Link segment requirements for 2.5Gbps operation

Gerrit W. den Besten
NXP Semiconductors
Bangkok, Nov 13-14, 2018

Supporters

- Christoph Wechsler (Audi)
- Olaf Grau (Bosch)

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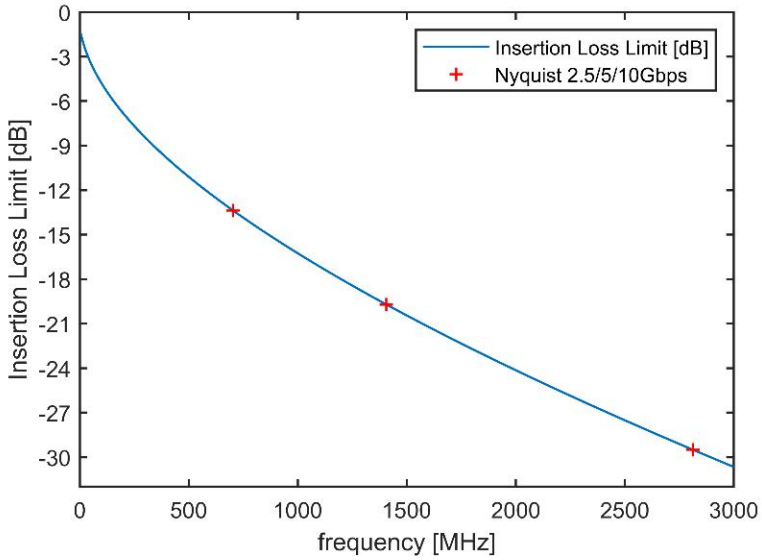
Rationale

- A link operating at 2.5Gbps uses 4x less bandwidth
  - Nyquist frequency around 700MHz
- Nyquist insertion loss with current IL formula 13.4dB
- Note: this formula was set for 10Gbps capable high-quality shielded twisted-pair with braid



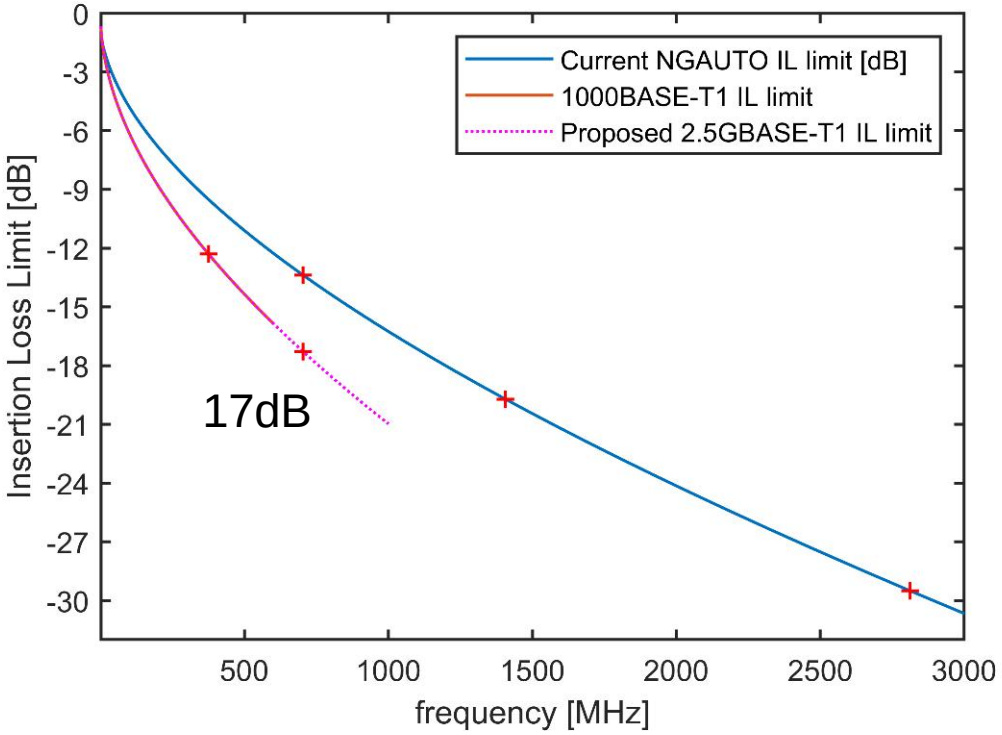
- At 2.5Gbps losses may be higher and shielding could be less ‘perfect’ = lower relative cost
- What if cables for 2.5Gbps could be an ‘enhanced 1Gbps cable’ instead of a downscaled 10Gbps cable?
- There will be 2.5Gbps transceivers that cannot do 10Gbps

