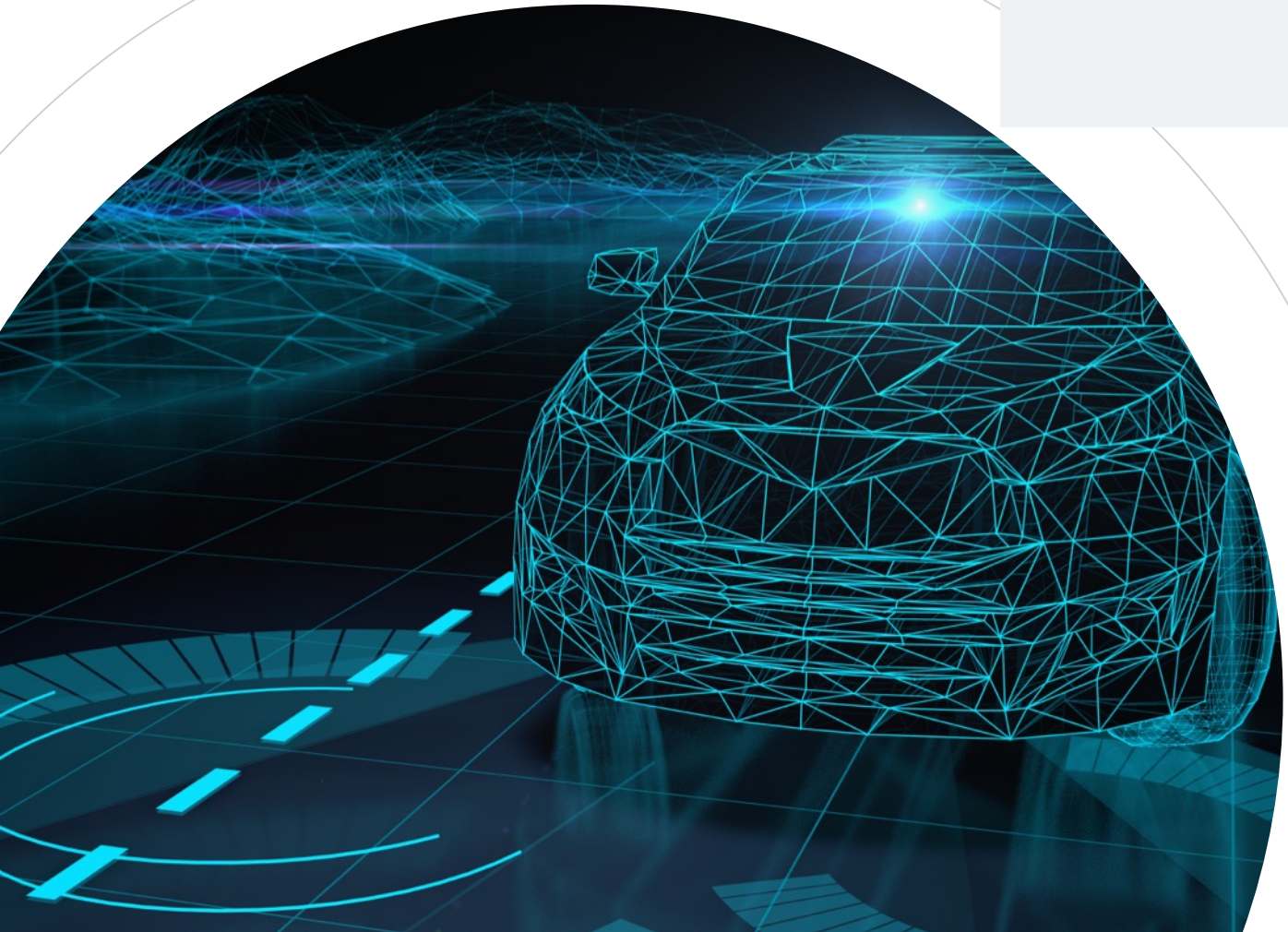

Evaluation of different Shielded Differential Pair (SDP) raw cables AWG26

Contribution to IEEE 802.3cy

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Supporter

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Evaluation overview

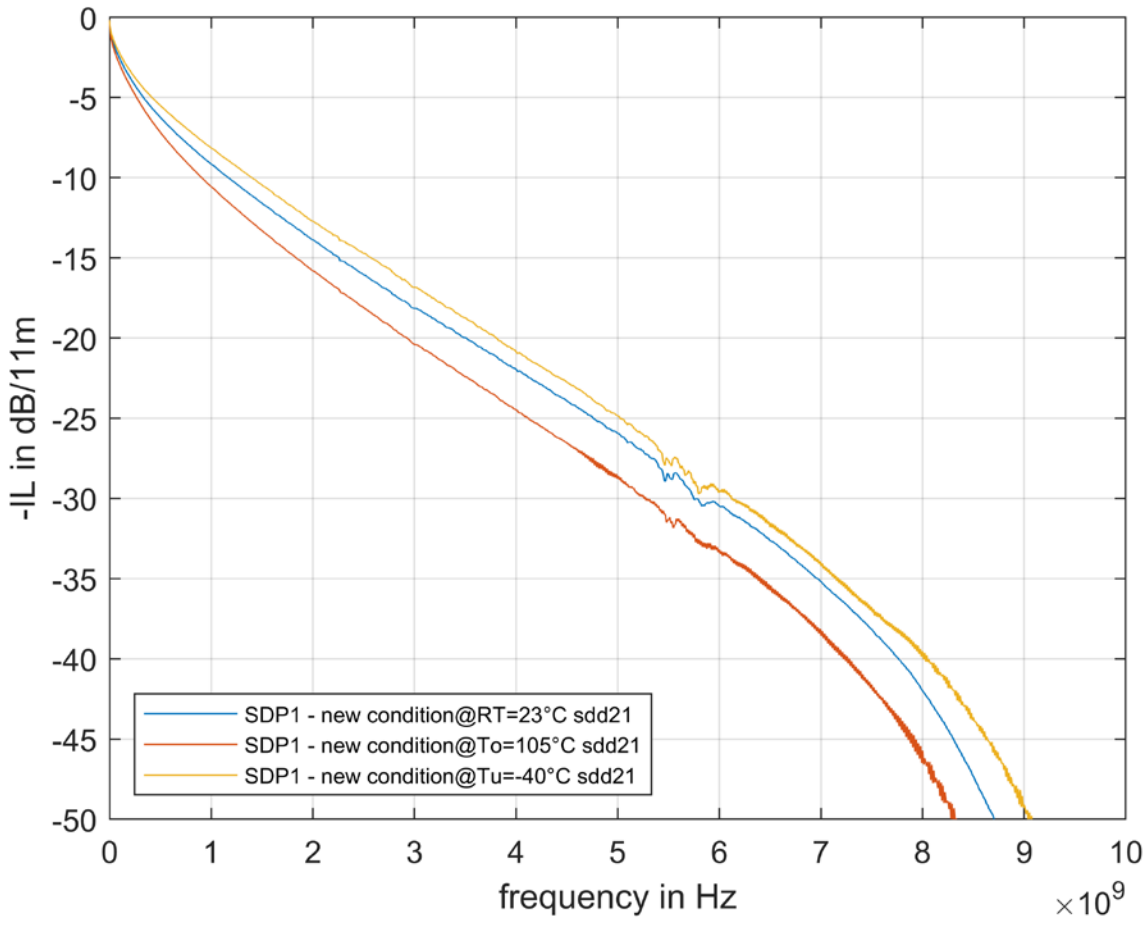
- Comparison of three AWG26 (0,14mm²) shielded differential pair (SDP) concepts with operating temperature $T = 105°C$ and a differential impedance of 100Ω ± 5Ω
  - SDP1: Designed for frequency range up to 5,5 GHz
  - SDP2: Designed for frequency range up to 6,5 GHz
  - SDP3: Designed for frequency range up to 9 GHz

