Editor's Summary of Comments Against Clause 69, Annexes 69A and 69B

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Topic List

- Normative channel
- Receiver requirements
- Frequency range
- Budget closure
- Eliminate channel return loss requirements
- Delay budget

Normative Channel (#183, 133, 16, 214, *209*)

- Orthogonal to all but #210

Receiver Requirements (#210, *208*, *186*, *188*, *233*)

- Delete Annex 69A (#210)
  - Valid only if the channel completely specified and requirements are normative
  - Proposed text (clause 72 examples):
  - *The receiver shall operate with a BER of better than 10^{-12} when receiving a compliant transmit signal, as defined in 72.7.1, though a compliant backplane channel as defined in Annex 69B.*
- Add swept-sinusoid jitter tolerance (#260)?

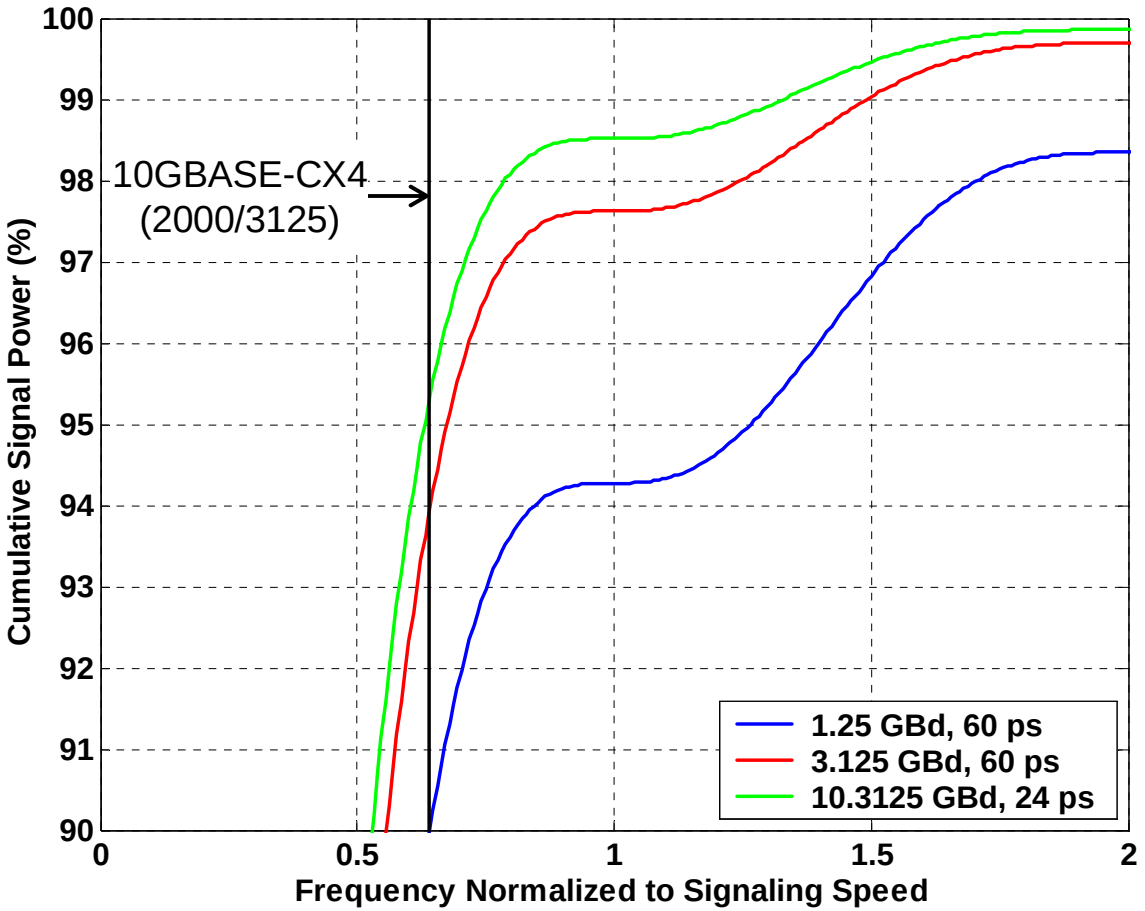
Comment #210 Considerations

- Pro's
  - Link closes by definition
  - Considers the entire channel space, rather than a singular corner case (worst-case) link
  - If accepted, #263, 63, 100, 232, 211, *216* overtaken by events
- Con's
  - Lack of well-defined test procedure yields inconsistent test methodologies and results

Frequency Range (#17, 18, 213)

- Channel parameters should be specified over a range of frequencies representing the occupied bandwidth of the PHY of interest
- The occupied bandwidth can be related to the signaling speed and the minimum transition time of the PHY.

