RTPGE
Return Loss Proposal for 1-Pair Ethernet

CommScope

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Channel Ad Hoc Meeting

connect+evolve

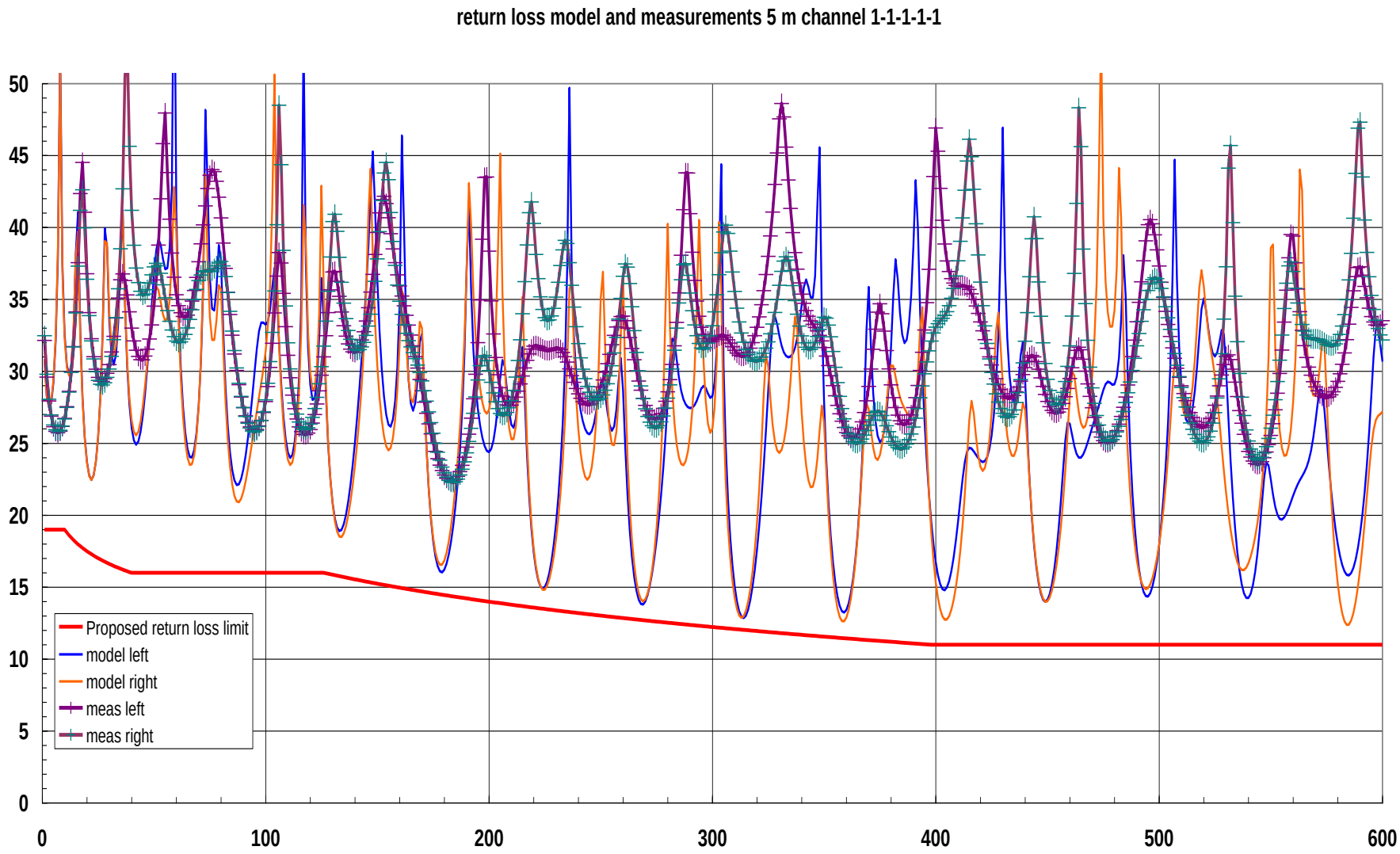
Proposed Return Loss Limit

Frequency range	Requirement
1-10 MHz	19 dB
10-40 MHz	24-5log(f) dB
40-130 MHz	16 dB
130-400 MHz	37-10log(f) dB
400-600 MHz	11 dB

