to an optimal ER at sensitivity (-5dBm) of 10.2dB, we demonstrate feasibility over the 10km reach objective.
  - OMA corresponds to optimal for performance at sensitivity. Approximately 10dB at 2GHz.
- RIN: 1310 DFB
  - Integrated (average) -145dB/Hz,
  - Peak ~ -138dB/Hz near 7GHz
- Low IRN PIN-TIA
  - 12-15 pA/√Hz at High Gain
- DMT Specifics:
  - Clipping Ratio of 3.16 (peak/RMS)
  - Cyclic-Prefix of 8
  - Sample-Rate of 64 GS/s
  - 256 sub-carriers



Conditions

- Data-Rate = 106.25 Gb/s, Sample-Rate = 64GS/s
  - DAC ~15.5GHz 3dB BW
  - Peaking Driver to compensate for bandwidth of DAC
  - Modulator is low-profile MZ with High-Vpi, ~27GHz Bandwidth,
  - ADC ~21 GHz 3dB BW
  - Some Peaking in PIN TIA and ADC

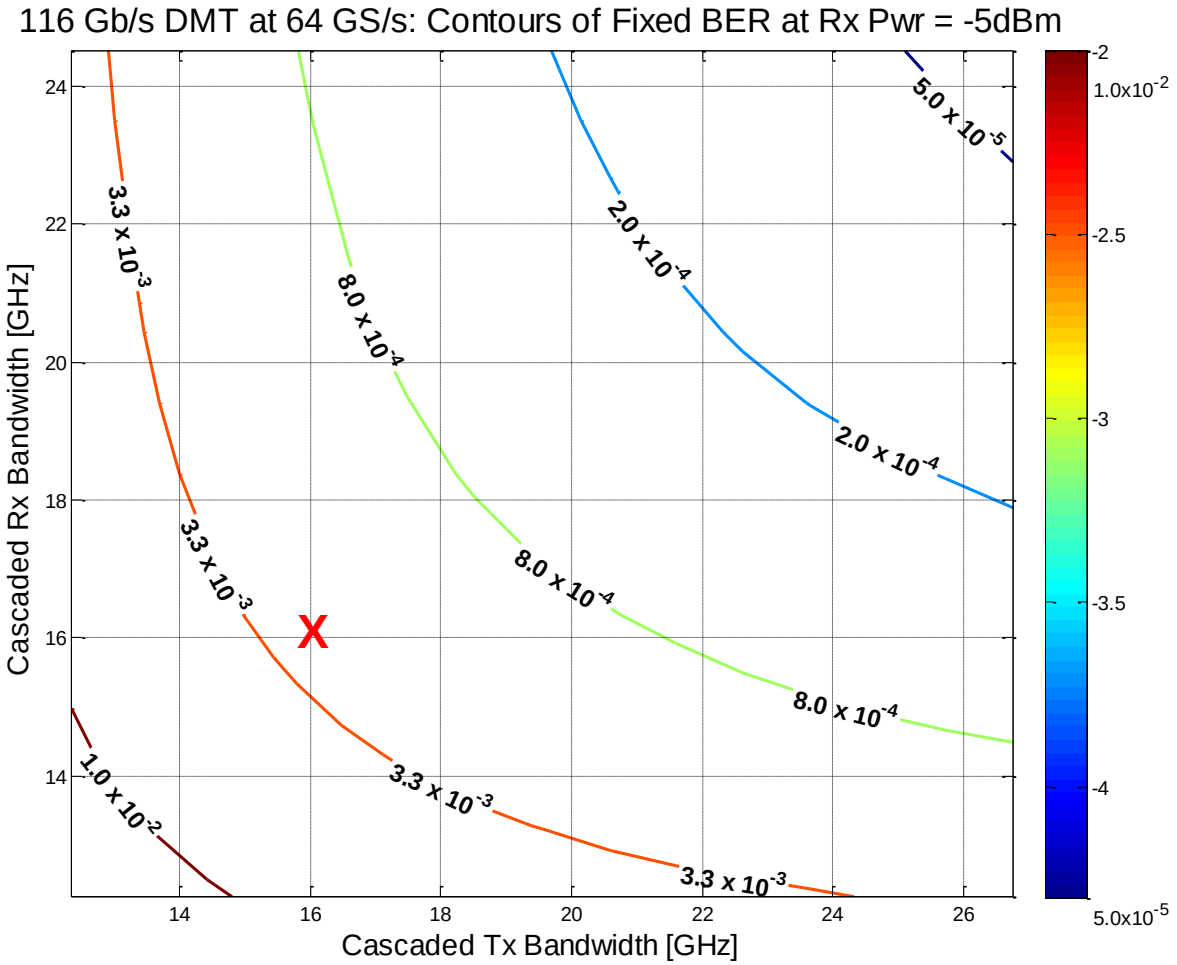




KP4 Feasibility Study

- Initial DMT research led us to requiring a high coding gain FEC, pushing the line-rate to 116Gb/s due to overhead required to maintain low latency
- We projected cascaded Tx & Rx Bandwidth each of ~15GHz, placing us near the red **X**.