Cumulative Signal Power vs. Frequency



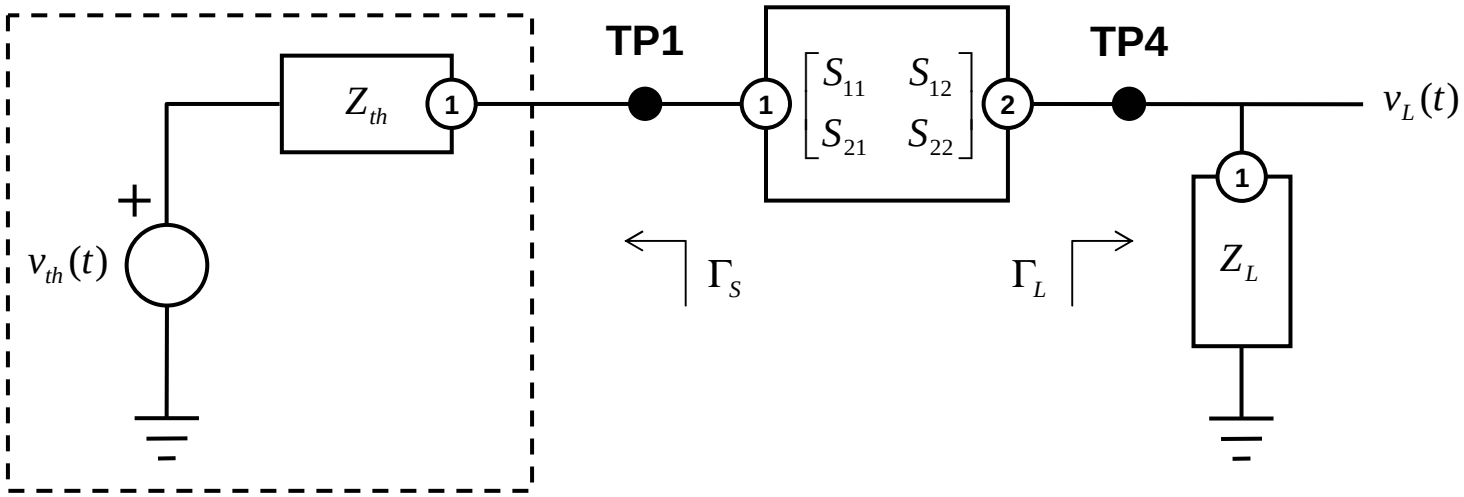
Budget Closure
(#15, 26, 20, 15, 221, 134, 215, 135, 101, *262*)

- Comment #15 recommends ICR_{min} incorporate worst-case penalties, “credits” defined for cases where detailed knowledge of the system configuration is available
- Migrate P_{ILD} to “residual ISI” penalty
  - http://ieee802.org/3/ap/public/sep06/baumer_01_0906.pdf
  - http://ieee802.org/3/ap/public/sep06/mellitz_01_0906.pdf
  - Both formulations look 10GBASE-KR specific; what about other PHYs?
- Constrain TP4 output waveform (#262) using TWDP-like methodology
  - http://ieee802.org/3/ap/public/sep06/ghiasi_01_0906.pdf

Eliminate channel return loss requirements (#26)

- Argues that residual ISI parameters contains necessary and sufficient information; return loss is requirement is overly constraining
- However, return loss interactions will influence residual ISI
  - http://ieee802.org/3/ap/public/channel_adhoc/mellitz_c1_0904.pdf

Voltage Transfer Function



Channel Insertion Loss = $-20\log_{10}(S_{21})$
Channel Return Loss = $-20\log_{10}(S_{11})$ and $-20\log_{10}(S_{22})$
Transmitter Return Loss = $-20\log_{10}(\Gamma_S)$
Receiver Return Loss = $-20\log_{10}(\Gamma_L)$

$$\frac{V_L(f)}{V_{th}(f)} = S_{21}\left(\frac{1}{2}\frac{(1+\Gamma_L)(1-\Gamma_S)}{1-\Gamma_S S_{11}-\Gamma_L S_{22}-\Gamma_S\Gamma_L\left(S_{12}S_{21}-S_{11}S_{22}\right)}\right)$$

Delay Budget (#166, *230*, *107*)

- 36.5.1 as referenced, includes the total delay from the GMII to the MDI (328 bit times)
  - The PMD must draw from this budget, not supplement it
- Comment #107 requests that the 1000BASE-KX PMD be allocated 512 bit times (to support multi-rate designs)
  - Would require complete decoupling from 36.5.1
- Comment #230 requests that the 10GBASE-KR PMD be allocated 1024 bit times

Other Delay Budget Topics

- Media delay assumed to be 8 ns for both 1000BASE-KX (8 bit times) and 10GBASE-KR (80 bit times)
  - Assuming a delay of 150 to 180 ps/in for a printed circuit board trace, the delay for a 1 m backplane would be approximately 6 to 7 ns
- Media delay is 20 bit times or 2 ns for 10GBASE-KX4
  - The delays should be identical
- The delay relevant to these tables should be the round trip delay
  - It would be more appropriate to state that the round-trip delay is assumed to be 16 bit times for 1000BASE-KX and 160 bit times for 10GBASE-KX4 and 10GBASE-KR.

Back-up

Cumulative Signal Power vs. Frequency