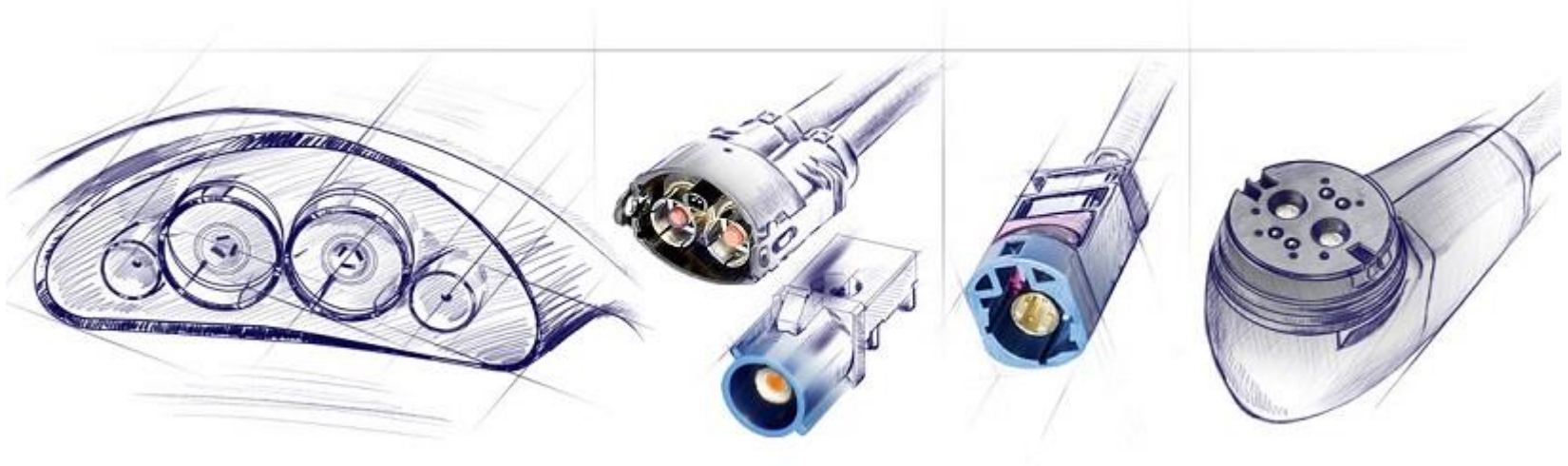
Automotive STP and SDP cable measurement results

Thomas Müller (Rosenberger)



802.3cy cable

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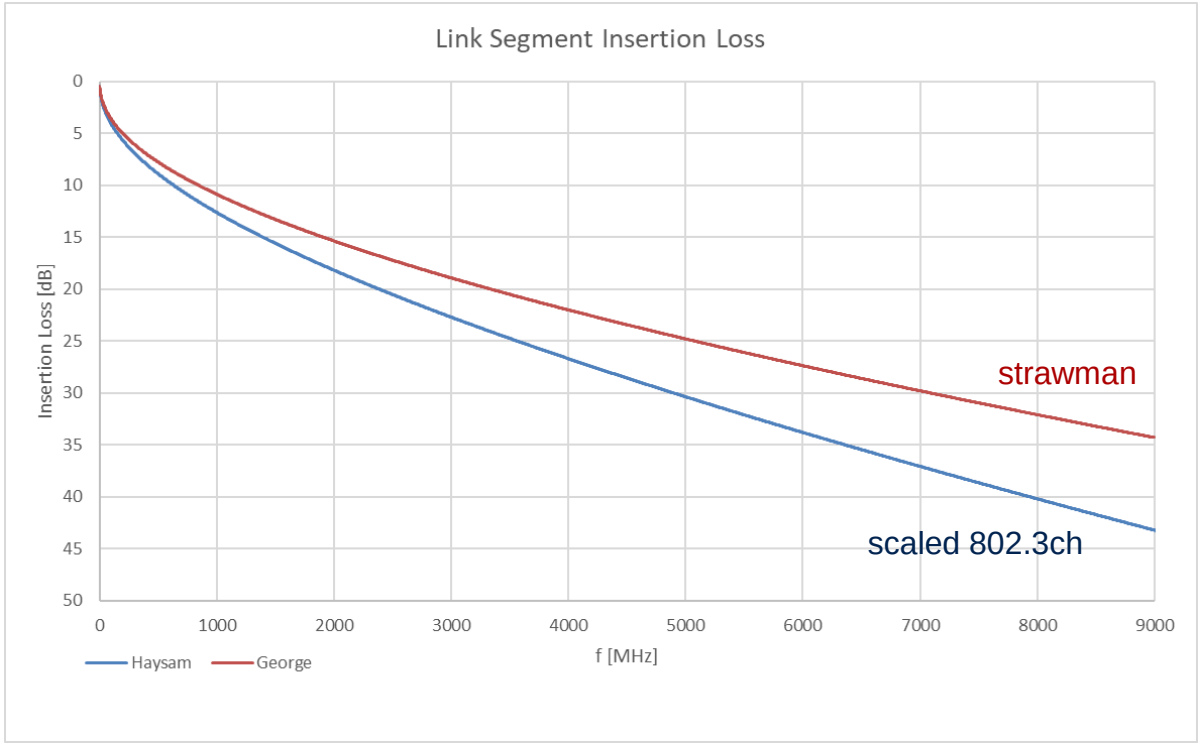
Scope

