

Impact of length-scaling on worst-case NEXT for 30m channels

Contribution to IEEE 802.3: 40G-BASE-T Task Force Plenary Meeting
November 2013
Dallas, TX USA

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Overview

- Motivation
- Assumptions
- Analysis
- Results
- Conclusions

Motivation

- Cabling standards limit lines are usually worst-case over a range of channel lengths and topologies
 - Some topologies may be worse in one parameter (e.g., IL, and others worse in another)
- Conventional wisdom suggests NEXT and RL are better than worst-case in longer channels where IL is worse
- 40GBASE-T “long channels” are of lengths considered “short” for prior generations
- How does 30m worst-case NEXT compare with the cabling limit lines?

Assumptions

- Channel NEXT can be formed from component NEXT
- Worst-case components specifications can be used
- Cable attenuation between lumped components applies

Analysis(1)

- Therefore:
 - Topology dominates:
 - In channels of the same length, cable NEXT components will be equal
 - Position of the connectors will be the dominant factor
 - Worst case NEXT positions both connectors as close as possible to the victim (Near) end
- Worst case NEXT w/worst-case IL:
 - 30m channel: 0.5m – 24m – 5.5m

Analysis (2)

- NEXT is voltage sum of components: (TIA Cat 8, d0.9 Channel NEXT)
 - Others voltage sum connectors & power sum in cable contribution
- 1st connector attenuated by 1m* flex cord IL
- 2nd connector attenuated by 1m* flex cord IL + 48m* cable IL + 2 connector IL
- Cable NEXT of length L is included as function of cable insertion loss (IL(L))
 - Some models voltage sum segments separately
 - $NEXT_cable(L) = \min(75,$

$$45.3 - 15 \log_{10}(f/100) - 10 \log_{10}(1 - \exp(-0.46 * IL))$$

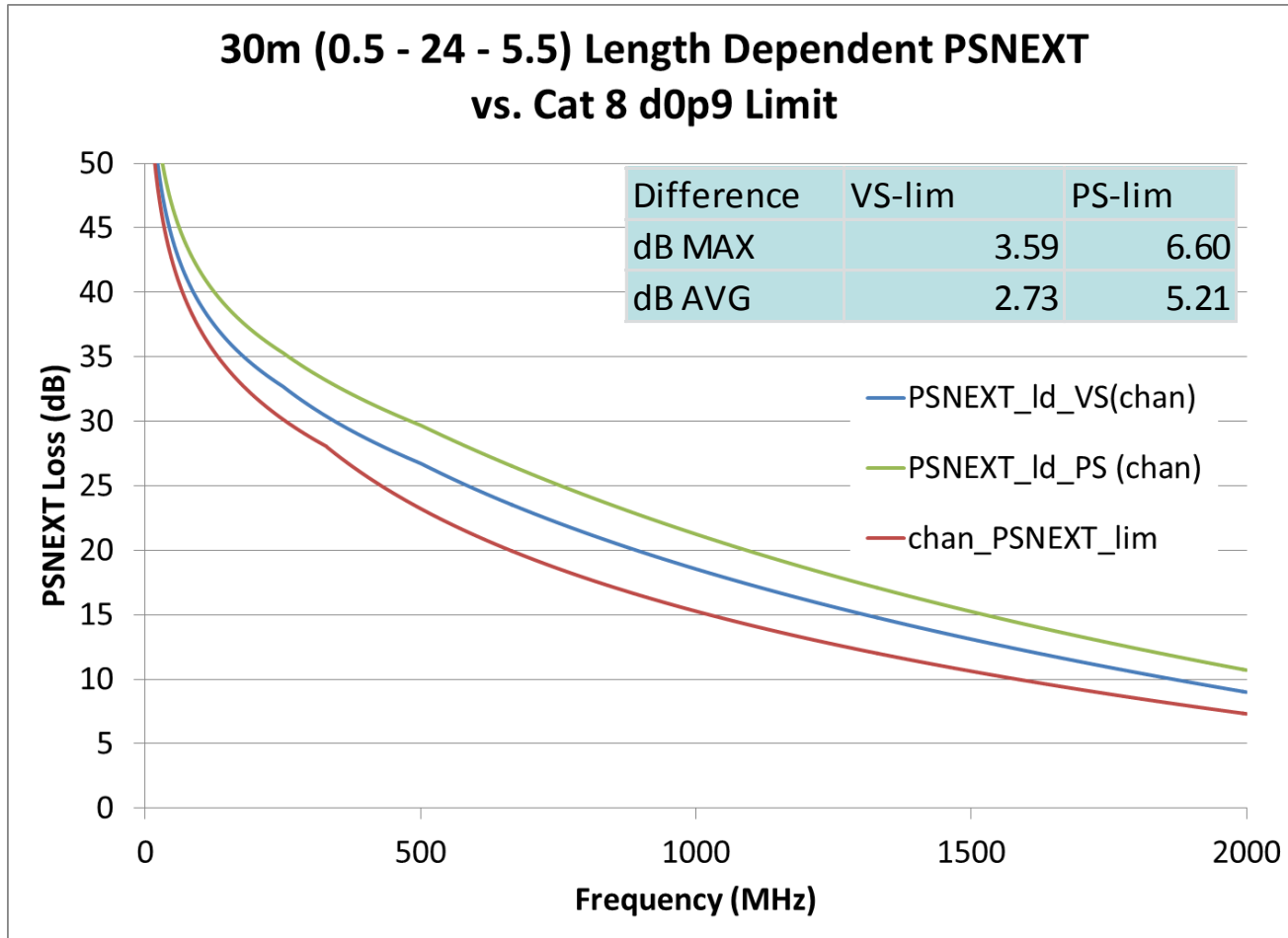
$$NEXT_ch_VS = -20 * \log_{10} [10^{(-0.05 * (NEXT_conn + 2 * IL_flex_1))} + 10^{(-0.05 * (NEXT_conn + 2 * (IL_flex_1 + IL_perm + IL_conn)))} + 10^{(-0.05 * NEXT_cable(L))}]$$

*IL lengths are round trip

Results

- Length dependent NEXT compares with previous work in TIA from H. Koeman during Cat6a development
- Using Equations from TIA Cat8 draft going into October meeting, worst-case length-dependent NEXT was evaluated relative to full channels

Results (2)



dB flat sum power		
PSNEXT_VS	PSNEXT_PS	PSNEXT_lim
17.76	15.72	20.08

Conclusions

- NEXT limit lines can be adjusted for length of channel
- Recommend not adjusting limit lines for length unless NEXT is limiting Parameter
 - Using length-dependent NEXT in worst-case topologies is not substantially different from using worst-case limit line NEXT
 - Peak total power differences of < 4.4 dB

BACKUP

Similar Analysis for RL

- Connectors voltage summed, cabling power summed
- Worst case connector RLs attenuated by IL
- Flat PSD total power differs by 2.7 dB

