
Rosenberger

802.3ch channel options

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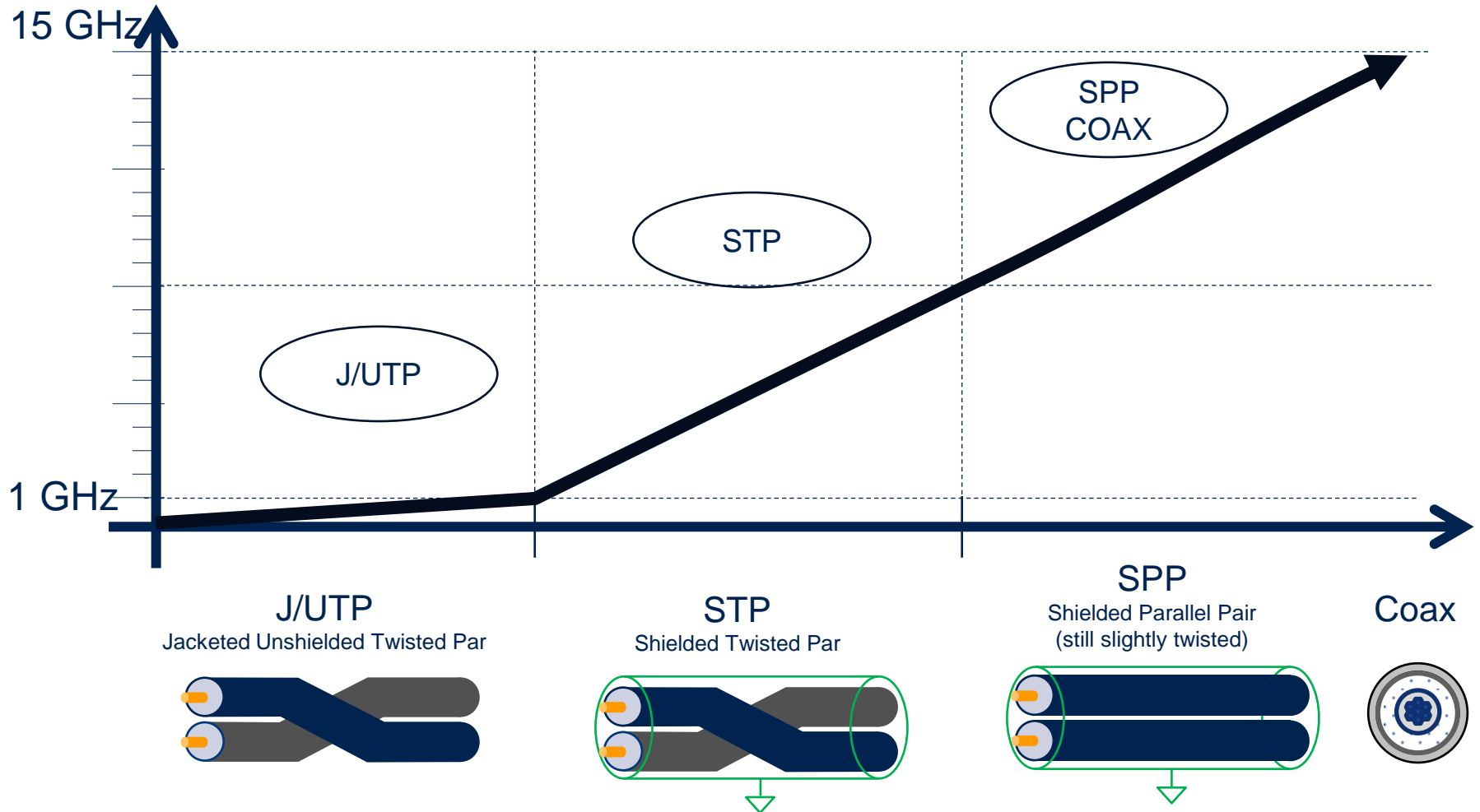


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- Estimated worst case bandwidth assumption for 10 Gbps (NRZ coding)

