CU4HDD Channel Test Points and Loss

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- The purpose of this presentation is to begin defining the test points to be used in 802.3cb, as well as the insertion losses associated with these test points
- There are two different models shown in the presentation that use 802.3bj as a starting point
  - A backplane reference model that is a generic model that could be a closed and/or proprietary system in which the only loss budget is ball-to-ball
  - A storage reference model that is more focused and allows for insertion loss budgeting of the HDD since it’s an external interface
    - The ball-to-ball budgets are equivalent between the two models
- Loss numbers at 2.578GHz are given in the presentation, with is the fundamental frequency of 5G assuming 64b/66b encoding
- The loss numbers are only a starting point and may shift around
SAS to 802.3bj Test Point Mapping

- The figure shows how the SAS test points differ from 802.3bj
- The 15dB refers to the 10m cable reference model for 6G SAS
- The 1.7dB comes from the reference termination models
- Shifting loss to 2.578 GHz
  - This equates to 16.61 dB of die-to-die loss at 2.578 GHz
  - 10m Cable: 13.87 dB at 2.578 GHz
  - Reference terminations: 1.37 dB at 2.578 GHz

- SAS Channel
  - The channel includes the mated pair connectors and everything in between, plus 2 Zero-Length test loads (TP1 to TP4 equivalent)
    - Zero-Length test load has a max loss of 1.27dB at 2.578 GHz, but no minimum loss is defined
    - The loss of the zero-length test loads are included in the simulations
  - The reference termination models include everything behind the connectors (traces, package)
Backplane Reference Model

- Use 802.3bj as a reference to define ball-to-ball loss at 2.578 GHz.

- The is a closed and/or proprietary environment in which the only loss budget is ball-to-ball.

- 1 dB was taken out of the 10 m cable reference model and given to each end to account for 2 zero length test loads.

1.75 dB (~3.5” of trace)

14.62 dB = 13.87 dB - 1 dB + 1.75 dB

16.37 dB ball-to-ball @ 2.578 GHz

Numbers shown here are just for correlation to the other slides and don’t imply loss budgeting.
Storage Reference Model

- For the storage application, it’s important to budget the drive loss since it’s an external component.
- The rest of the “box” is vendor specific and can be any combination of cable and backplane.
- The numbers shown are a starting point:
  - Drive board loss: 1.75 dB equating to roughly 3.5" of FR4 trace
  - Mated connector loss: 0.3 dB
  - Fixture trace loss: 0.5 dB equating to roughly 2.5" of Rogers 4350B trace plus SMA connectors
- The tolerances defined for the mated connector assembly would need to allow for variances in connectors from different vendors in addition to manufacturing variation.