- Investigation on different temperature conditions and ageing behavior
  - Temperatures $R_T = 23°C, T_u = -40°C, T_o = 105°C$
  - Short term ageing (STA) $240h@130°C$ and measurement at $R_T = 23°C$
  - Sample ends ~10cm outside of the oven

- Measurement setup
  - Cable length 10m
  - $f_{start} = 300\ kHz, f_{stop} = 10\ GHz$, linear sweep
  - Measurement fixture losses not eliminated (<0,1dB@7GHz)

RF results including temperature drift

SDP1 concept



- Even if the dip doesn´t occur for some conditions, the dip-free frequency range can be ensured only up to 5,5 GHz for all conditions

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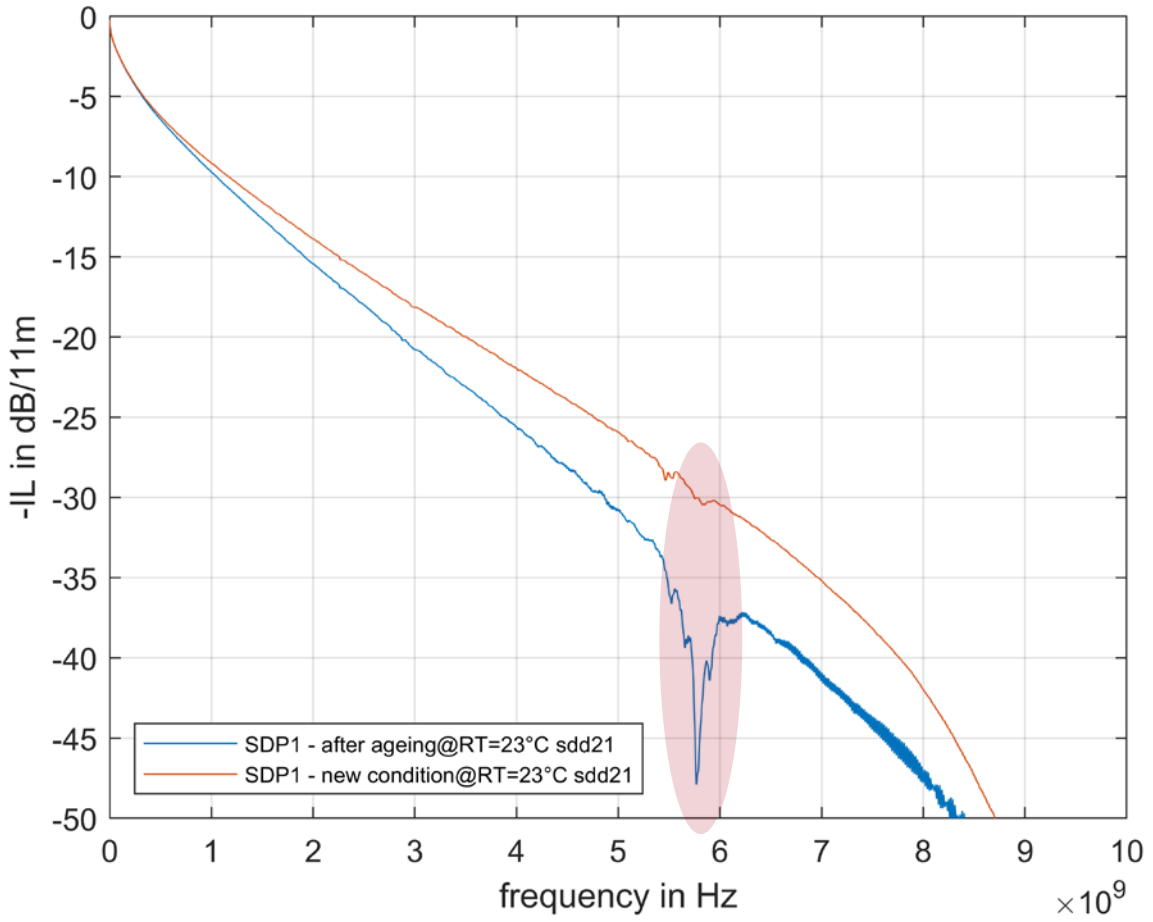
RF results aging behavior