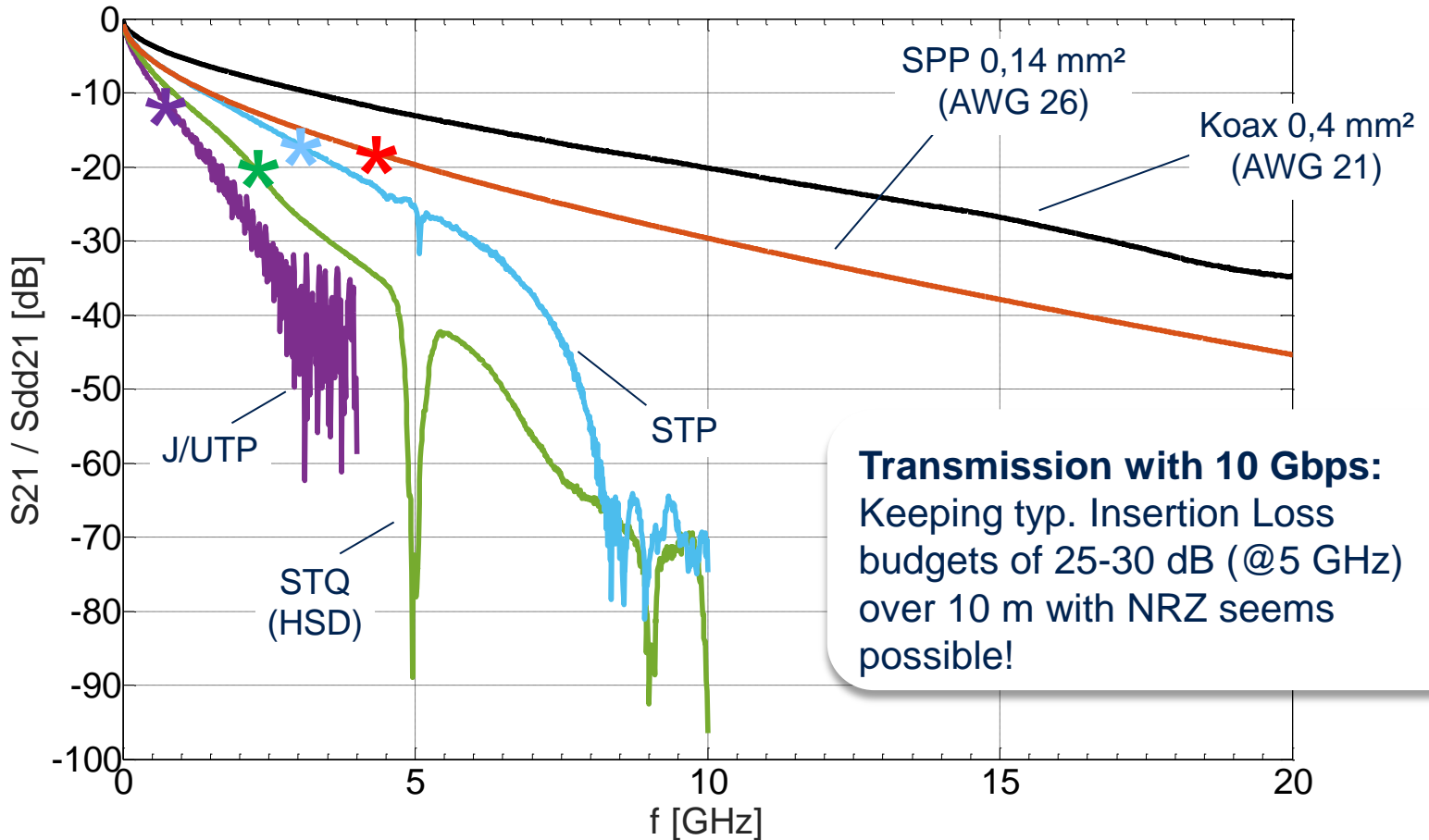
$$0.75 \times \text{bit rate}_{[\text{in bps}]} = \text{bandwidth}_{[\text{in Hz}]}$$

- 10 Gbps requires a bandwidth of 7.5 GHz maximum
 - With more advanced modulation (e.g. PAMx*) the required bandwidth can be reduced (*x ≥ 3)
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- Channel options for 802.3ch

