

IEEE 802.3CY – BEYOND 10G ELECTRICAL AUTOMOTIVE ETHERNET PHY TF

Return Loss Limit Proposal

Emilio Cuesta, Eric DiBiaso, and Thomas Müller

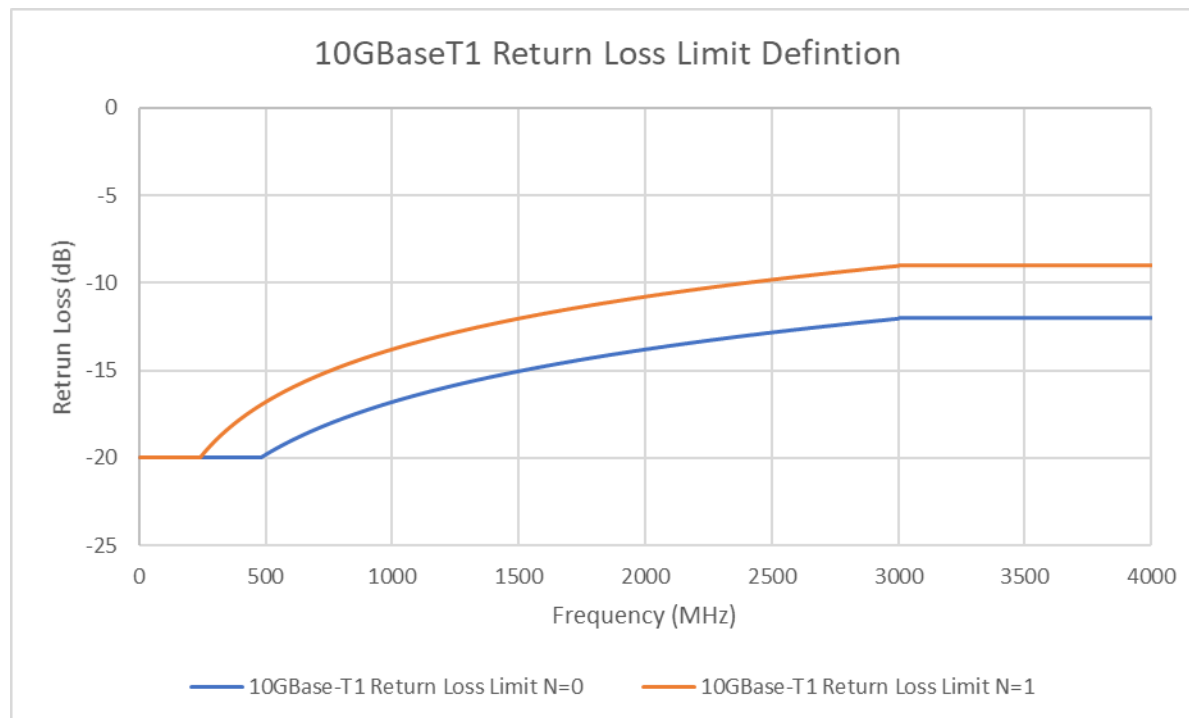
June 22, 2021

Purpose of the Analysis

- Review 802.3ch return loss limits
- Review data measured to set a proposed return loss limit for 802.3cy

802.3ch 10GBase-T1 Return Loss Limit

$$10G \text{ Return Loss} \geq \begin{cases} 20 & ; 1 \leq f < \frac{480}{2^N} \\ 20 - 10 \log_{10} \left(\frac{2^N * f}{480} \right) & ; \frac{480}{2^N} \leq f < 3000 \\ 12 - 3N & ; 3000 \leq f \leq 4000 \end{cases} \quad N = \begin{cases} 0 & ; 15dB < IL(3GHz) \\ 1 & ; IL(3GHz) \leq 15dB \end{cases}$$