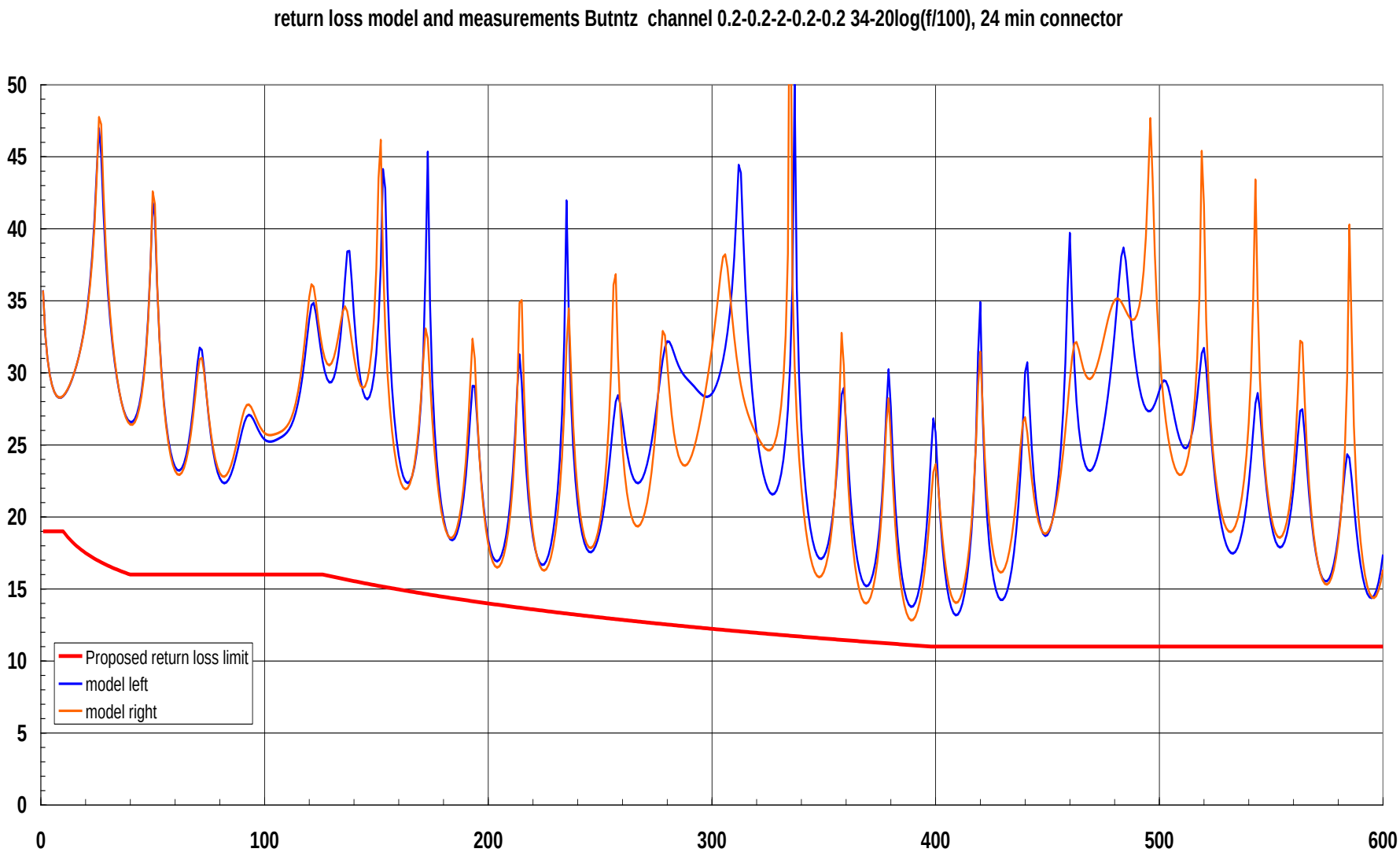
Research

- A cascaded S-parameter model was constructed based on a 5 m channel constructed with four connectors, each cable segment being 1 m.
- This was selected as a reasonable worst case model based on synthesized cable and connectors.
- Return loss measurements were made on a physical channel.
- The return loss of this channel model was graphed along with the measured data.
- Additionally, another model was made of a 4-connector channel per Buntz, topology 0.2-0.2-2-0.2-0.2.
- This model was also plotted against the proposed specification.