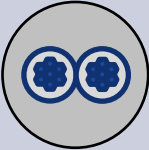
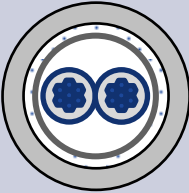
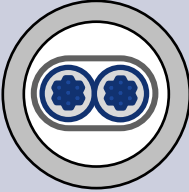

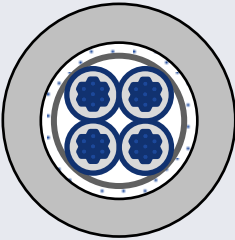
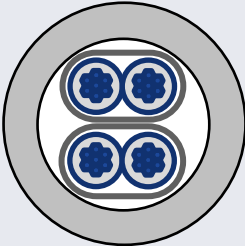


- Insertion loss of 10 m cable length at room temperature



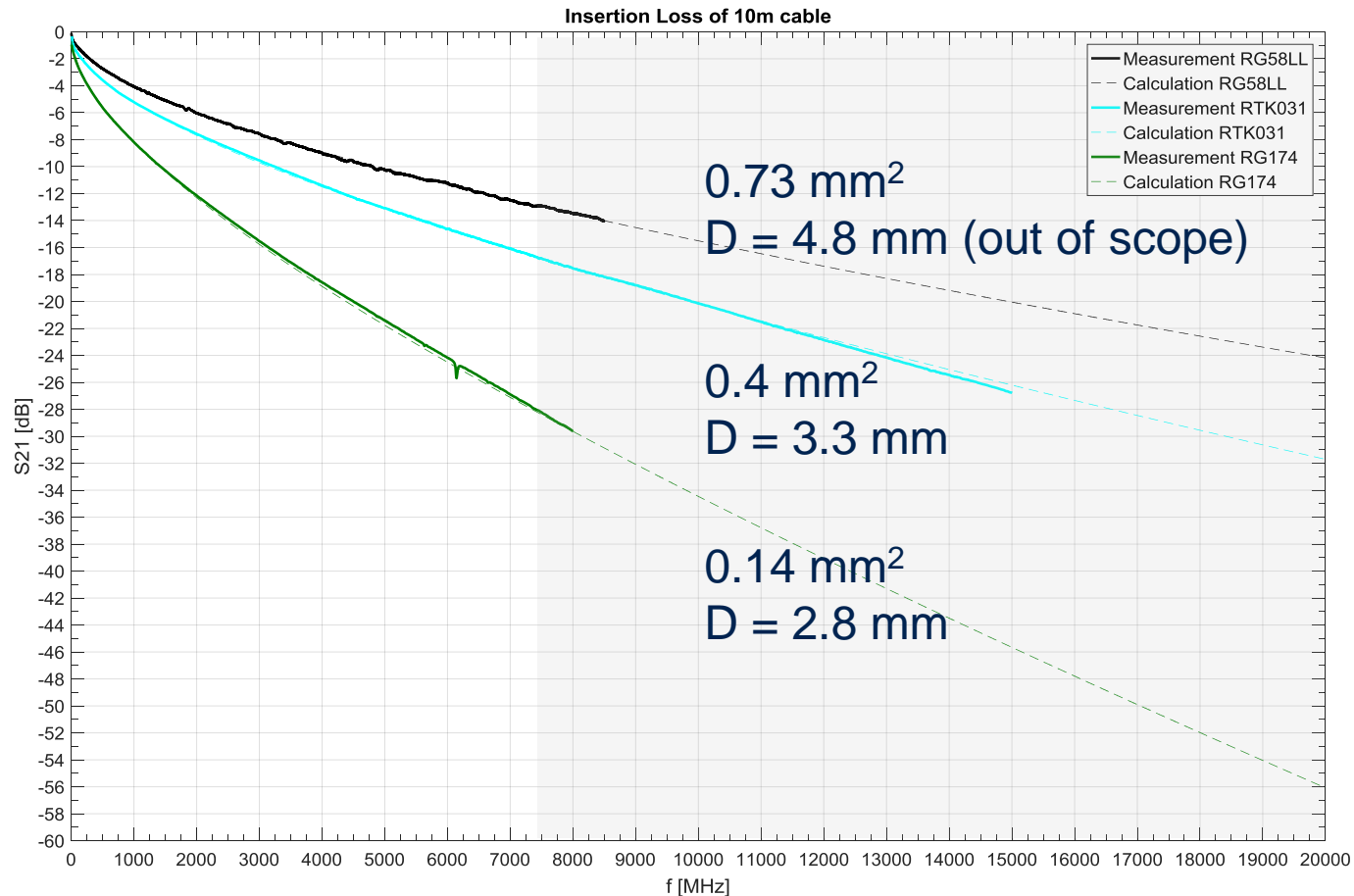
* Highest frequency according to data sheet for each cable type