- To define insertion loss requirements on the link segment, more data was requested on automotive cables, that have been optimized for this application.
- Results for an STP cable AWG 26 for 9 GHz at room temperature presented before mueller_3cy_01_10_14_20.pdf.
- This presentation shows 802.3cy cables STP and SDP under temperature.
- IL strawman proposal as reference as in zimmerman_3cy_01_1120.pdf

$$IL \leq 0.002 \left(\frac{f}{2.5}\right) + 0.68 \left(\frac{f}{2.5}\right)^{0.45}$$



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Measurement setup

- Automotive grade SDP (shielded differential pair) cable (exemplary development sample).
- 10 m cable assembly with connectors based on H-MTD interface.
- Precision measurement fixtures (no PCB, included in the results).
- Connectors and fixtures outside the climate chamber.
- Temperatures +20°C, -40°C and +105°C.

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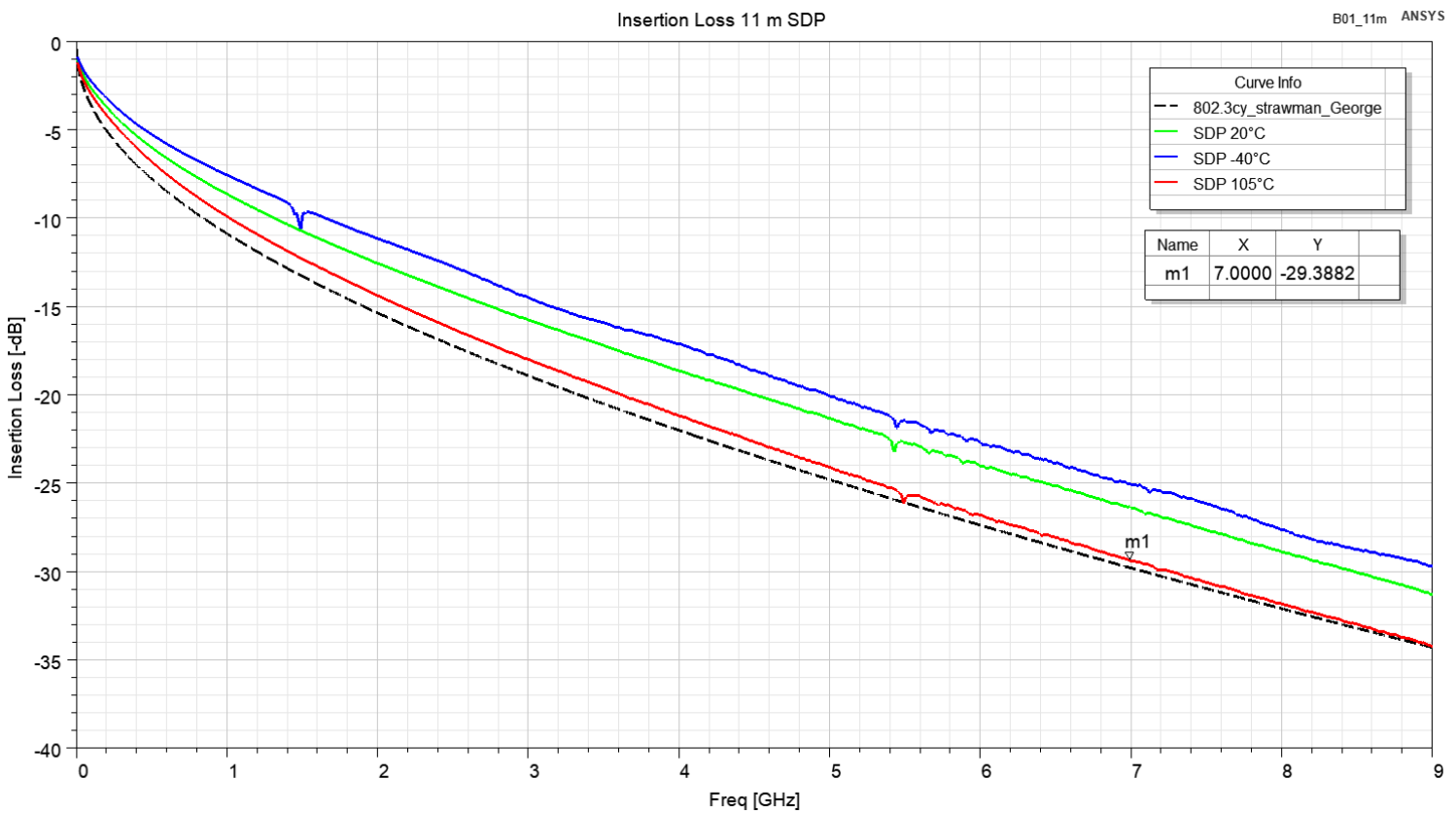
Measurement results IL of SDP