SDP1 concept



- The insertion loss increases after short term aging approx.
- **Even if the dip doesn´t occur for some conditions, the dip-free frequency range for concept SDP1 can be ensured only up to 5,5GHz for all conditions!**

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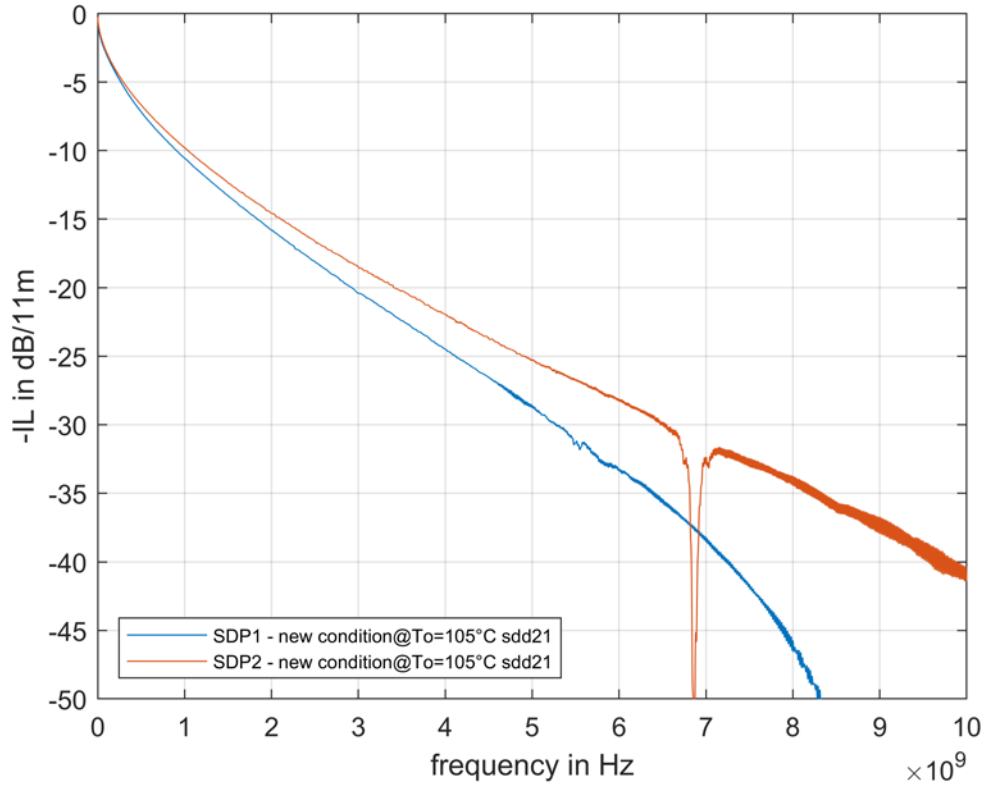
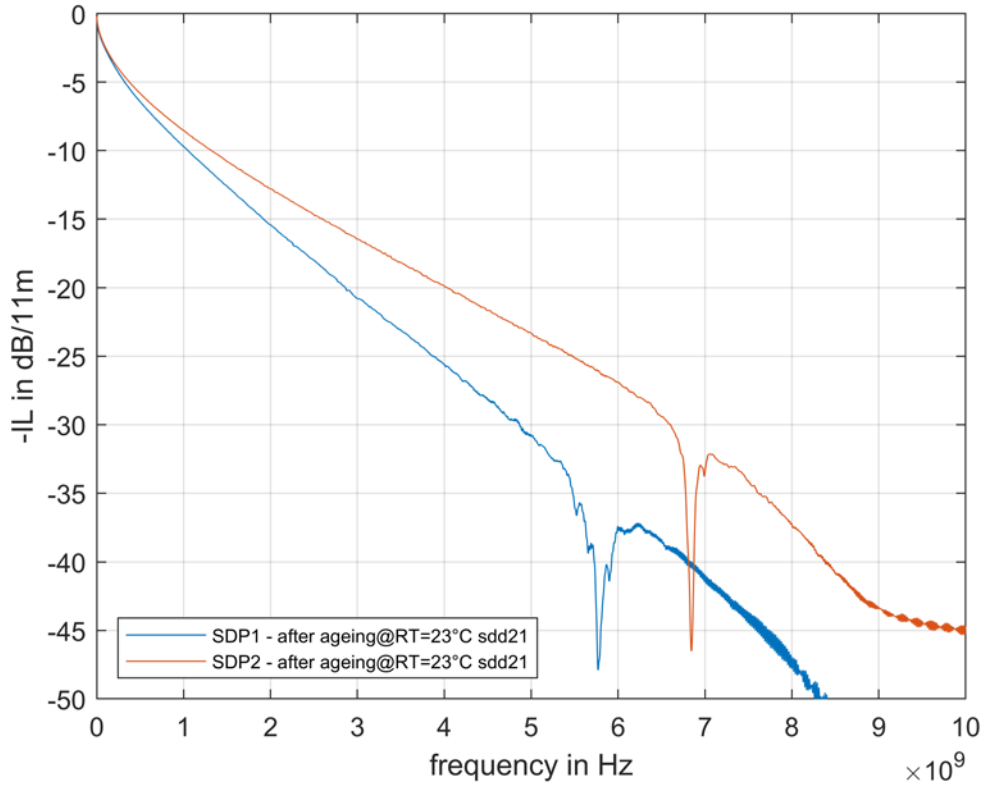
RF results including temperature and aging behavior