- Cabling options for 802.3ch

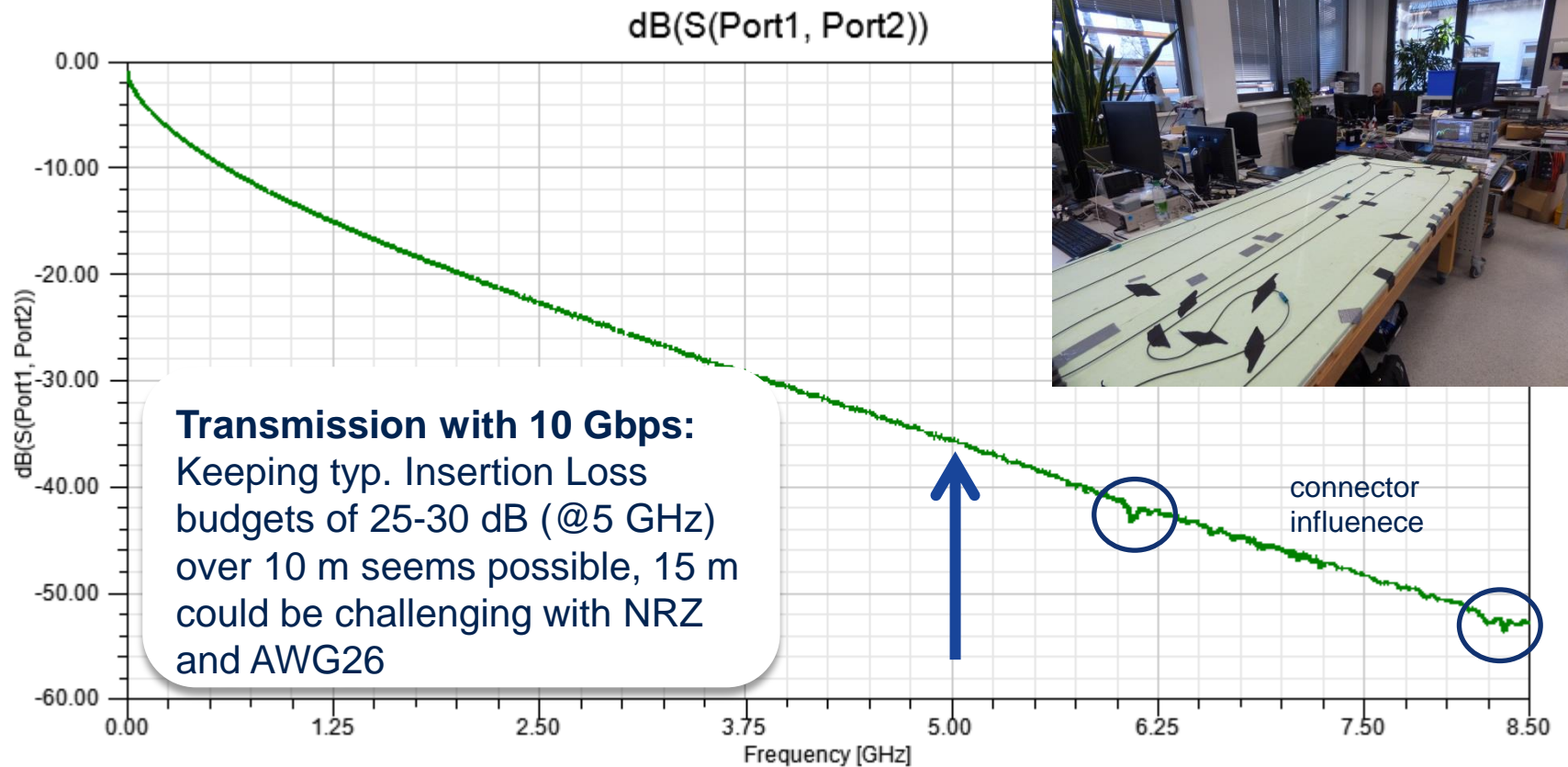
Lanes	UTP	STP STQ	SPP (Parallel Pair)	Coaxial
One				
Two				