- New SDP cable concept IL measured as ~2.7 dB/m @ 7 GHz at +105°C.
- 11 m cable passes strawman proposal even at +105°C.



- Further improvements on the residual resonances are expected.

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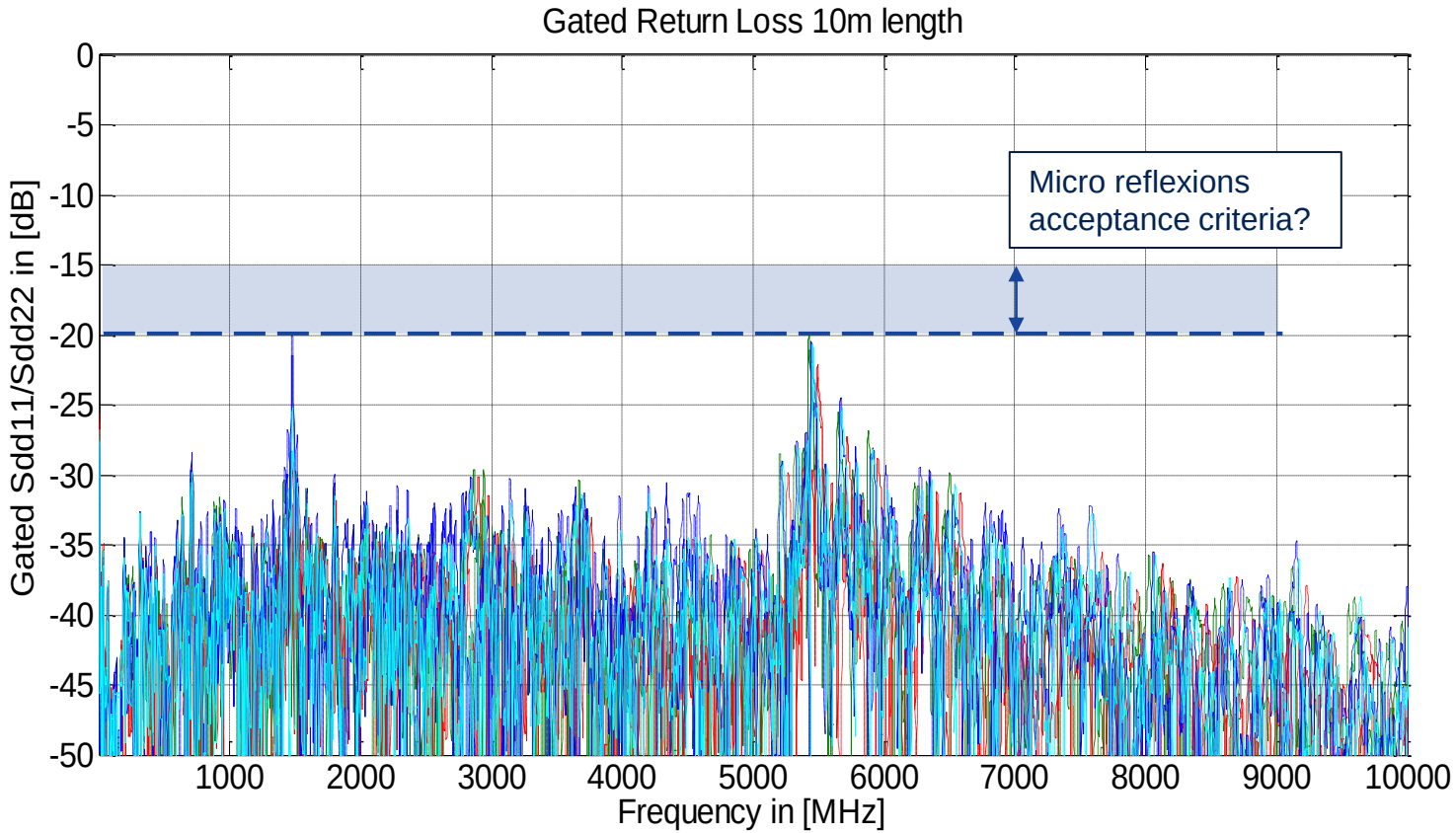
Measurement results Gated RL of SDP

