IEEE P802.3cy
Greater than 10 Gb/s Electrical Automotive Ethernet PHY Task Force

Link segment insertion loss measurements

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MD ELEKTRONIK
BEYOND CONNECTIONS

Agenda

Content

- Motivation: investigation of link segments **with inline connectors** according to objectives
- Definition and construction of suitable **cable assemblies**
- RF measurement results
  - Focus on 11 m and 7 m link segment insertion loss with inline connectors
- Summary

Motivation

Objectives

Approved Objectives P802.3cy – May 21, 2020:

"Define the performance characteristics of an **automotive link segment** and an electrical PHY to support 25 Gb/s point-to-point operation over this link segment supporting up to **2 inline connectors for at least 11 m** on at least one type of automotive cabling "

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Suggested requirements and limit lines for insertion loss (IL)

- Nyquist frequency and IL limit „802.3ch - scaled to 11 m" - Kadry_3cy_02_0820
- Straw-man proposal - zimmerman_3cy_01a_1120

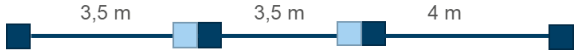
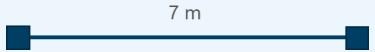
Test samples

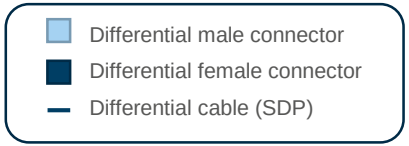
Cable

- Shielded Differential Pair (SDP) - AWG26 (0.14 mm²)
- Designed for frequency range up to 9 GHz
- Differential impedance of 100 Ω ± 5 Ω

Connector system

- Shielded differential connector system
- Designed for frequency range up to 15 GHz

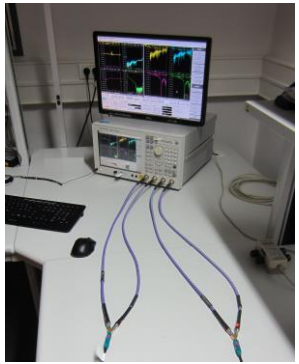
Link segments	Length	Inlines
	11	2
	11	2
	7	0
	7	1
	7	2