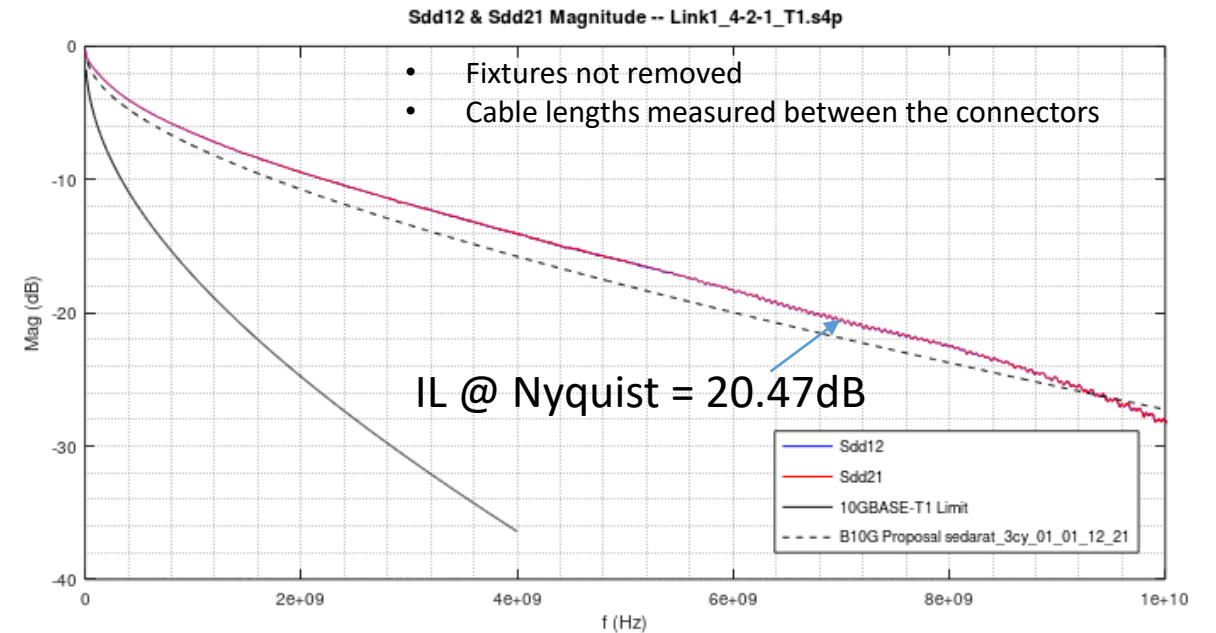
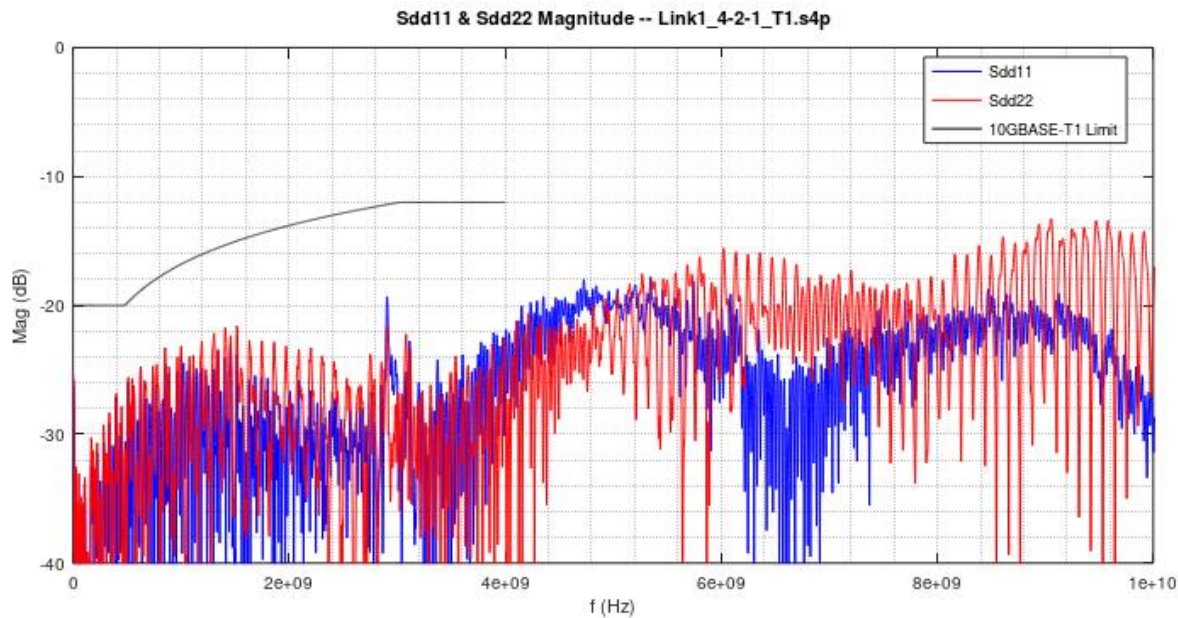
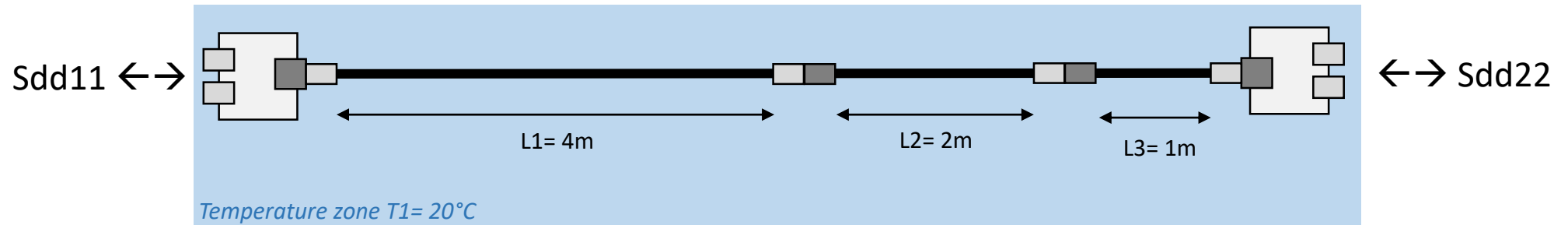


Note:

The N condition is open for consideration in 802.3cy

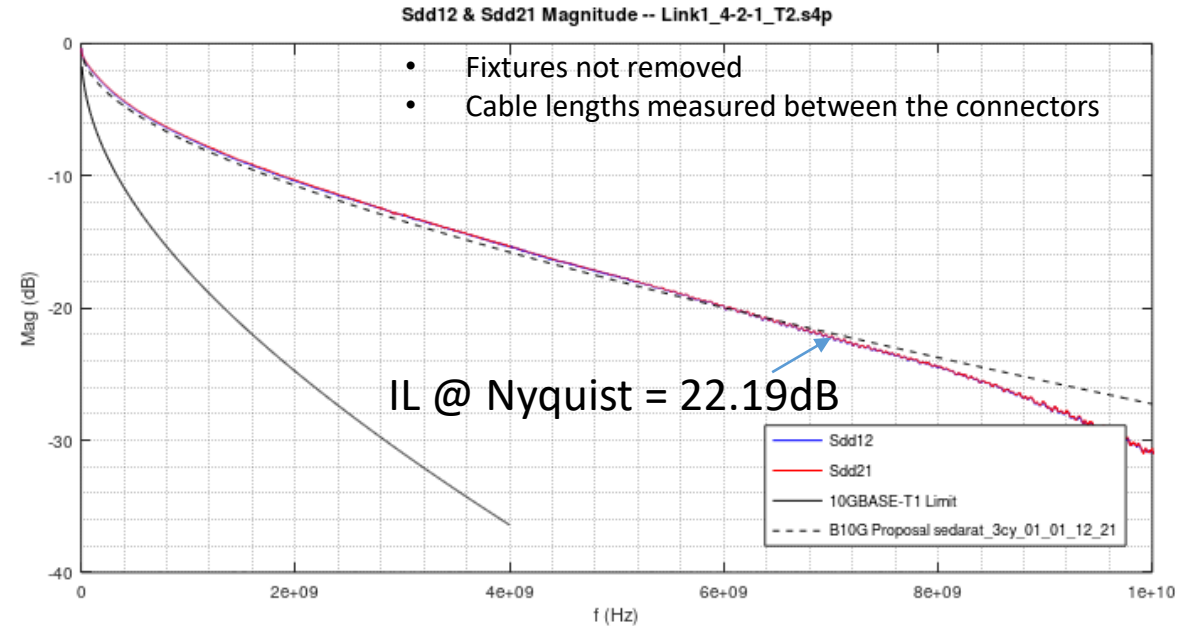
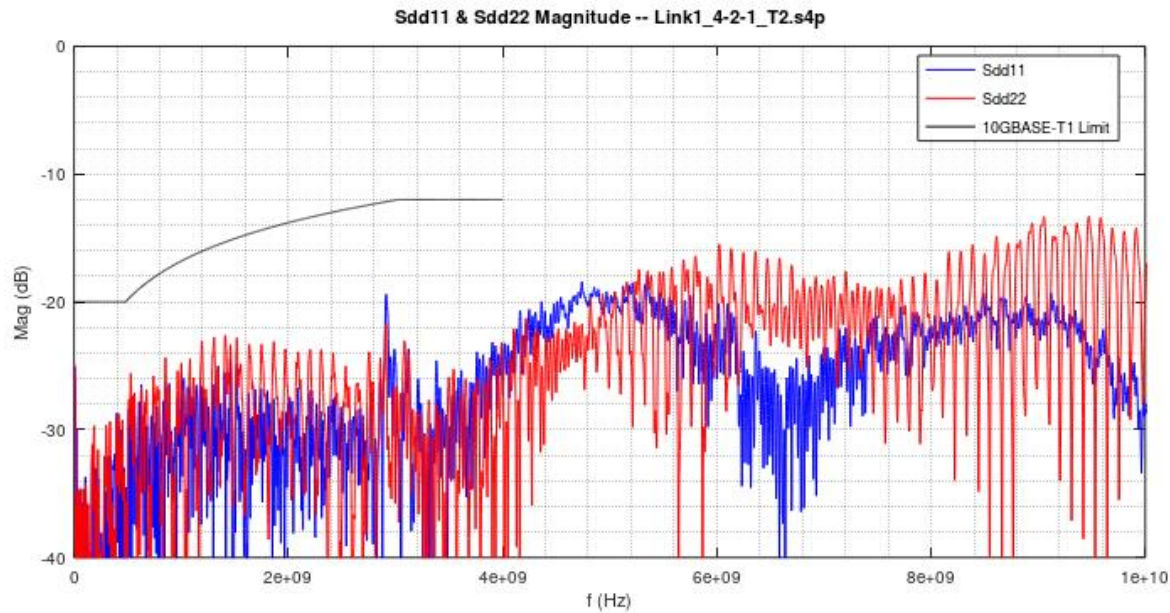
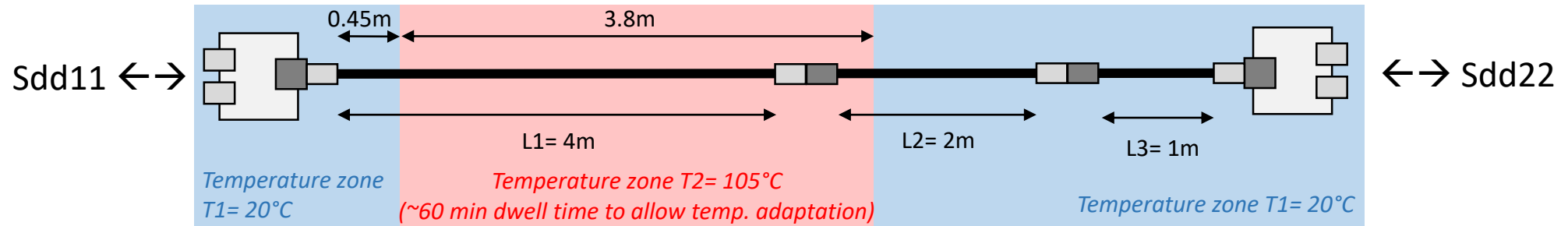
Moving forward in this presentation, the proposals presented are the strictest return loss limit if the N condition is required.