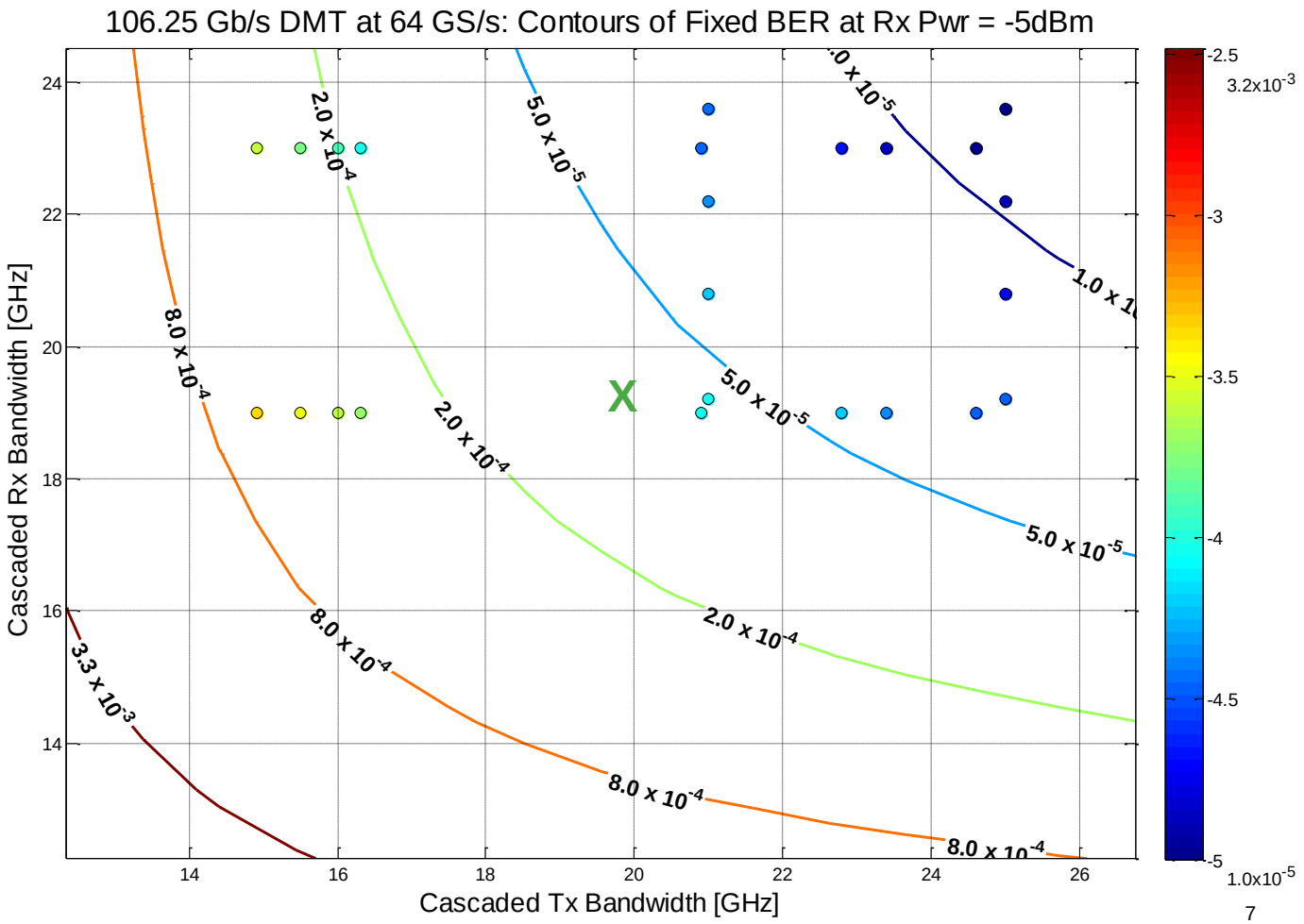
  - Contours shown on this plot use ideal 4th order Bessel responses to mimic DAC, Driver, Modulator, ADC and PIN-TIA.
  - All three Tx components are kept equal in bandwidth in order to give desired cascaded bandwidth
  - Ditto for both Rx components.
  - Noise sources (RIN and IRN) same as in previous slides.



