Channel Model Ad Hoc Report

IEEE P802.3ap Task Force Meeting

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Meetings

- ## Teleconference: Wednesday, December 15
  - Mellitz, "Exploring Data for Modifications of Proposed SDD21 Channel Model"

- ## Teleconference: Tuesday, January 11
  - Mellitz, Hendrick, et al, "Status Update - SDD21 & SDD11/22 Model Development"
  - Sawyer, "S-Parameter Cascading for Channel Model"

Thanks to all who participated!

IEEE P802.3ap Link Model

TP1   TP4   TP5

Tx package   Rx package
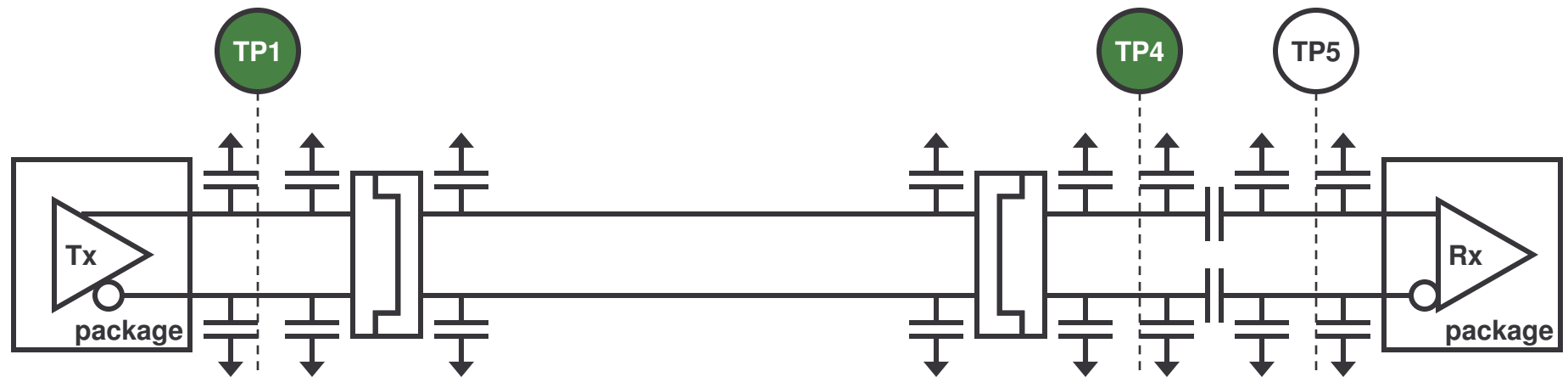
X = Normative

Y = Informative

Note 1: This definition is consistent with conventions adopted in XAUI, OIF TFI-5 and CEI, and PICMG 3.1

Note 2: While only two connectors are shown, a three connector topology may also reside between TP1 and TP4, so long as the channel requirements are met.

**Definition adopted via TF Motion
July 2004 (32/2/21)**

Where are we?

- Which came first… [chicken-and-egg problem]
  - Channel and signaling decisions are linked.
  - Take a stab at the channel, study signaling performance over that channel, and then iterate the channel?
  - Take a stab at the signaling, study signaling performance over candidate channels, and iterate the signaling?
- Specification Methodology
  - Define a parameter set in the frequency-domain or time-domain.
  - Figure of merit: Do these parameters reliably predict link performance? By bounding these parameters, can inter-operability be guaranteed?
    - Channel Ad Hoc looking toward Signaling Ad Hoc output (e.g. the table of margins) for "Figure of Merit".
  - Influence of TP4-to-TP5 link segment and package should be considered in the methodology.

'Thru' Specification Methodology (1/2)

- Mellitz and company working with "pulse settling time" as a signaling-independent figure of merit.
  - Premise: ↑ settling time, ↑ equalizer complexity
  - Correlation between various frequency- and time-domain parameters studied.
  - Over 200 simulated and measured channels studied:
    - ↑ margin above SDD21 limit at 1GHz, ↓ settling time
    - ↑ excursion below SDD21 over 1 to 6GHz, ↑ settling time
    - ↑ pulse peak, ↓ settling time
    - ↑ 1st pre-cursor, ↑ settling time
  - No correlation to SDD11/SDD22 observed. This is likely the result of the influence of TP4 to TP5 and package.
  - No correlation to group delay observed.

'Thru' Specification Methodology (2/2)

- **Frequency-Domain**

  - Some correlation to frequency-domain parameters and settling time observed.

  - Relationship between settling time and link performance is unclear.

  - Influence of TP4 to TP5 link and package needs to be considered in the methodology and parameter bounds.

- **Time-Domain**

  - Both proposed time-domain methodologies consider the influence of imperfect terminations on channel response.

  - Challenges associated with accessing time-domain data:
    - Lower SNR with direct measurement.
    - Care must be taken when extrapolating frequency-domain data to DC prior to inverse-FFT.

Crosstalk Specification Methodology

- Frequency-Domain Methodology.

  - No time-domain alternative presented.

- Multi-Disturber Crosstalk Definition issues:

  - Power sum or voltage sum?

  - How many aggressors to sum (not fixed as in a cabling environment)?

- Plan of Record:

  - Define single-aggressor NEXT and FEXT curves to limit the correlated noise.

  - Define power-sum MDNEXT and MDFEXT specifications to limit the total noise.

  - Consider only "dominant" aggressors?

  - Attenuation-to-Crosstalk Ratio (ACR) still being considered.

Additional Issues Identified

- Definition of Receiver Return Loss:
    - Define Receiver Return Loss at TP5?
    - Define Receiver Return Loss at TP4, with appropriate allowances made for the TP4 to TP5 segment?
    - Force DC coupling, TP4 to TP5 segment irrelevant?
        - AC coupling to be done on-chip.

Summary

- Chicken-and-egg problem must be solved before any real progress can be made.

- Decision yet to be made on normative methodology.

  - Waiting for signaling ad hoc "table of margins" to properly judge merit of various approaches.

  - Do frequency-domain requirements remain in an informative capacity if not normative?

- Package and TP4 to TP5 exhibits strong influence.

  - How it is factored in will influence how receiver return loss is defined.

  - Best articulated in the proposed time-domain methodologies, but perhaps not completely.

- Perhaps this meeting will provide some catalysts…

Thank you!