Link Segment with Inliner – Link 1 (4-2-1) @ T1=20°C



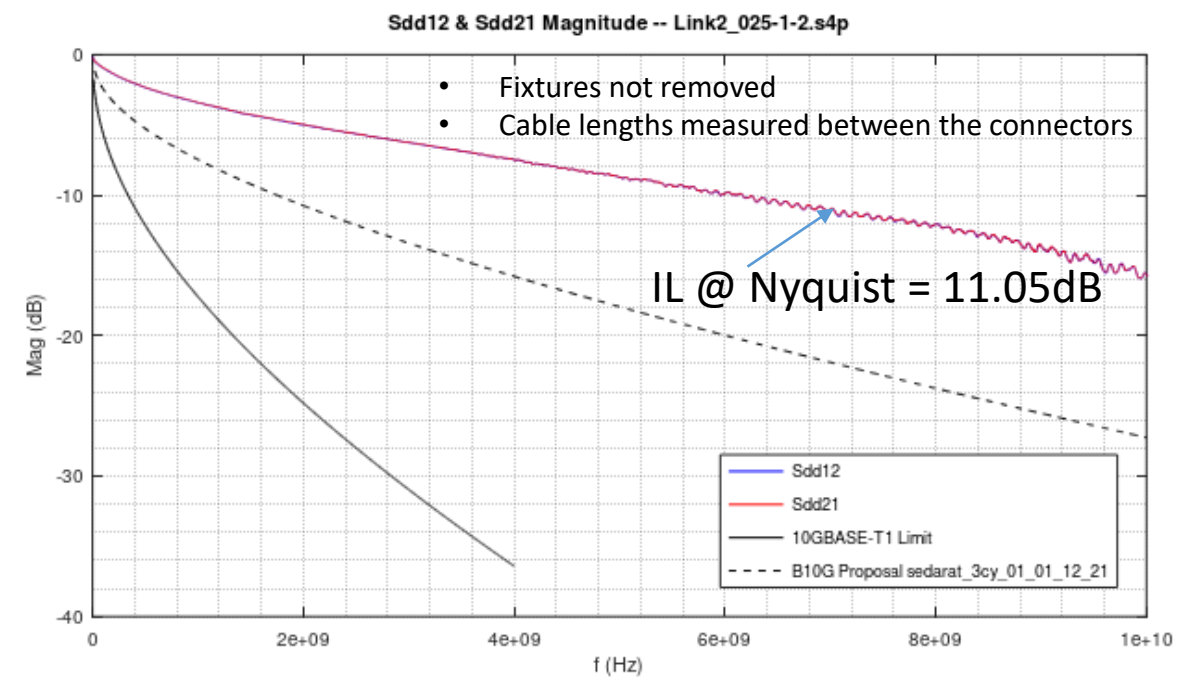
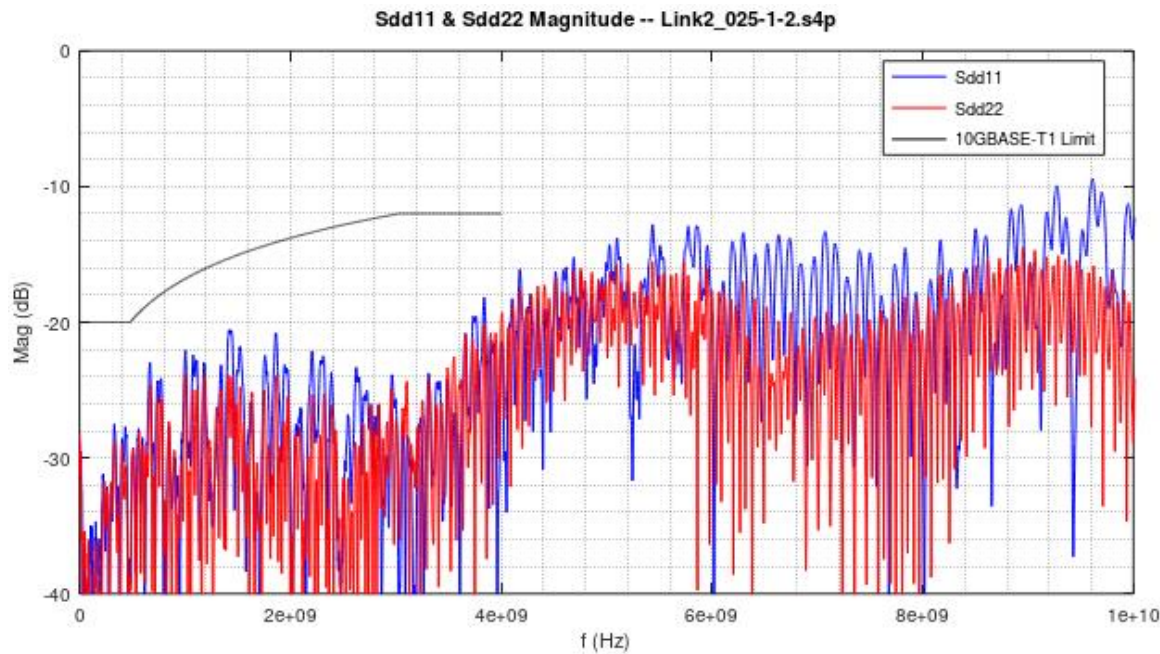
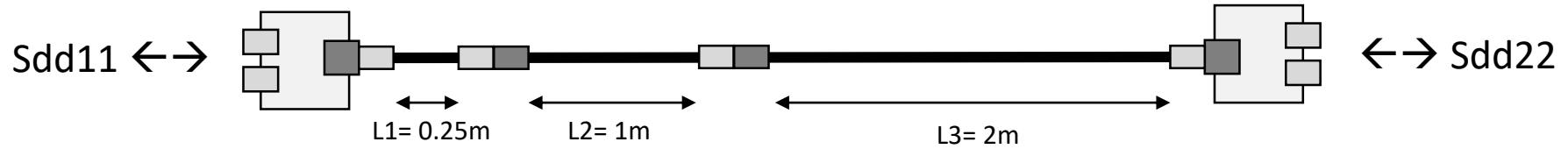
Referencing: https://www.ieee802.org/3/cy/public/adhoc/BergnerCuestaDiBiaso_3cy_01a_01_19_21.pdf