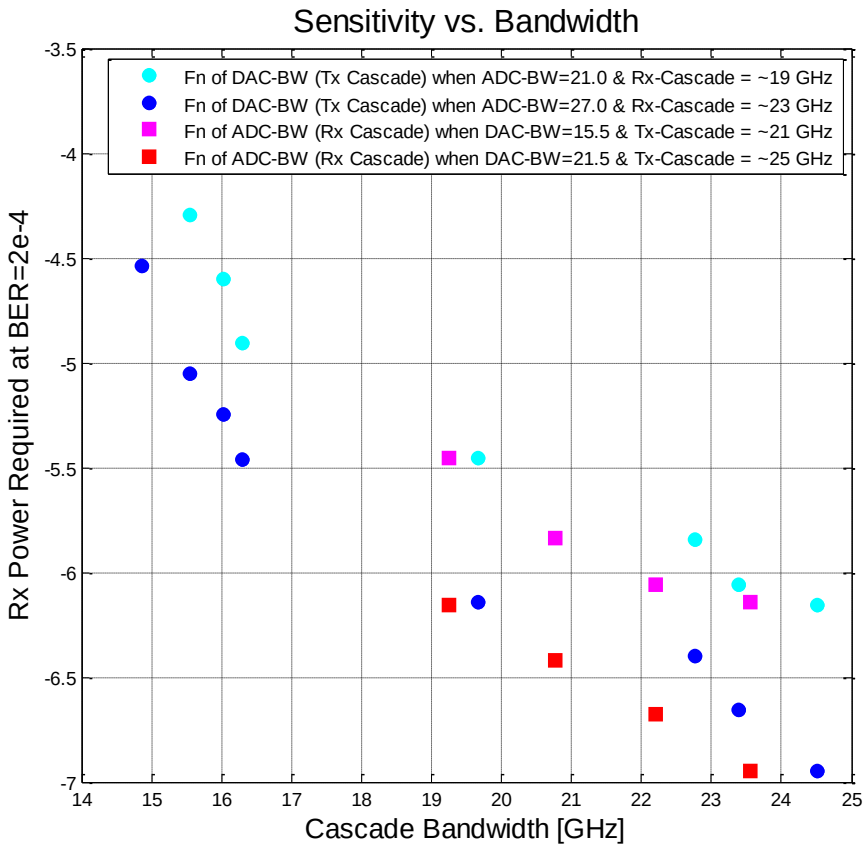
KP4 Feasibility Study

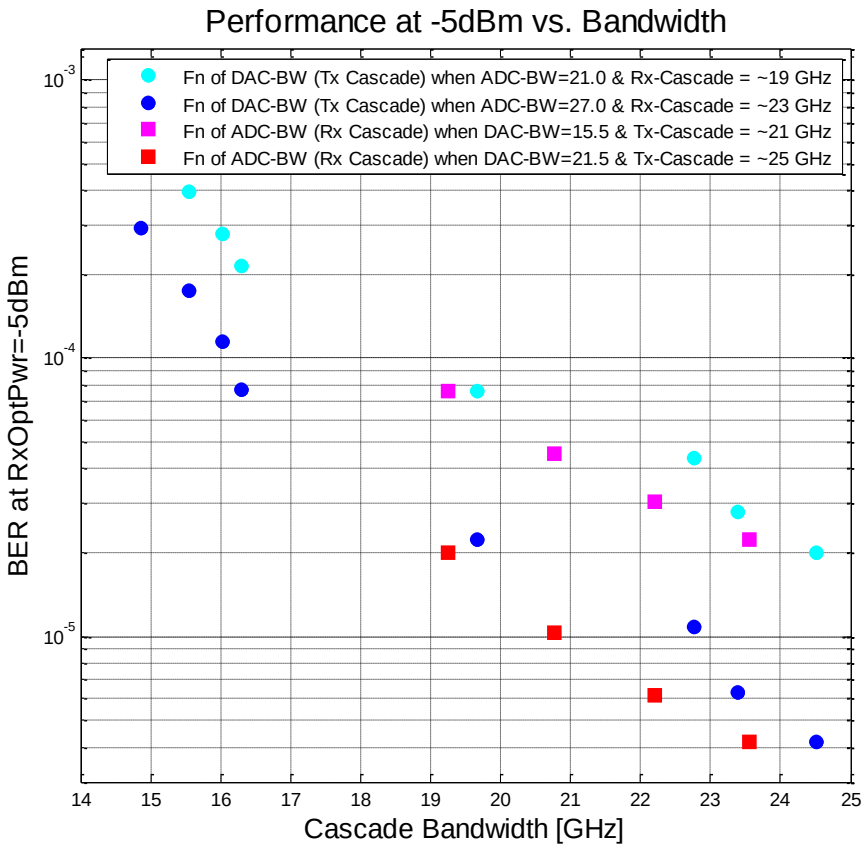
- Lower line-rate of KP4 (106.25) helps in achieving better performance with same components.
- Component availability in 2018 will yield higher bandwidth, placing us closer to the Green **X**.