Comparison SDP1 concept vs. SDP2 concept

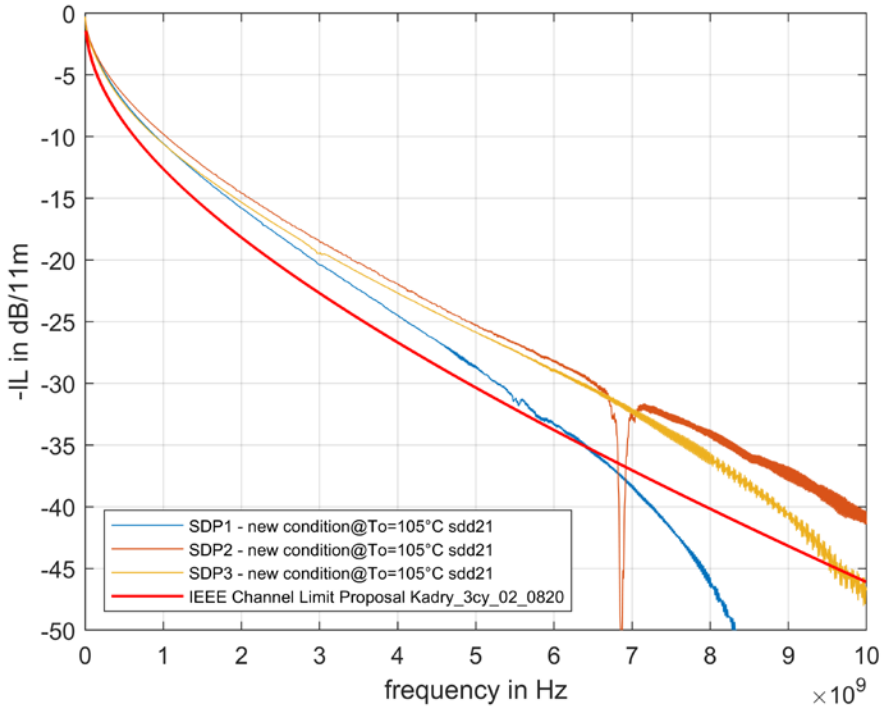


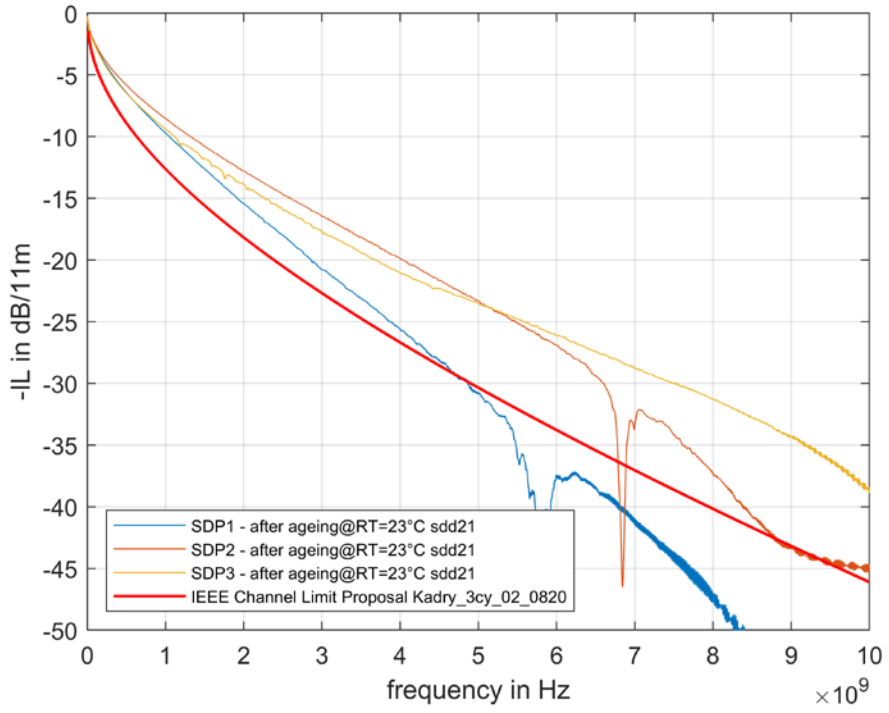


- The frequency range of the SDP2 concept is currently limited by the dip @ ~6,7 GHz
- The temperature and aging behavior of SDP2 is much better than SDP1

RF results including temperature and aging behavior

Comparison SDP1 concept vs. SDP2 concept vs. SDP3 concept





	SDP 1	SDP 2	SDP 3
Evaluation acc. Kadry_3cy_02_0820.pdf regarding IL bandwith	✘ (suck-out @ 5,8GHz)	✘ (suck-out @ 6,8GHz)	✓
Evaluation acc. Kadry_3cy_02_0820.pdf regarding IL limit proposal	✘ (exceed limit @ 6GHz)	✓	✓