Link Segment with Inliner – Link 1 (4-2-1) @ T2=105°C



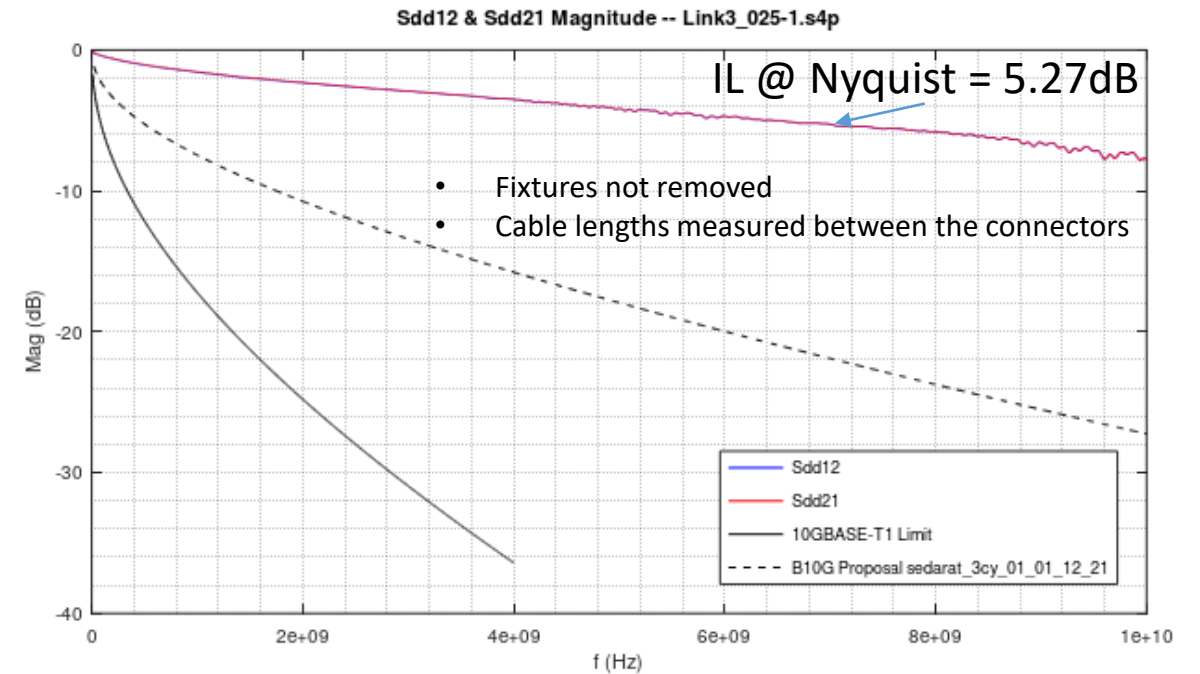
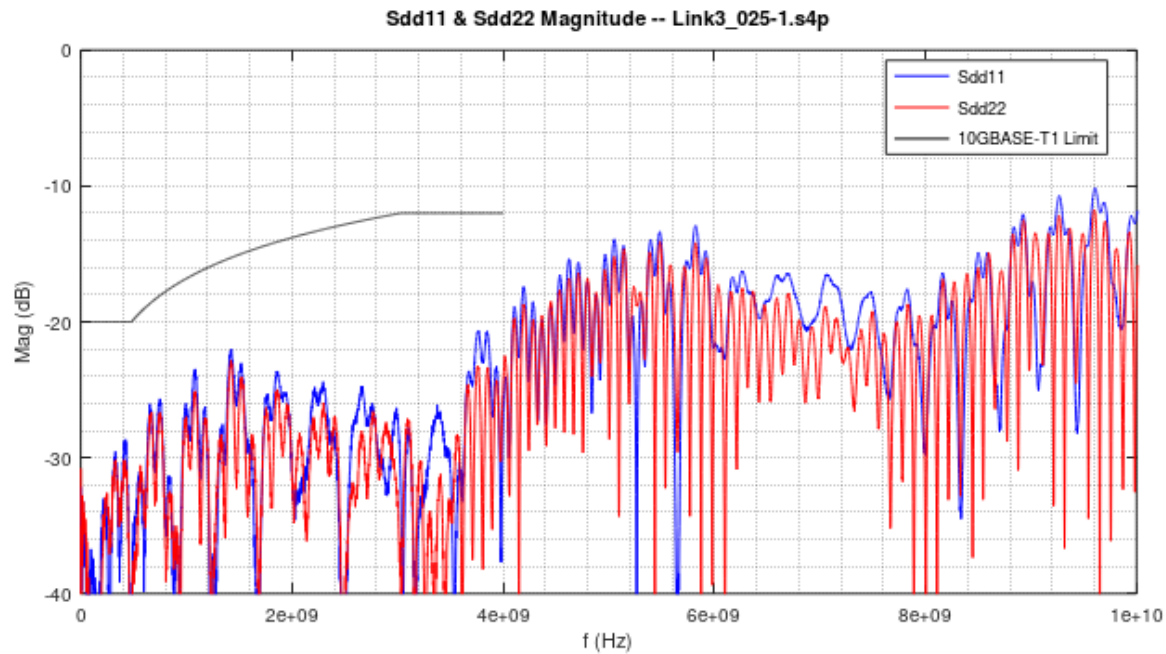
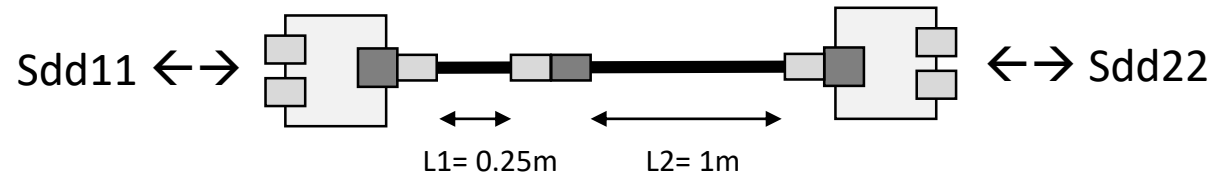
Referencing: https://www.ieee802.org/3/cy/public/adhoc/BergnerCuestaDiBiaso_3cy_01a_01_19_21.pdf

