Channel Model Ad Hoc Report

IEEE P802.3ap Task Force Meeting
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From January…

- Move that normative channel specification be defined in the time domain (applies to analysis and not necessarily measurement).

  PASSED (23/2/9)

- Direct the channel model ad hoc to include reference transmitter, receiver, terminations (package and IC), and TP4-TP5 segment in the normative channel specification.

  PASSED (25/1/10)

Meetings

- Teleconference: Thursday, February 10
  - Methodology to derive time-domain data.
- Teleconference: Wednesday, February 23
  - Identify time-domain parameters.
- Teleconference: Wednesday, March 2
  - Crosstalk.

Presentations

- Popescu, “Proposal to IEEE P802.3ap Channel Model Ad Hoc”.

  http://ieee802.org/3/ap/public/channel_adhoc/popescu_c1_0205.pdf
- D’Ambrosia, “Revisiting Channel Model Measurements”.

  http://ieee802.org/3/ap/public/channel_adhoc/dambrosia_c1_0205.pdf
- Moore, “Computing the effect of crosstalk using convolution”.

  http://ieee802.org/3/ap/public/channel_adhoc/moore_c1_0305.pdf
- Brunn, “Proposal for S-parameter extraction to DC”.

  http://ieee802.org/3/ap/public/channel_adhoc/brunn_c1_0305.pdf

Derivation of Time-Domain Data

Options

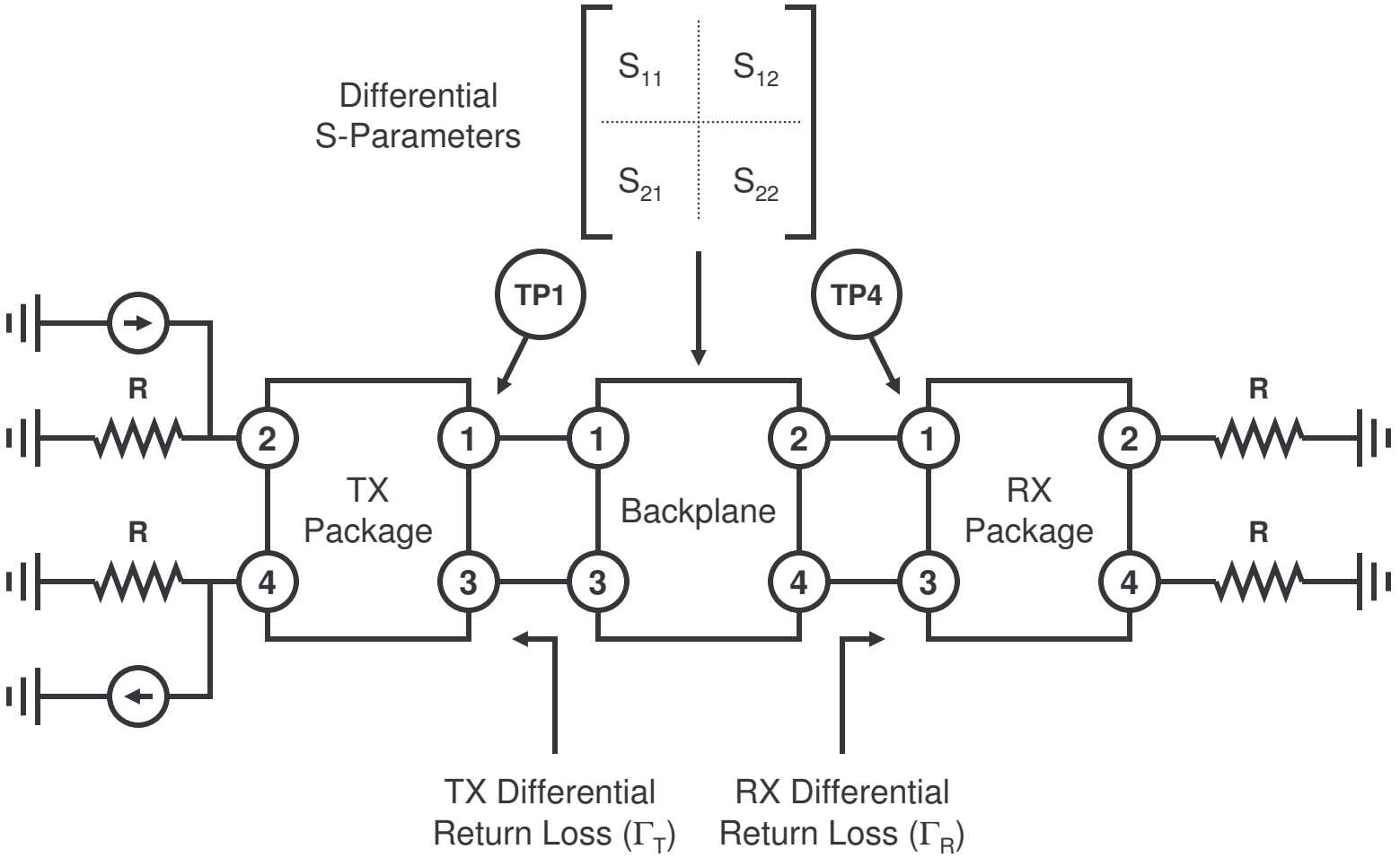
- Option #1 is to supply recommended practices on how to derive time-domain data.
- Option #2 is to leave such details out of the standard.
  - The user is free to choose their favorite tool set to acquire the backplane impulse/pulse response.
- Straw poll in favor option #1 (10:6).
  - “If it matters, then we should define it.”