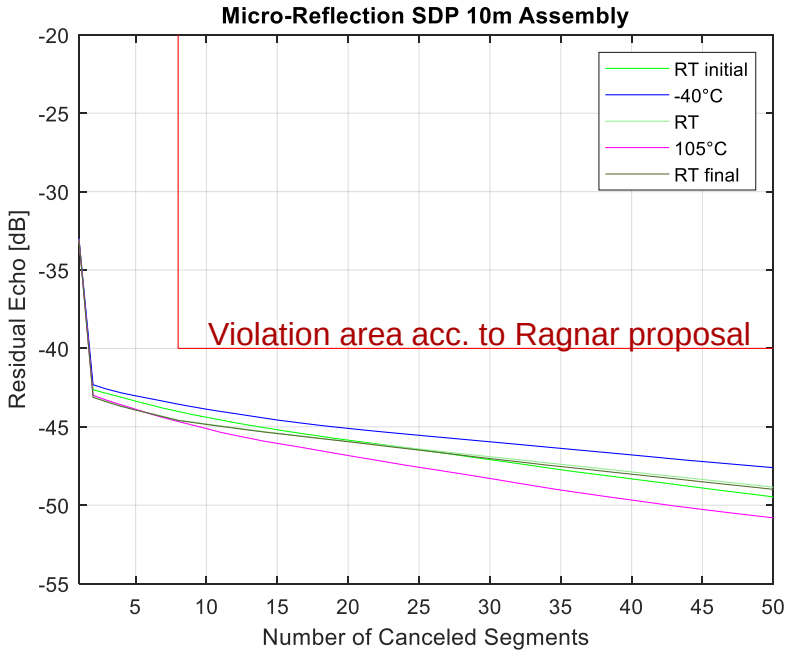
- Micro reflexions can be visualized as return loss of the cable

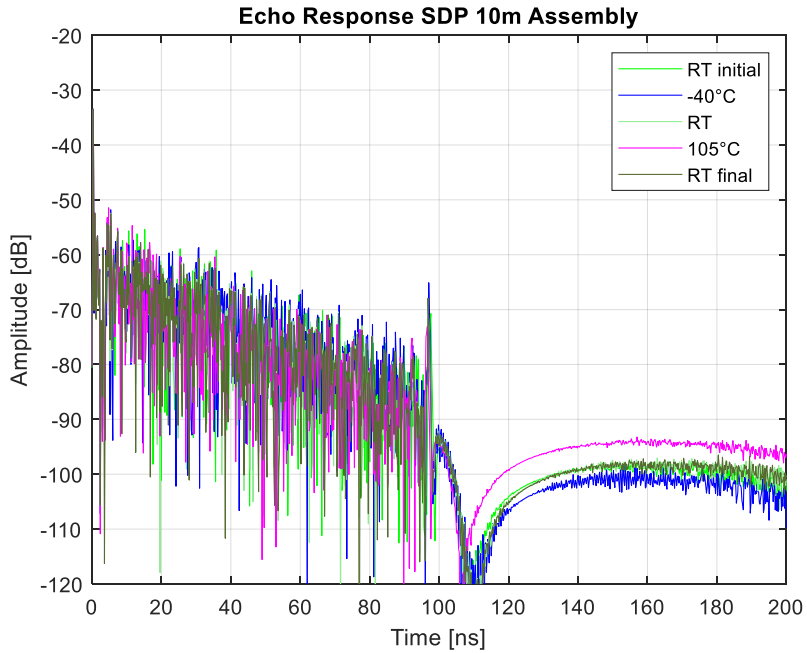


- Modified procedure of Ragnar's micro reflexions analysis method is being investigated with results in frequency domain (return loss). Goal is to apply this method to whole channels.