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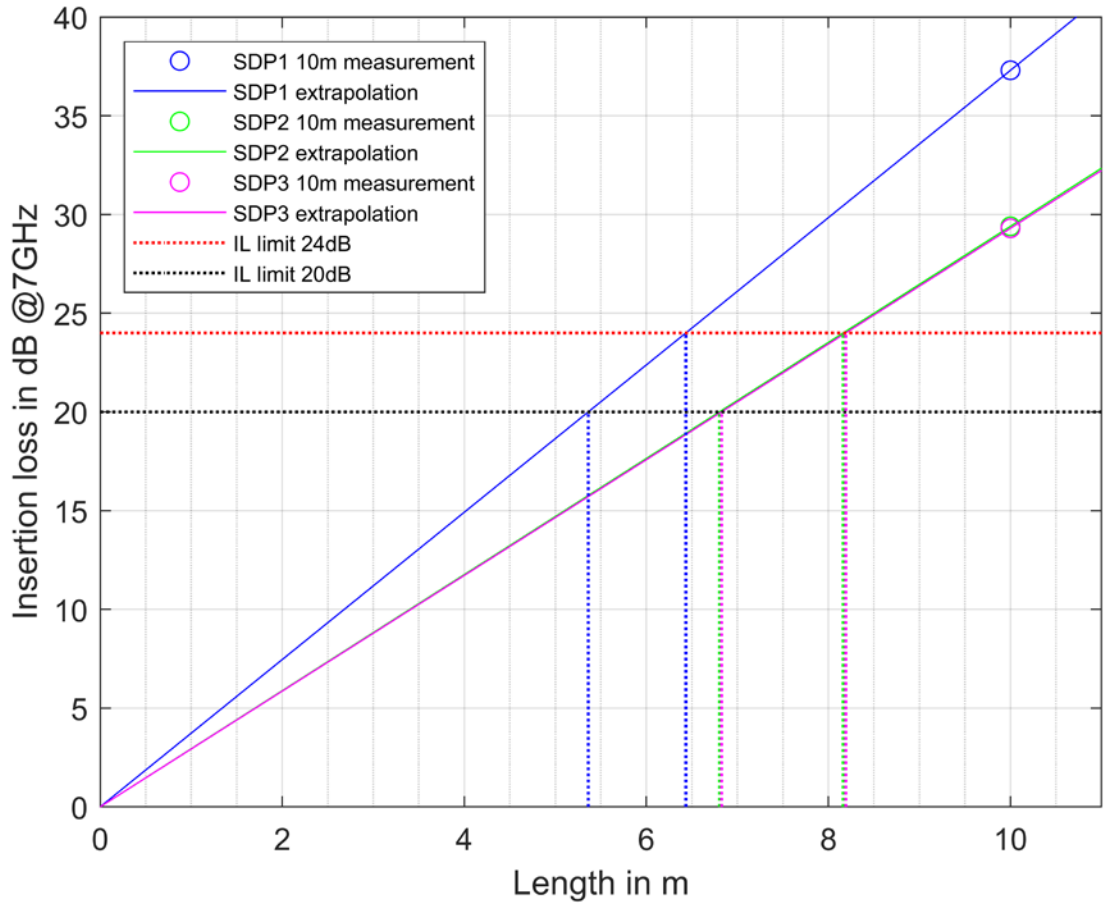
Insertion Loss Budget vs. length calculation

Comparison SDP1 concept vs. SDP2 concept vs. SDP3 concept



- The suggested IL limit of sedarat_3cy_01_10_14_20.pdf is 24dB@Nyquist to limit the PHY complexity
- The expected Nyquist frequency is 7GHz acc. Kadry_3cy_02_0820.pdf
- Expected budget for MDI, PCB and connector is 4dB@7GHz
- The IL budget for the cable only (without any connector) is 20dB@7GHz!

- **The length for the whole channel should be limited to approximately 7m to achieve the IL budget target acc. sedarat_3cy_01_10_14_20!**

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Conclusion

- Different cable concepts allow different bandwidths

- Concept of SDP2 could be extended to a maximum frequency of about 7GHz if required
- Concept of SDP2 can fulfill proposal Kadry_3cy_02_0820.pdf up to 7GHz

- Concept of SDP3 fulfills bandwidth and IL requirement for limit proposal Kadry_3cy_02_0820.pdf even after STA

- Concept SDP2 and SDP3 also fulfill the requirements regarding the microreflections described in jonsson_3cy_01a_10_14_20(1).pdf

- **Common SDP concepts (SDP2 and SDP3) have a Insertion Loss of 3,0dB/m @ 7GHz (cable only; with temperature and aging)**

- **If a stronger IL limit is required, the maximum length of the link segment should be limited.**