- Automotive cables to support 10 Gbps (≥ 7.5 GHz BW) are available for differential 1 pair, 2 pairs and coax

- Insertion loss of 10 m coaxial cable with different wire gauges at room temperature

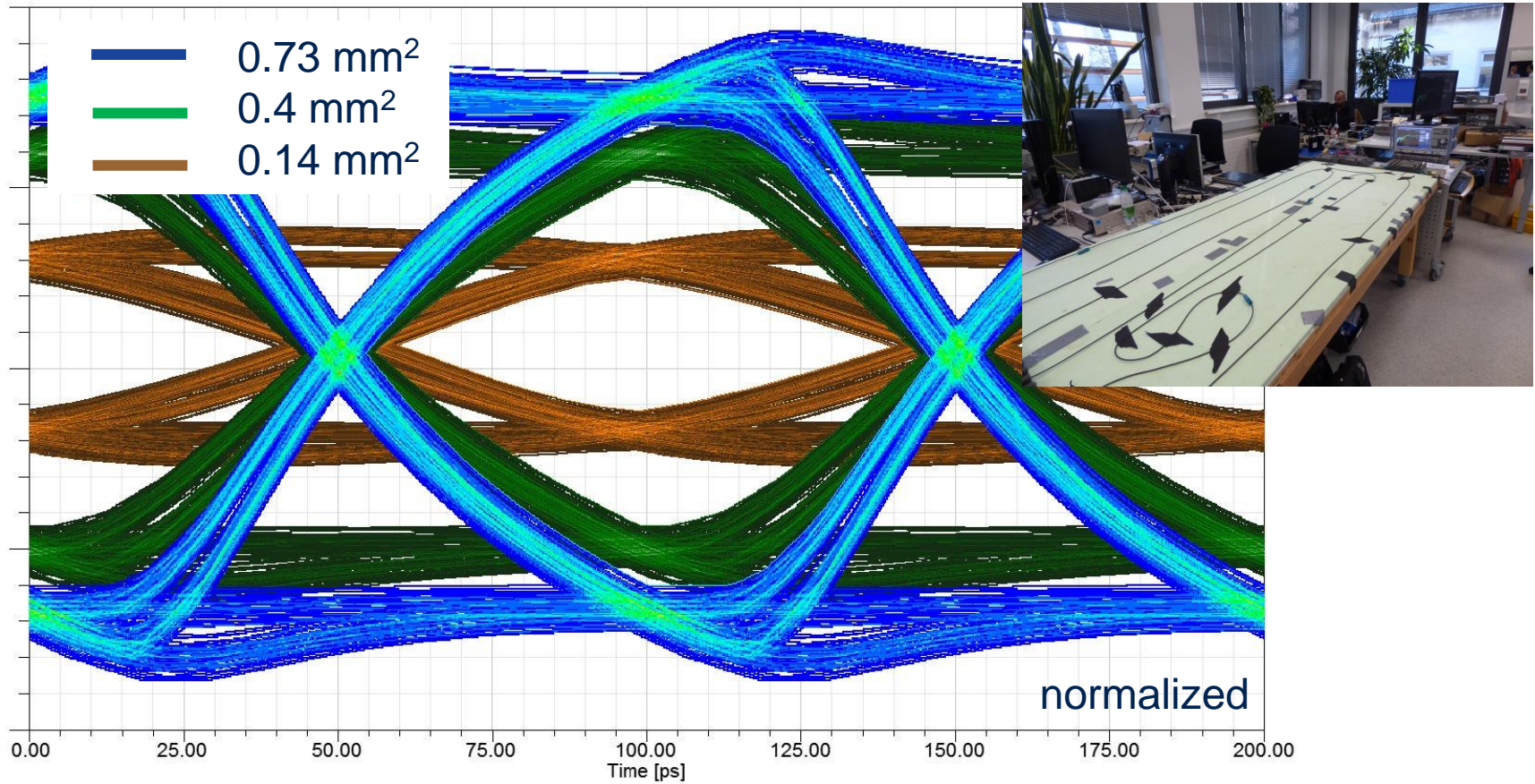


- Channel insertion loss at room temperature
- 15 m coax channel with 4 Inlines (5 x 3 m, AWG26)