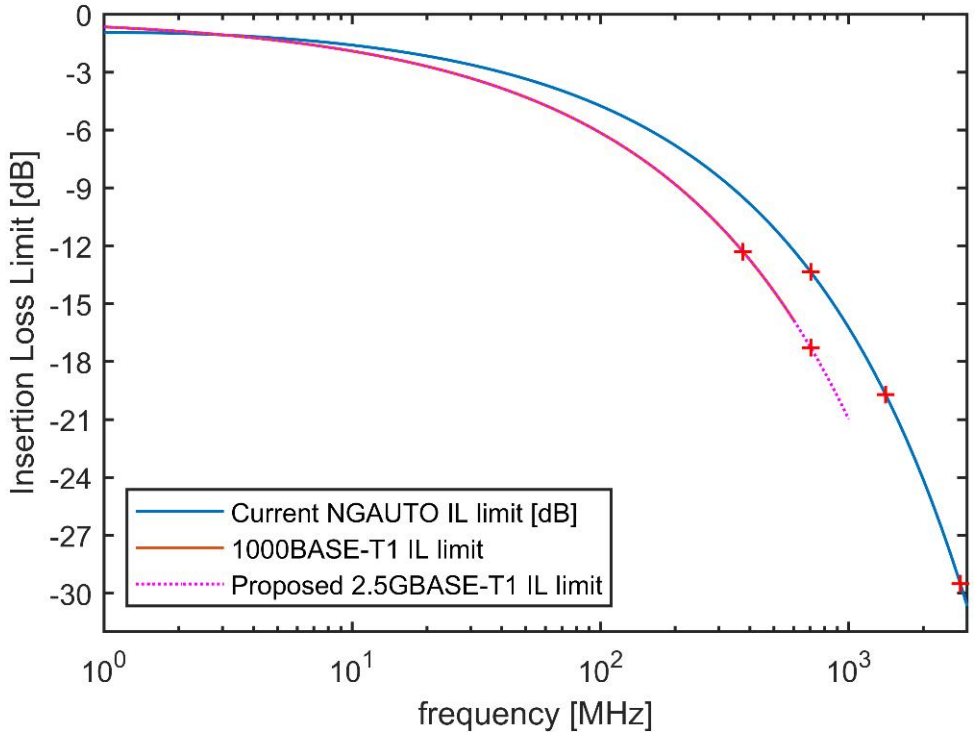
UTP versus STP

- Emission challenges for 1000BASE-T1 over UTP results into use of 1000BASE-T1 shielded link segment
- Feasibility to meet emission limits with 2.5Gbps (1.4GBd) over UTP is unclear
- Extremely well-balanced UTP cables become comparable in cost to STP, and ‘installation’ impacts performance
- However 2.5Gbps operation doesn’t require a better IL limit than the 1000BASE-T1 spec limit line
- Don’t want to require AWG24 for 15m at 2.5Gbps
- STP with extended 1Gbps spec limits seems right way to go