Extrapolation

- Conversion of SDD21 vector to time domain requires extrapolation to DC.
  - May not be necessary if source data is from time-domain.
  - Proposal is to linearly extrapolate magnitude and unwrapped phase (best-fit line derived from first 10 measured points).
- Maximum measurement frequency of 15 GHz results in approximately 3 samples/baud at 10.3125 Gbaud.
  - To increase the sample rate, extrapolation to the desired Nyquist frequency is also required.
  - Zero-padding is the most convenient option (frequency content above 15 GHz probably does not have a strong influence in the time domain response).

Channel Specifications

Link Model


Differential
S-Parameters
S_{11}
S_{12}
S_{21}
S_{22}
TP1
TP4
R
R
R
R
2
1
1
2
1
2
4
3
3
4
3
4
TX
Package
Backplane
RX
Package
TX Differential
Return Loss (Γ_T)
RX Differential
Return Loss (Γ_R)

TX / RX Return Loss Considerations

- One approach may be the voltage transfer function referenced by Mellitz.

  http://ieee802.org/3/ap/public/channel_adhoc/mellitz_c1_0904.pdf

$$\frac{V_o}{V_i} = \frac{\frac{S_{21}}{2}(1+\Gamma_R)(1-\Gamma_T)}{1-S_{11}\Gamma_T - S_{22}\Gamma_R - S_{21}S_{12}\Gamma_T\Gamma_R + S_{11}S_{22}\Gamma_T\Gamma_R}$$

- This could apply equally to the informative frequency-domain methodology.
- Question: What to use for Γ_T and Γ_R?

“Thru” Specifications

- “Residual” ISI Penalty
  - The ISI Penalty following the application of an “ideal” fixed-complexity equalizer.
  - Equalizer definition somewhat dependent on 10GBASE-KR signaling decision.
  - Link budget to include margin for “implementation loss”.

Crosstalk

- Methodologies under consideration:
  - RMS sum of the peak values of the individual crosstalk aggressors.
  - Convolution of the amplitude distributions of individual aggressors. Amplitude distribution of the aggressors averaged over sample phase.
- Follow-up studies have been performed and results will be presented at this meeting.

Thank you!