- Data points (colored circles shows noise model simulations based on more realistic data, still using the 3dB Tx cascade as a figure of merit.
- BER information is in color-coding:
  good match with generic component contour predictions.



Performance Dependence on Bandwidth



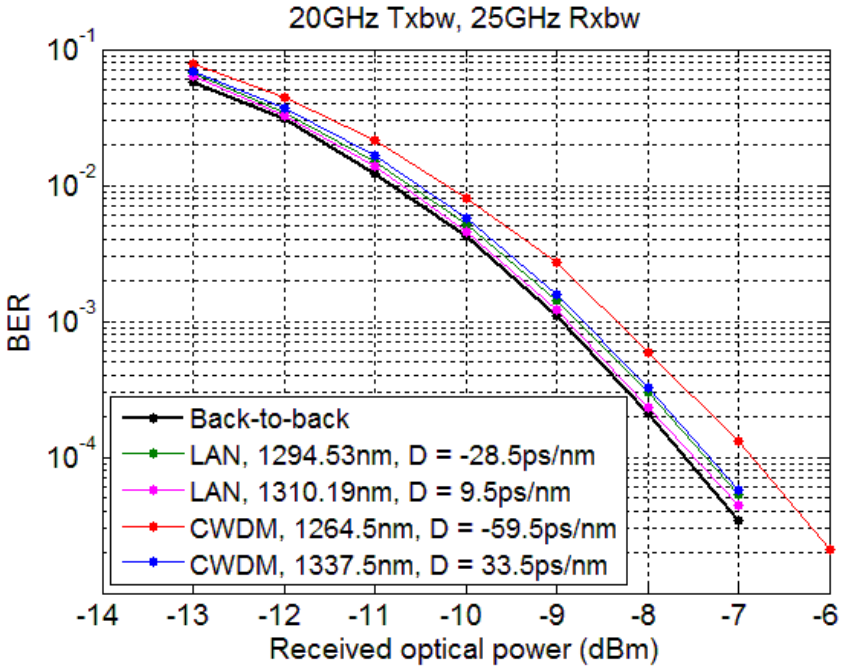


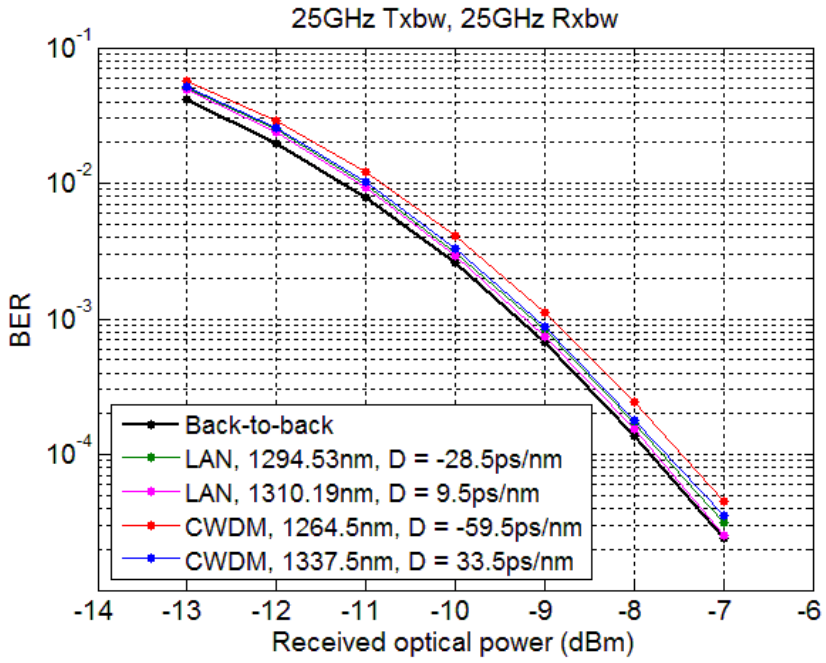
400G DMT Simulation Results

Simulations of Rx Sensitivity Penalty with Chromatic Dispersion

Penalty due to CD for LanWDM and CWDM grids

- LanWDM grid shows < 0.5 dB penalty over 10km
- CWDM grid < 1dB with Tx BW of 20 GHz and ~0.5 dB with Tx BW of 25 GHz
- Measurements planned to be done by May interim meeting





Thank You