Insertion loss

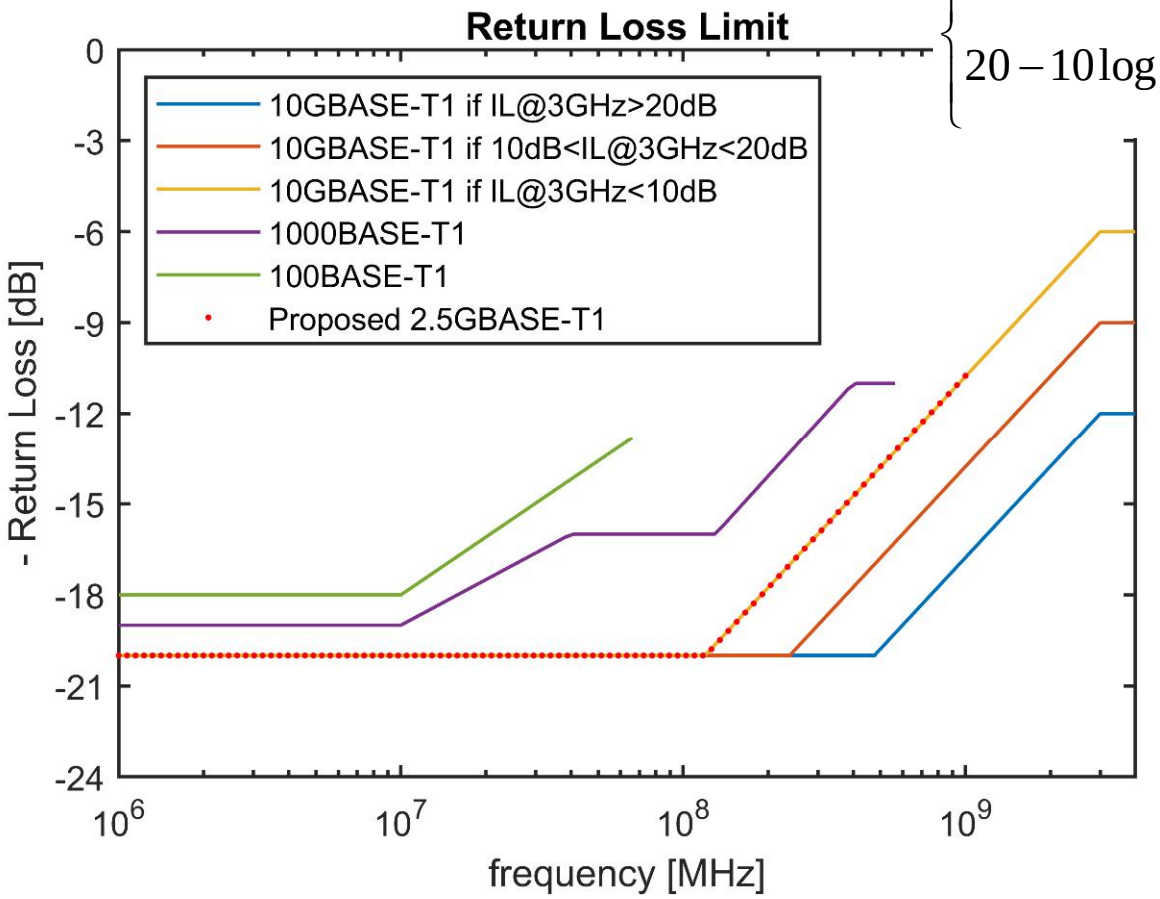
- 1000BASE-T1 IL limit: $IL < 0.0023 \cdot f + 0.5907 \cdot \sqrt{f} + \frac{0.0639}{\sqrt{f}}$
- Baseline proposal: extended curve for 2.5Gbps
- Freq=1-1000MHz