Measurement results micro reflexions of SDP

- Micro reflexions analysis acc. to Ragnar's method (jonsson_3cy_01a_10_14_20.pdf)
- Analyzed with 10 GHz bandwidth





- 10 m cable assembly within the mask at all temperatures. Higher IL causes better results.

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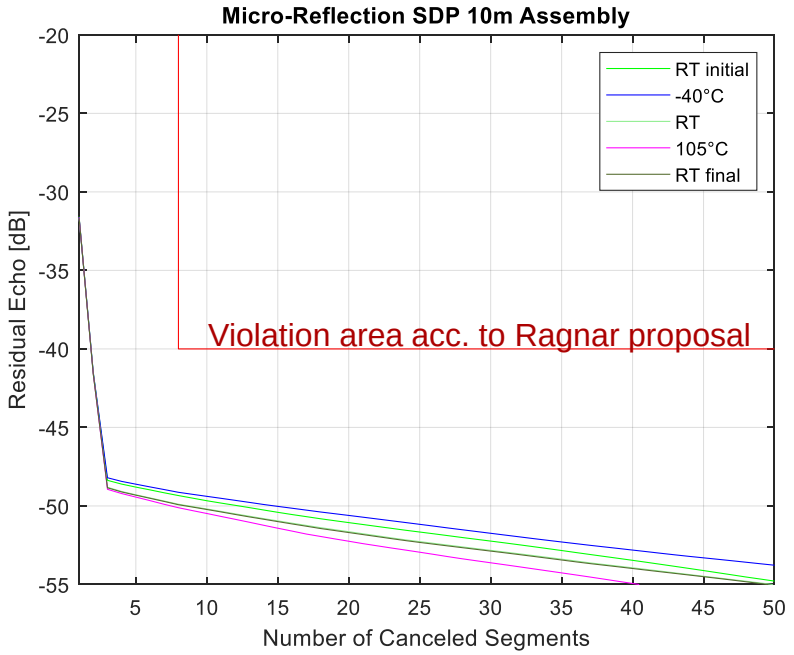
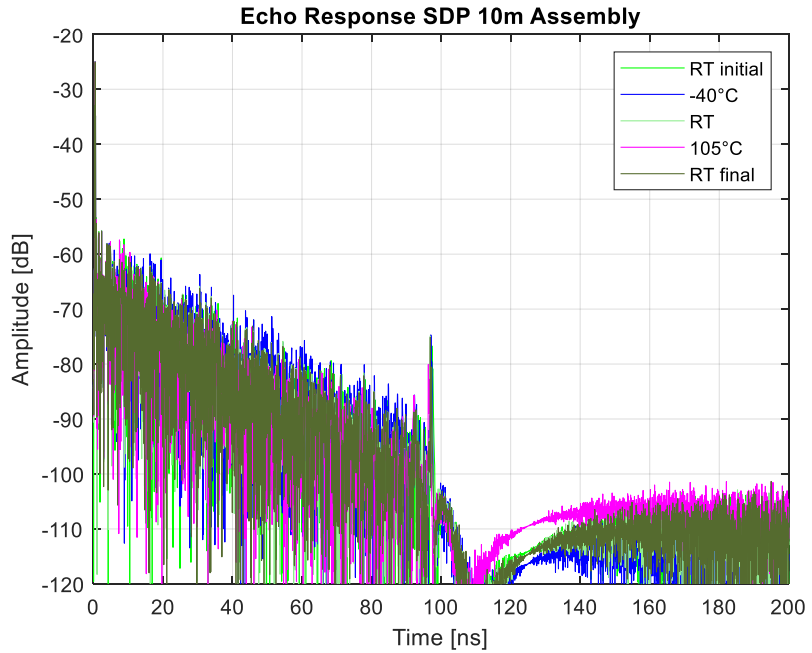
Measurement results micro reflexions of SDP

- Analyzed with 28 GHz bandwidth





- Larger bandwidth causes „better“ results. Needs clarification.

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Measurement results micro reflexions of SDP

Observations on the micro reflexions analysis provided by Ragnar:

- Higher insertion loss and higher bandwidth causes better results.
  - Dependency on the length of the sections (0.3 ns) is likely.
  - Bandwidth of the input data should be defined.
- “Rj2ft” in the Matlab code function shows unexpected results:
  - Extrapolation of the DC point not very accurate. Input data starting at 1 MHz should be sufficient.
  - Impulse response does not meet expection: It seems that upper frequencies of the input data not considered / cut. Using differentiated step response to get the impulse response shows more consistent results.
- Modified procedure of Ragnar’s micro reflexions analysis method is being investigated with results in frequency domain (return loss). Goal is to apply this method to whole channels.