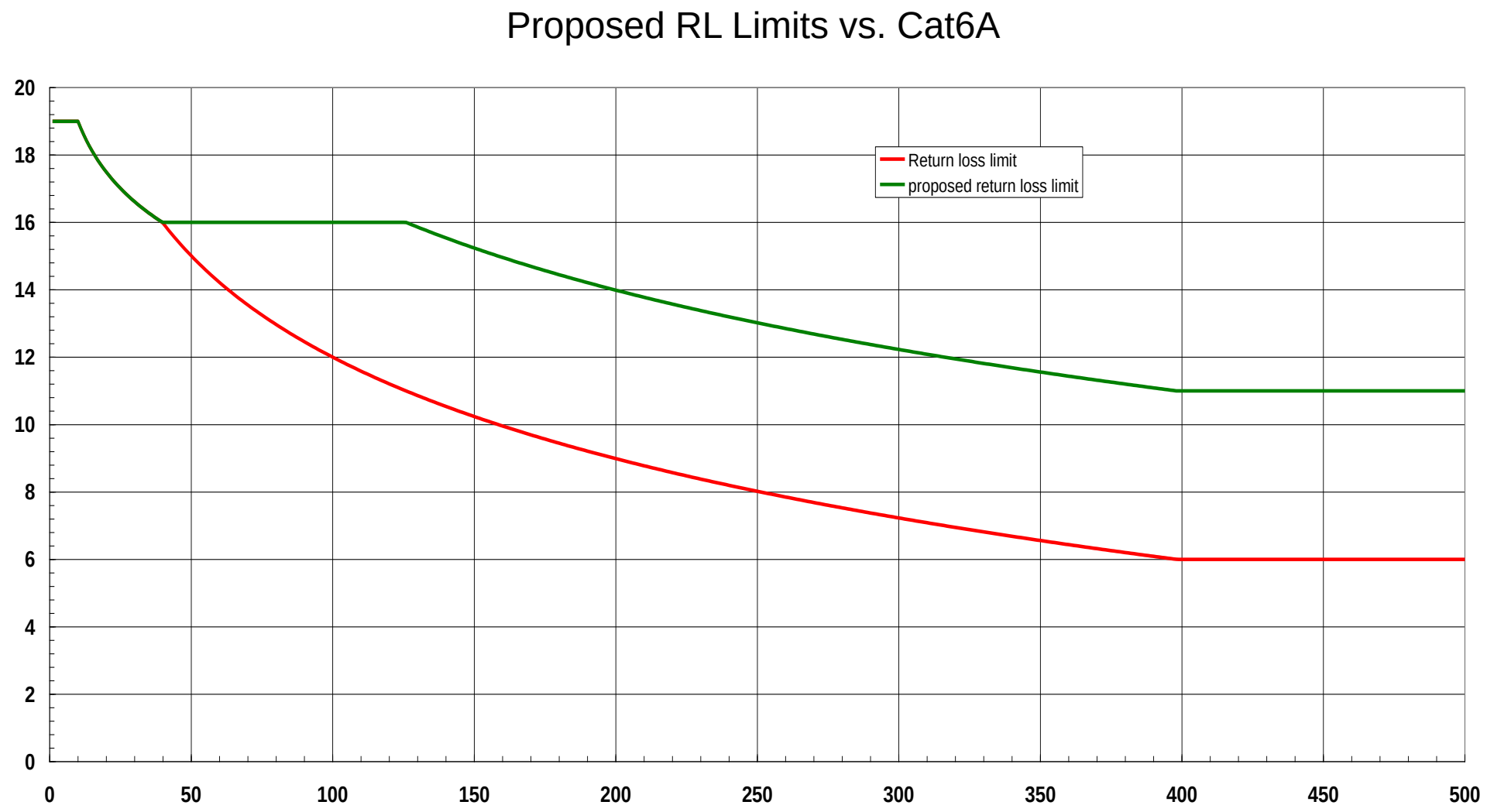
5m Channel Results



2.8m Channel Modeling Results



Cat6A Return Loss Reference



Details of Modeling

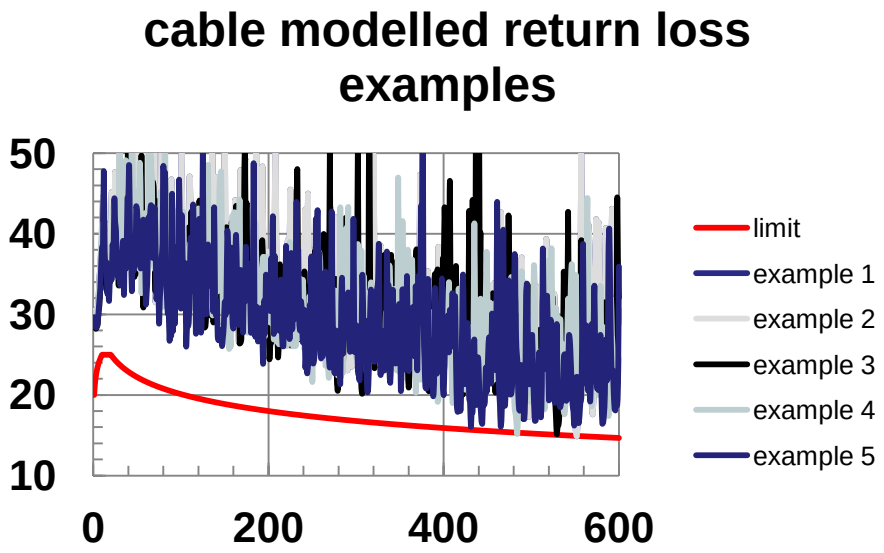
- Connector return loss requirement assumed 34-20log(f/100), min 24
- Cable assumed to comply with TIA cat 6A cable return loss requirement, extrapolated to 600 MHz, and length scaled to the appropriate length of the channel segment.
- Full differential 2x2 s-parameter matrix synthesized for each channel element (connector or cable segment).
- The channel s-parameters were modeled based on a cascade of the channel elements.