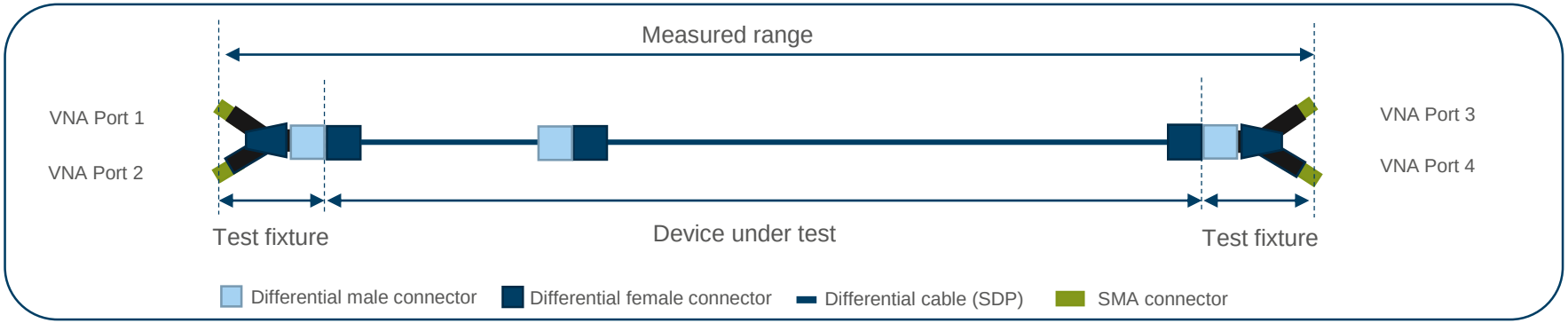


Test setup

Settings

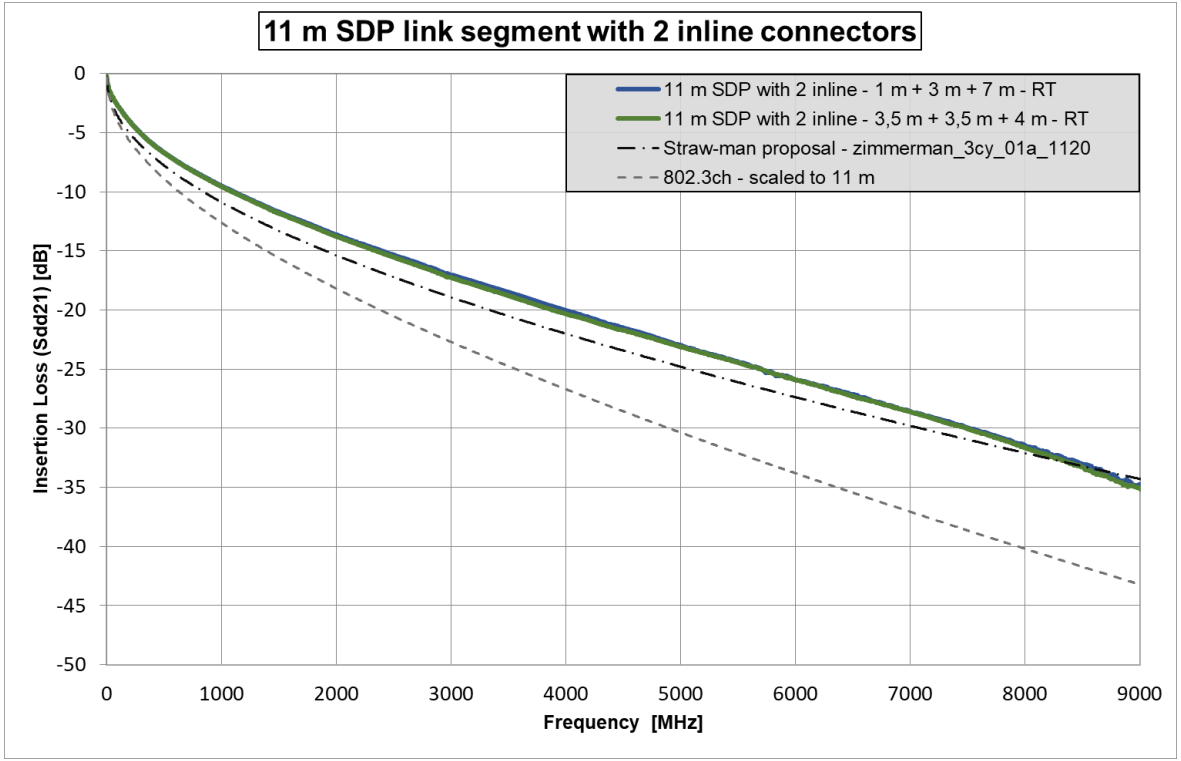
- Network analyzer: 20 GHz, test cables and calibration kit
- Fstart: 300 kHz, Fstop: 9 GHz, linear sweep
- Measurement Points: 1800, IF-Bandwith: 1 kHz
- Use of precision test fixtures, losses not eliminated
- Room temperature: 23°C



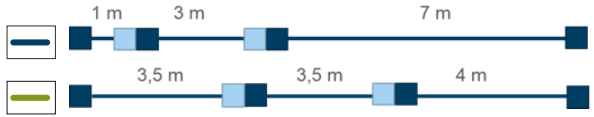


Link segment measurements

11 m – Insertion loss



Topology:

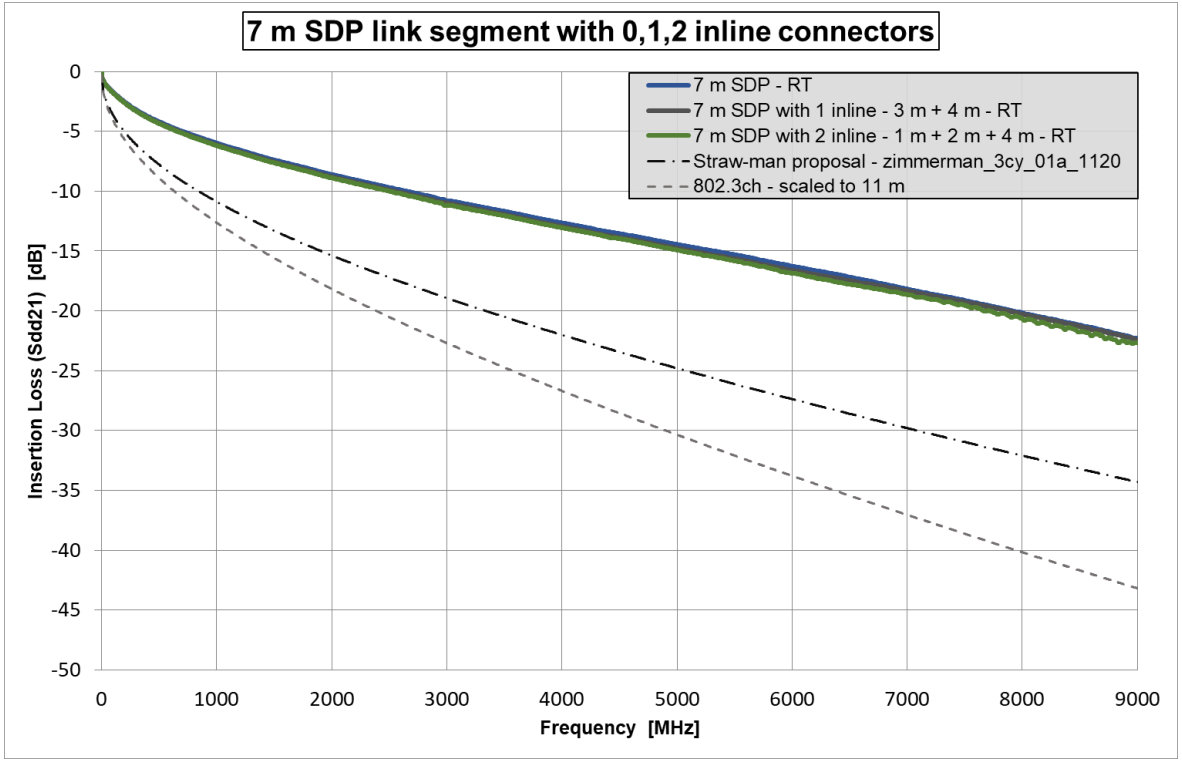


- Insertion loss = 28 dB at 7 GHz
- Straw-man limit line is crossed after 8 GHz
- 802.3ch scaled limit line is passed
- Further investigations in progress

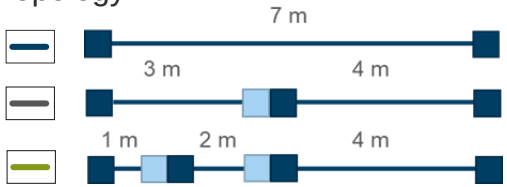
Differential male connector
Differential female connector
Differential cable (SDP)

Link segment measurements

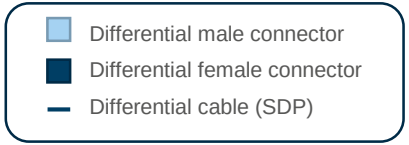
7 m – Insertion loss



Topology:



- Insertion loss = 18 dB at 7 GHz
- No influence of inline connectors
- Straw-man limit line is passed
- 802.3ch scaled limit line is passed
- Further investigations in progress



Summary

Conclusion

- SDP link segments with good IL characteristic, 2.6 dB/m at 7 GHz, in new condition and room temperature (23°C).
- Cable with linear insertion loss characteristic up to 9 GHz.
- **Assembling of connectors with no significant influence on insertion loss is possible.**
- 11 m: suggested straw-man limit line (zimmerman_3cy_01a_1120) → no margin for aging and other effects.
- The currently proposed straw-man limit line only works for shorter link segments.

Outlook

- Further investigations, such as aging of complete link segments with inline connectors.
- Other measurements of cable assemblies.

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