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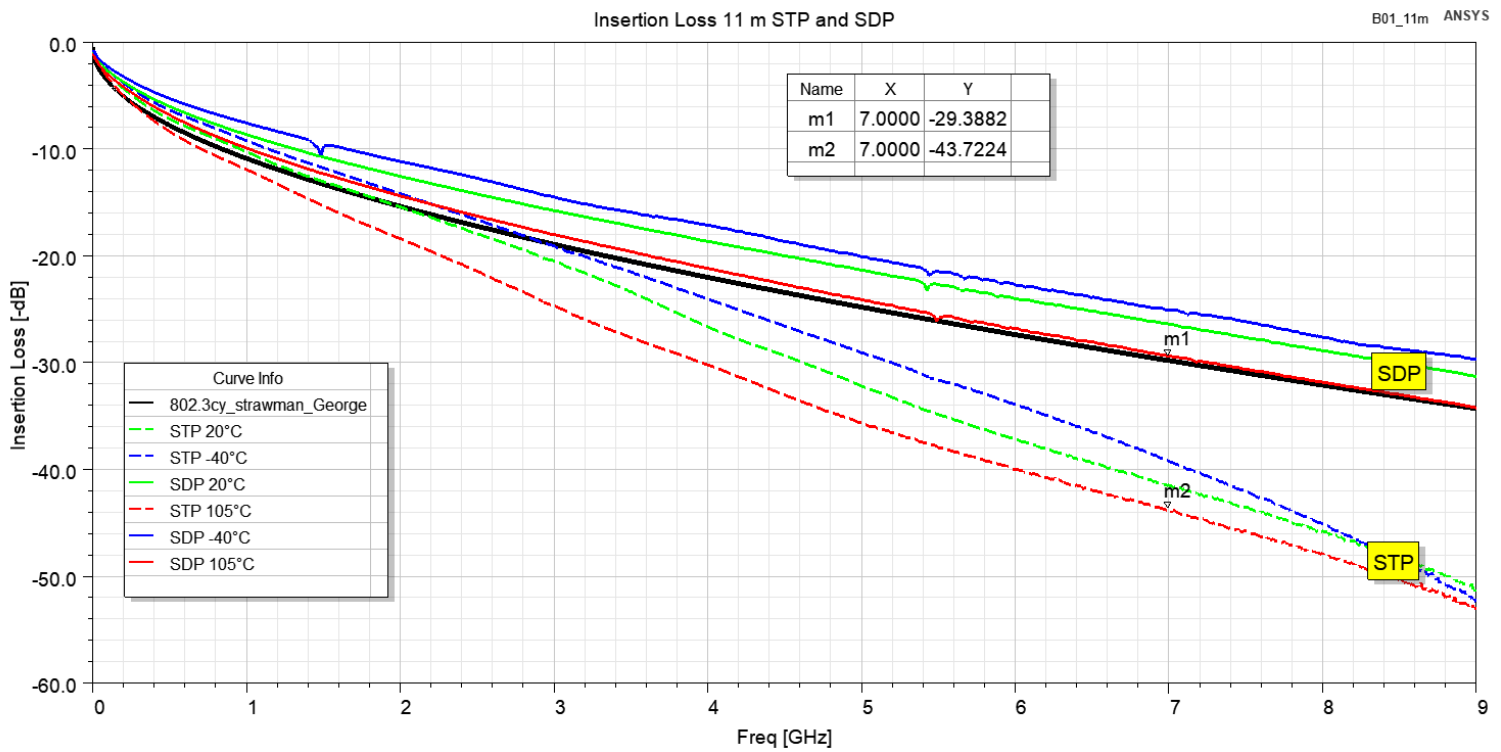
IL comparison of SDP vs. STP 11 m

- New SDP cable concept has ~14.3 dB (33%) lower insertion loss compared to STP @ 7 GHz.