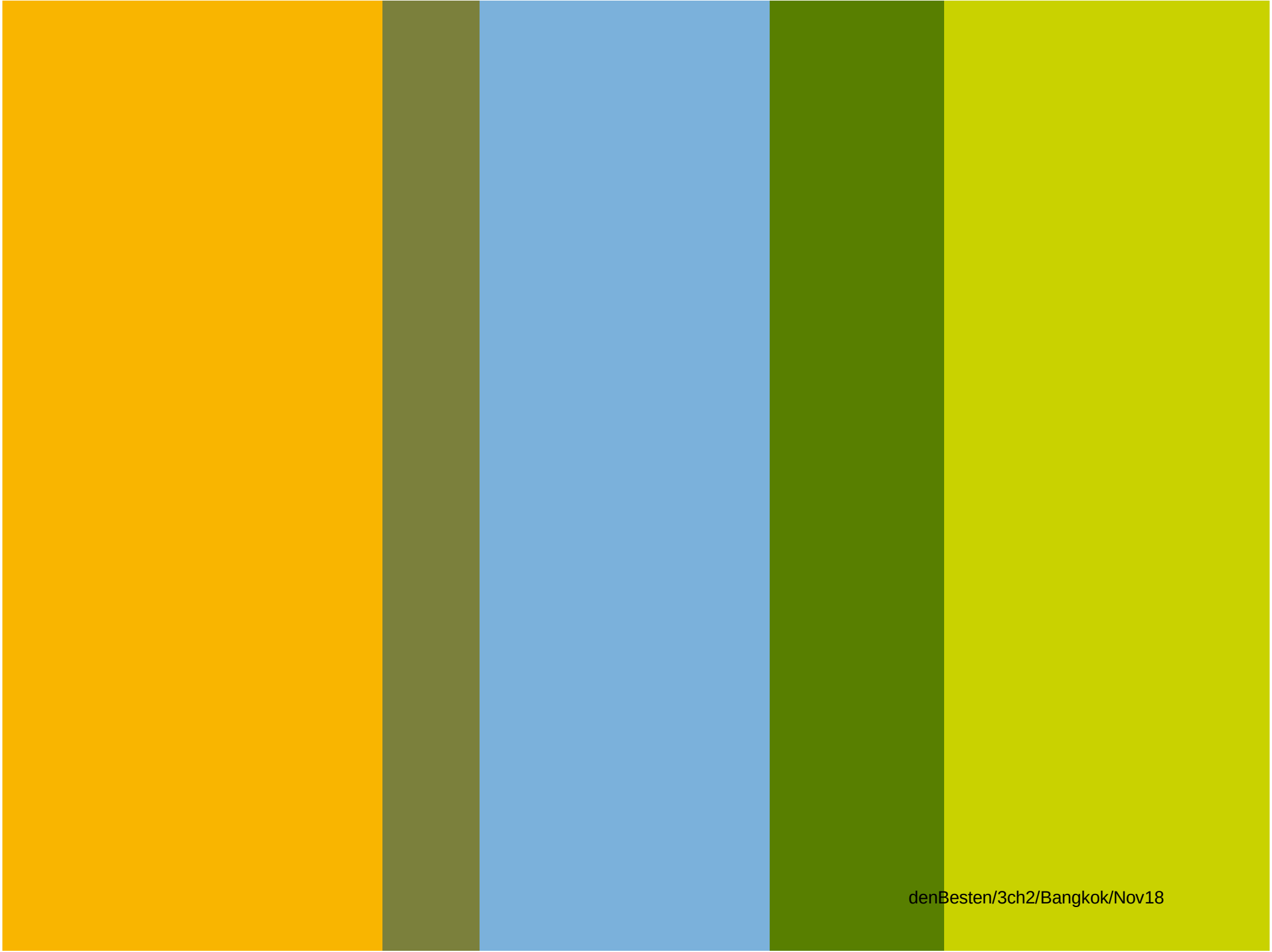


Return Loss

$$\begin{cases} 20dB & f = 1-120MHz \\ 20-10\log\left(\frac{f}{120}\right)dB & f = 120-1000MHz \end{cases}$$



- 10dB/dec roll-up for 2.5Gbps ~2x higher than for 1Gbps
- Freq=1-1000MHz
- Results in limit line coinciding with 10Gbps RL limit for IL<10dB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