Link Segment with Inliner – Link 2 (0.25-1-2) @ T=20 °C



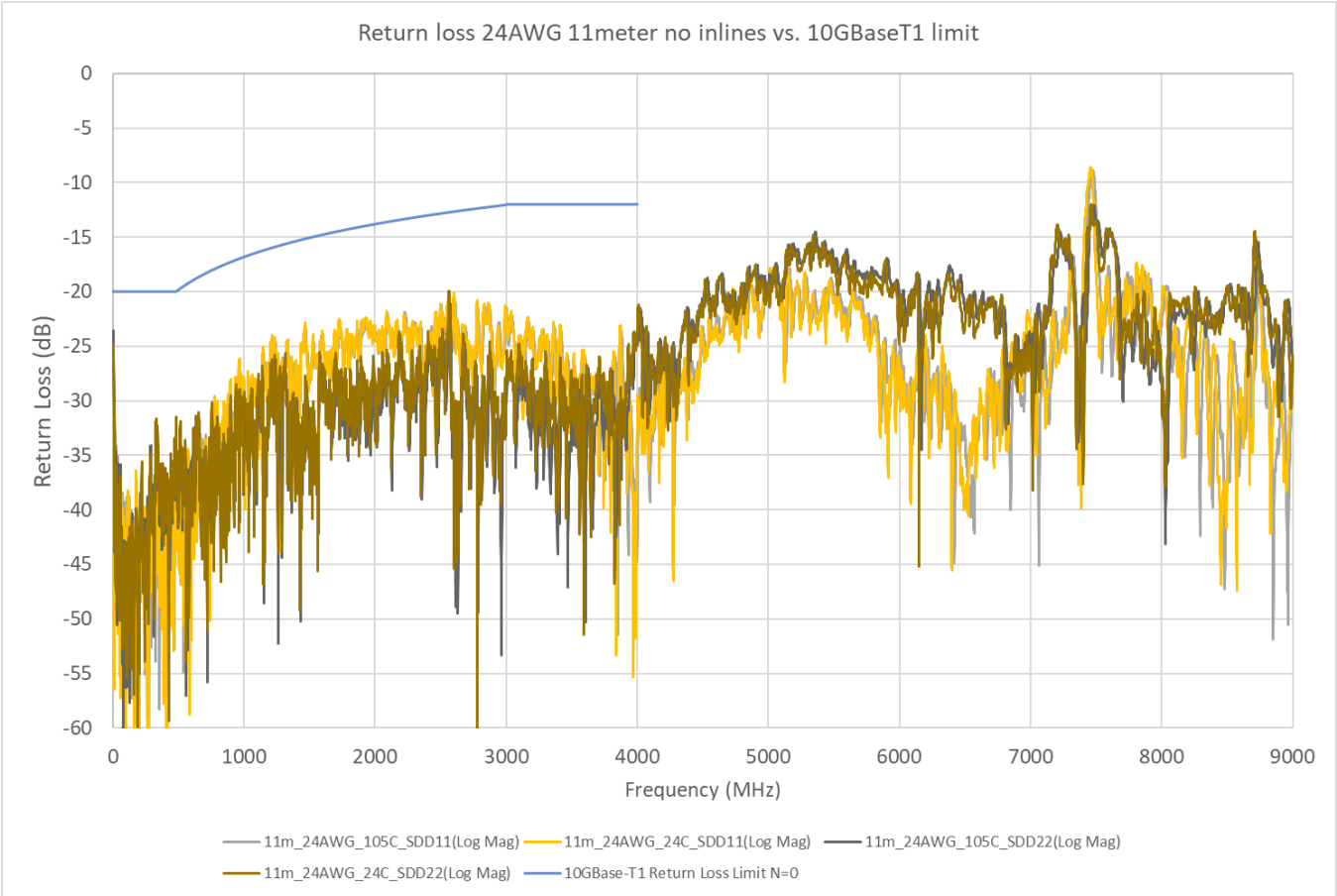
Referencing: https://www.ieee802.org/3/cy/public/adhoc/BergnerCuestaDiBiaso_3cy_01a_01_19_21.pdf

Link Segment with Inliner – Link 3 (0.25-1) @ T=20 °C



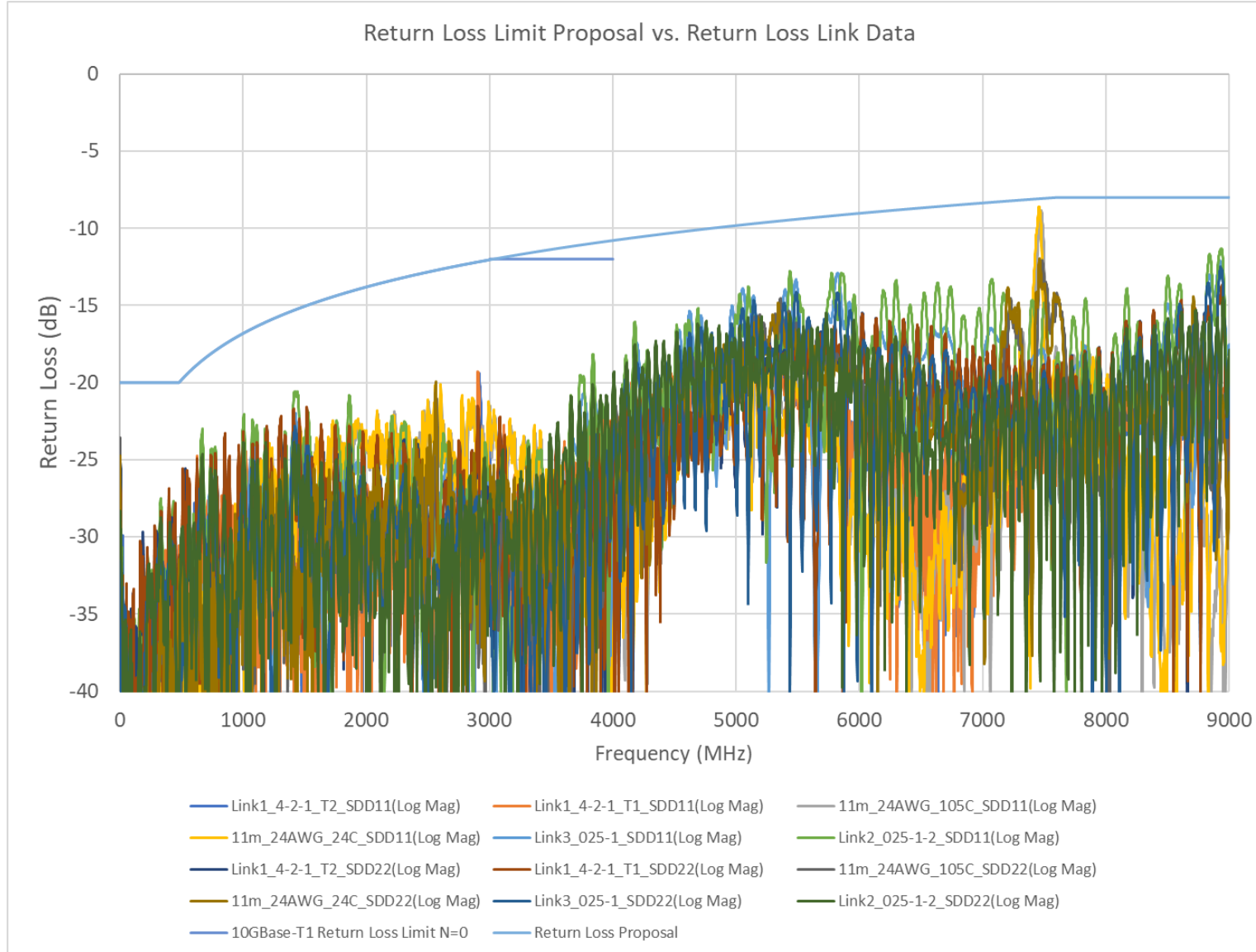
Referencing: https://www.ieee802.org/3/cy/public/adhoc/BergnerCuestaDiBiaso_3cy_01a_01_19_21.pdf