Details of Modeling

- The cable return loss requirement was taken from TIA category 6A:

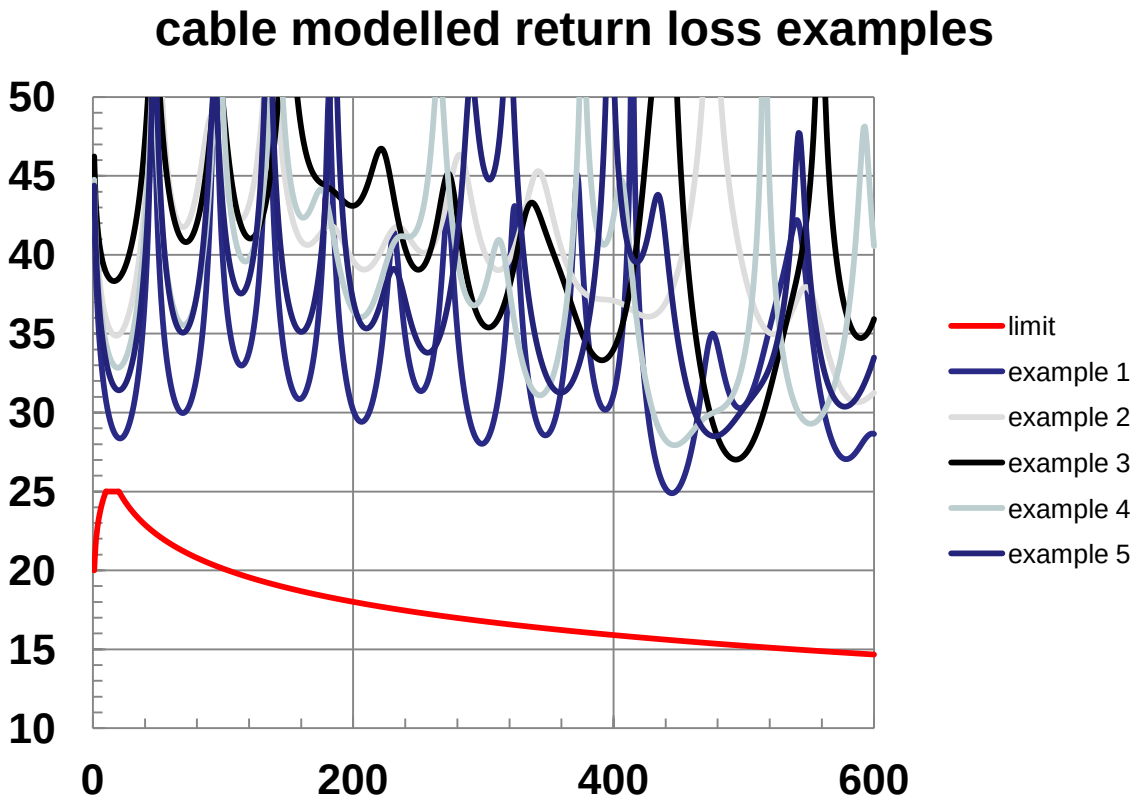
requirement	Frequency range
20+5log(f)	1-10 MHz
25	10-20 MHz
25-7log(f/20)	20 MHz and up

- The last equation was extrapolated from 500 to 600 MHz.
- To model cable return loss, random characteristic impedances and reflection factors for short segments are chosen, assembled, and scaled. 5 results are shown at the right.



Details of Modeling

- From this, the part of the cable comprising the needed length is selected. Examples of 1 m selected length cable return loss are shown below.



Conclusions

- The limit proposed limits are based on the channel topologies provided.
  - Supported by theoretical modeling.
    - 1-1-1-1-1 channel topology
    - 0.2-0.2-2-0.2-0.2 channel topology
  - Supported by measurements.
    - 1-1-1-1-1 channel topology
- The concerns voiced in the York Interm Meeting have been reviewed and accounted for with the short channel configurations.
- The specification should be tighter than Cat6A for the RTPGE cable and connector construction.
- The proposed Return Loss specification should be adapted for baseline proposal.

Thank You