Analysis of Various Options for Multimode Fiber Links

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About this talk:

• **Objective:**
  – Show what outputs the analysis should provide
  – Show what is possible for various options
    • We can refine the parameters as we gather more information from various sources

• **Not an objective:**
  – to propose a solution for parameters or achievable distance
Approach to Link Analysis

• Higher bit rate requires careful treatment of noises in optical links
  – Mode Partition Noise (MPN) is just one of the major penalties for longer multimode links

• Used the same link model used for standardization of OM3 (and OM4) - same data sets for fiber DMD and launch conditions, statistics for connector offsets

• For a link with a given distance and power budget, compare bath-tub curves for both assumptions for MPN behavior (dynamic and constant MPN SD [3])
  – Calculate horizontal eye opening at 1e-12 (TP35)
  – Repeat for all 40000 links
  – Explore for various distances and power budgets
  – Explore impact of using CDR and/or FEC for various distances and power budgets
Dynamic vs. constant MPN assumption

- Bath tub curves for both assumptions (ref [3]) compared, 6dB power budget, 100m, no CDR
- Extract eye width at given BER

![Graph showing eye opening at 1e-12 for one link and all 40k links.](image)
Exploring Distance

- Calculations repeated for various distances and power budgets (5 and 6 dB results shown)

Whiskers signify 99.3% of data range
Distances using FEC

• Repeated results considering the use of FEC
  – Still need to have minimum eye opening, but at higher BER (4.68e-6)
Summary of all options

- Three values for power budget (4.5, 5 and 6 dB), with and without FEC (1e-12 or 4.68e-6)
- Assume minimum required eye opening for a CDR is 0.15UI

99 percentile shown
Instead of Conclusion

• Explored impact of power budget size, use of CDR and or FEC on link distances
  – FEC provides great boost to achievable distance

• Need to refine parameters, make choices
  – Cost impact of power budget size should be discussed
    • What is the cost ratio between the 20m and 100m?
References


Backup Slides
Signal Eye diagrams

- ISI at laser output is ~1.52 dB
- ISI at the fiber output is ~1.9 dB