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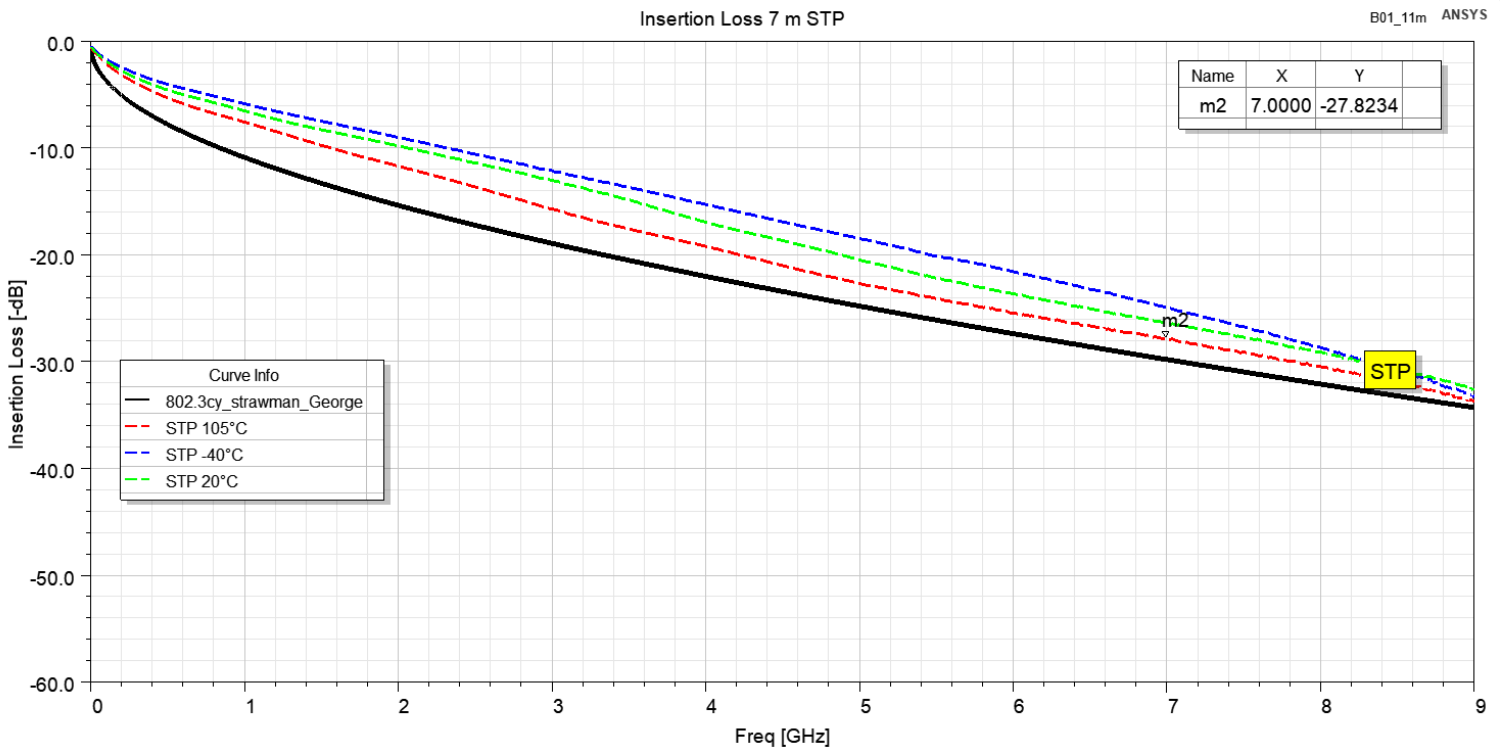
IL STP 7 m

- 7 m cable with STP within the strawman as well.
- STP cable may cover applications up to 7 m.