Link Segment with No Inliner – 24AWG 11m



- Fixtures not removed
- SDD11 and SDD22 shown in plot
- Resonance at 7.5GHz caused by cable construction

Return Loss Complete Measured Link Data



Data Includes:

Link1 @ 24°C and 105°C , Link2, and Link3 ;

SDD11 and SDD22 included

https://www.ieee802.org/3/cy/public/adhoc/BergnerCuestaDiBiaso_3cy_01a_01_19_21.pdf

11m 24AWG @ 24°C and 105°C

SDD11 and SDD22 included

https://www.ieee802.org/3/cy/public/adhoc/DiBiasoCuesta_3cy_01_06_01_21.pdf

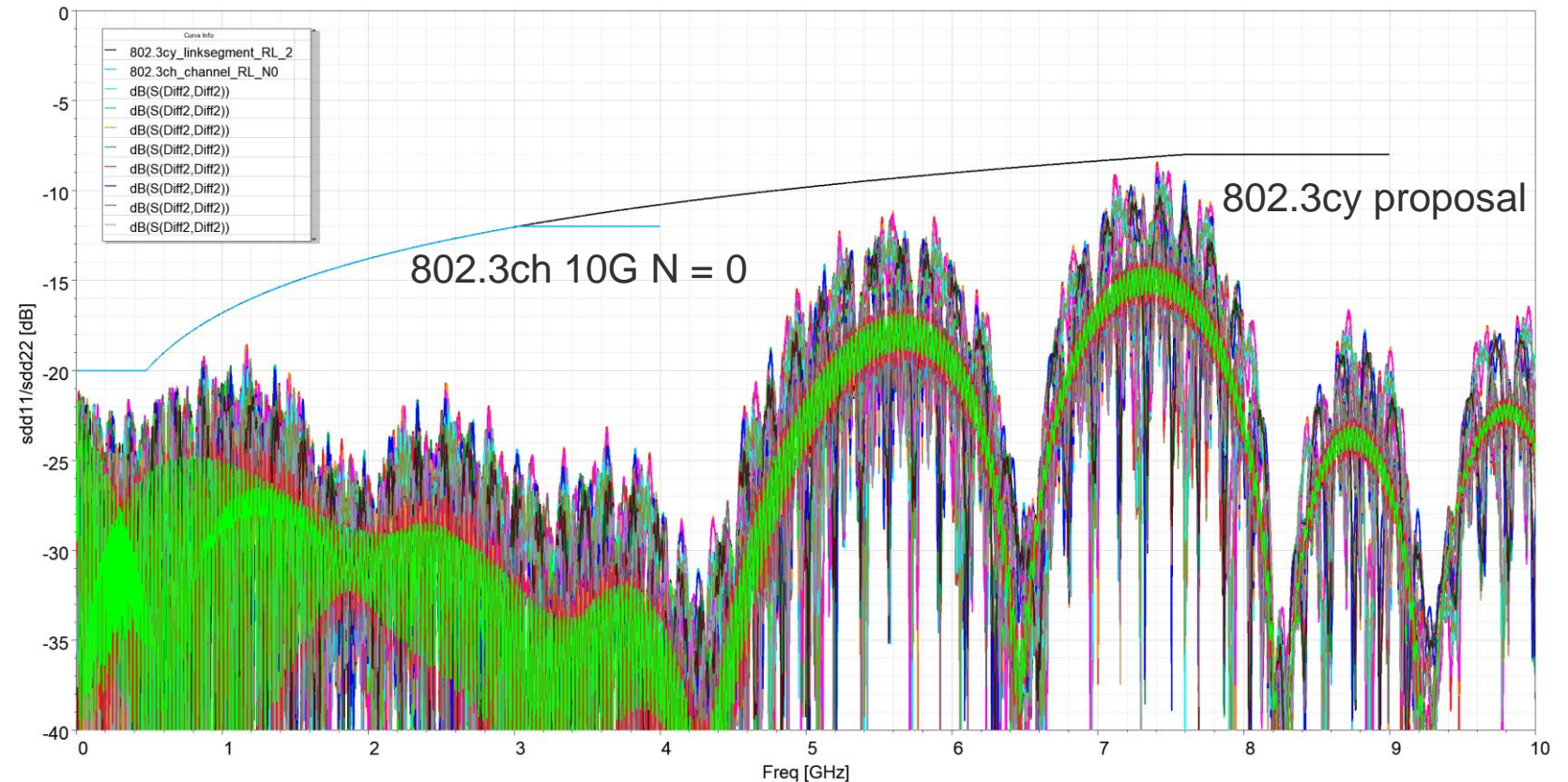
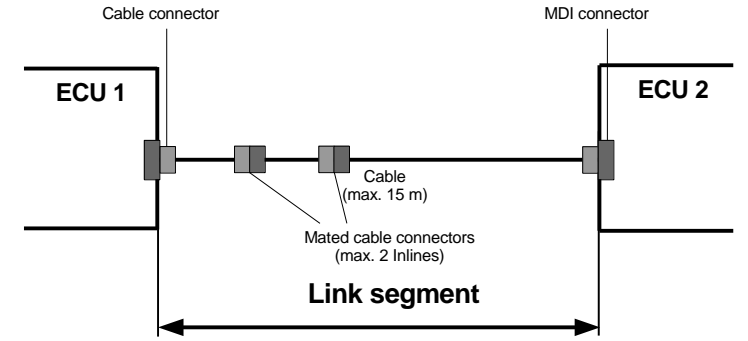
802.3cy link segment return loss