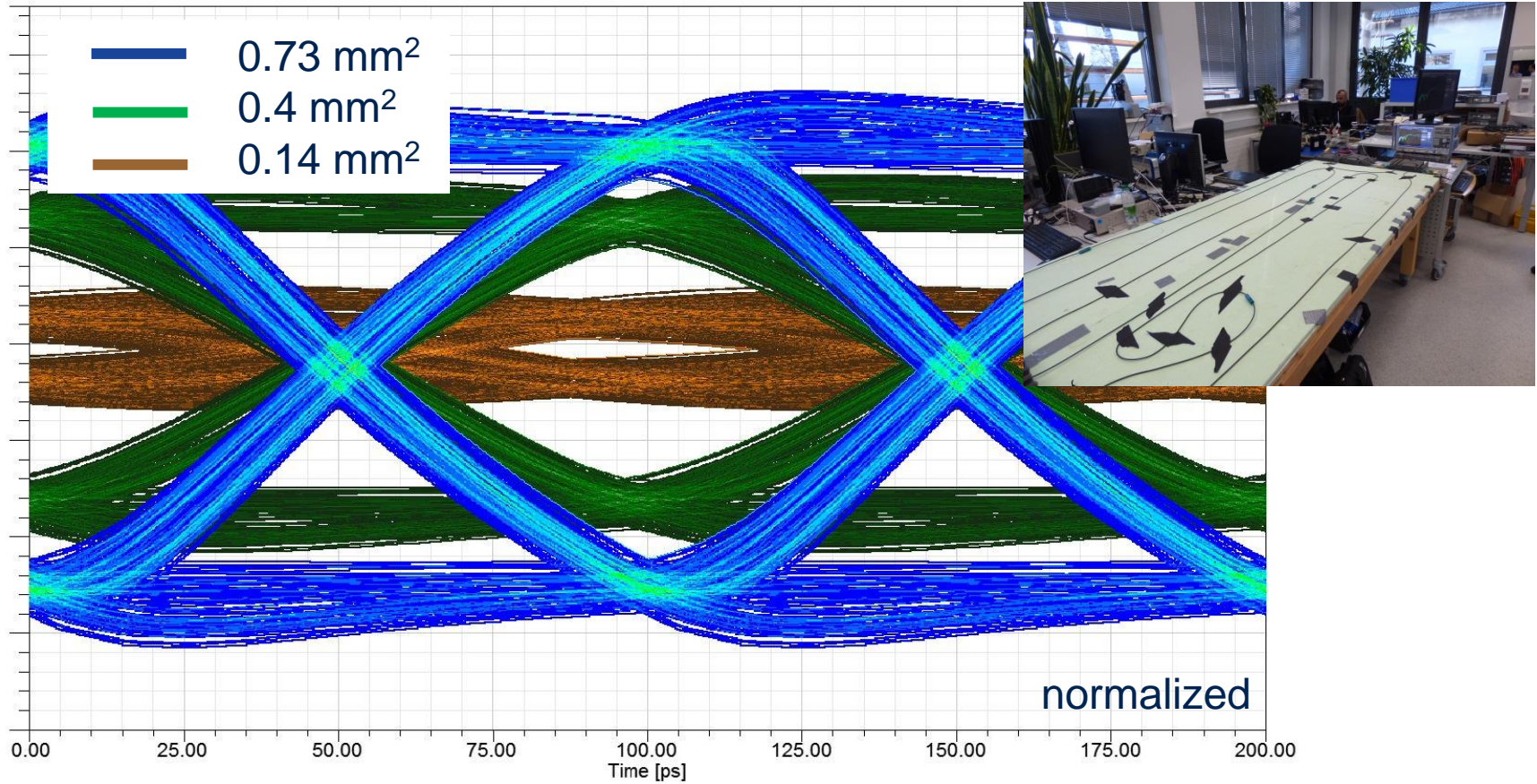
- Smooth slope with low reflections (dips)