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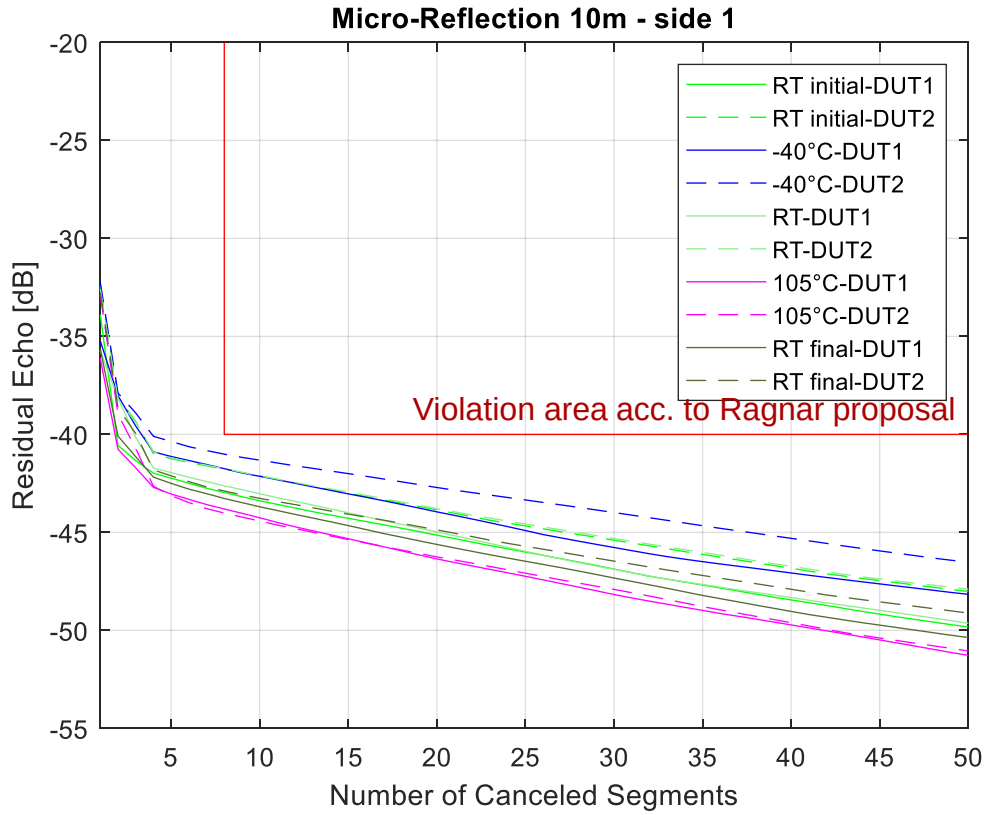
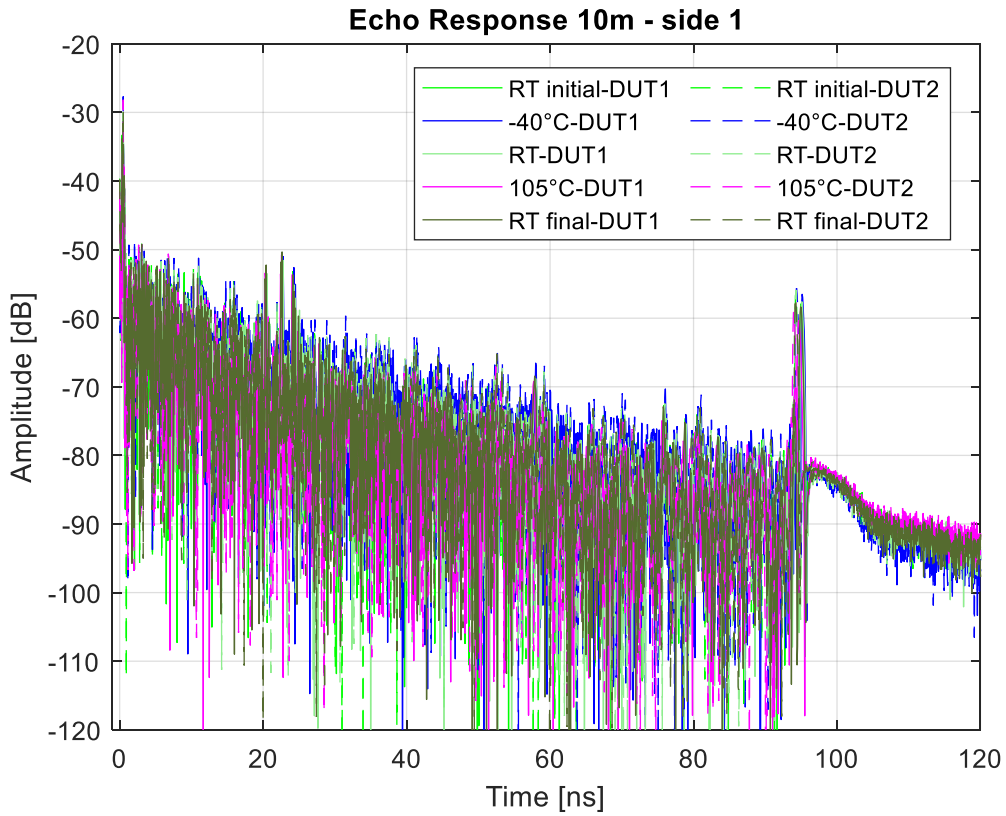
Measurement results micro reflexions of STP

- 10 m STP cable is close to the mask.
- Passes at 28 GHz bandwidth.





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Conclusion

- Measurement results for automotive STP and SDP cables with usable bandwidth ≥ 9 GHz were shown.
- SDP provides around 33% improvement of IL compared to STP at 7 GHz.
- SDP fulfills the George’s IL strawman for 11 m and STP for 7 m.
- Additional ageing and connectors are not included in the results.
- The micro-reflexions analysis method should be refined.