June 22th 2021

802.3cy link segment insertion loss

Analysis results

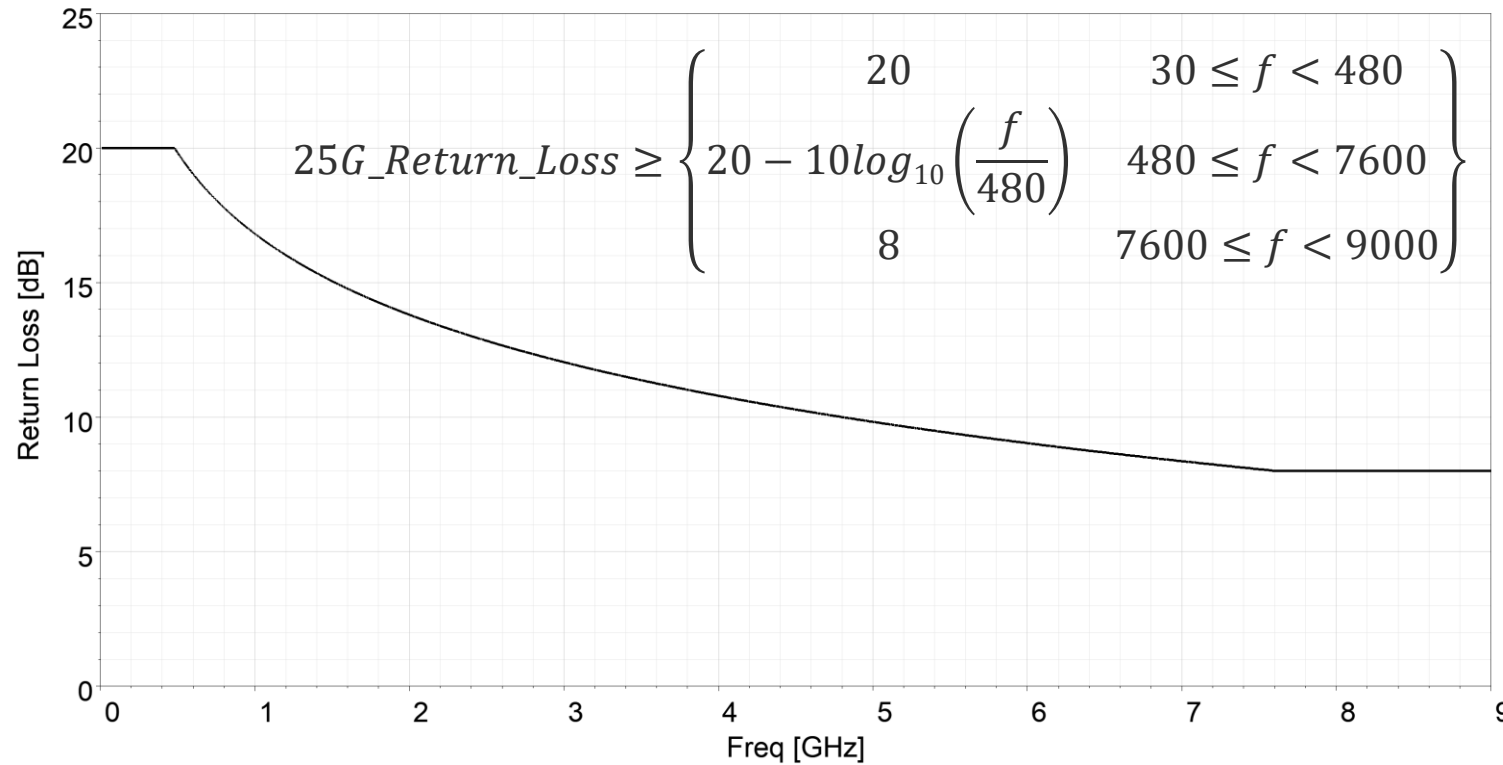
- Link segment transmission line model with 2 inline connections and variable cable assembly lengths
- Connector RL profile matches measured and data sheet values
- Worst case RL topology assumed to be 0.25 m + 1 m + 2 m
- 802.3ch link segment RL 10GBASE-T1 N=0 as reference



802.3cy link segment return loss

Link segment return loss proposal

- Extend existing 802.3ch return loss curve up to 7.6 GHz, flattening out at 8 dB.



Conclusion / Discussions

- Return loss limit proposals provided are acceptable when considering short and long cable assemblies with up to 2 connectors included up to 11 meters.
- How can micro-reflections be included to further refine return loss limit proposed?