- Eye diagram 10 Gbps with preemphasis and equalization
- 10 m coax channel with different wire gauges



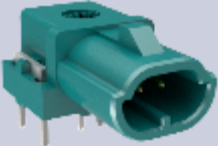


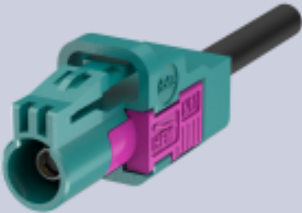


- Transmission should be possible

- Eye diagram 10 Gbps with preemphasis and equalization
- 15 m coax channel with different wire gauges



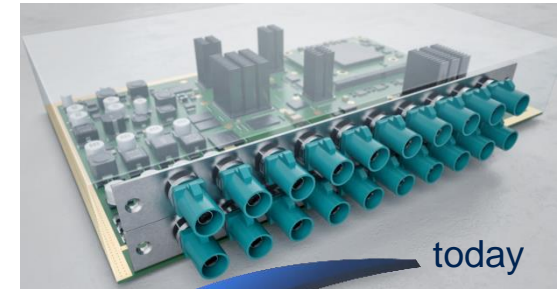
- Achievable link length depends on the cable attenuation

- Connector options for 802.3ch (examples)

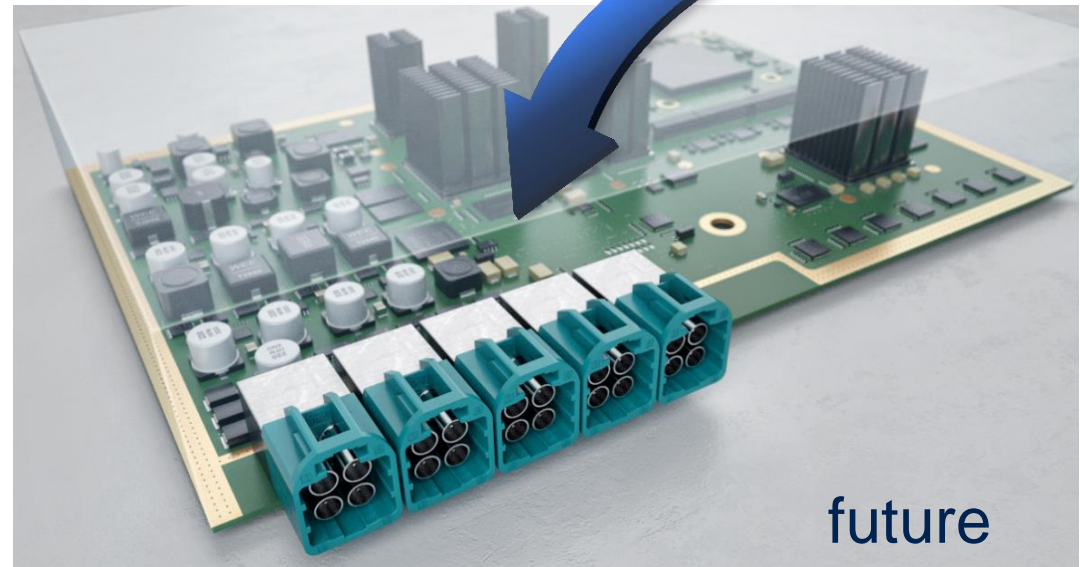
Lanes	UTP	STP STQ	SPP (Parallel Pair)	Coaxial
One				
Two				

- Automotive connector interfaces to support 10 Gbps (≥ 7.5 GHz BW) are available for differential 1 pair, 2 pairs and coax

- Miniaturization of connector is the second driving force apart from improving bandwidth
- Miniaturization leads to limitations on the physical dimensions of the cables



today



future

- 802.3ch should target cables with $D = 4.6$ mm max. for differential links and $D = 3.6$ mm max. for coaxial links

- Measuring transfer impedance and screening attenuation
- Differential and coaxial components

Component Tests

IEC 62153-4-4

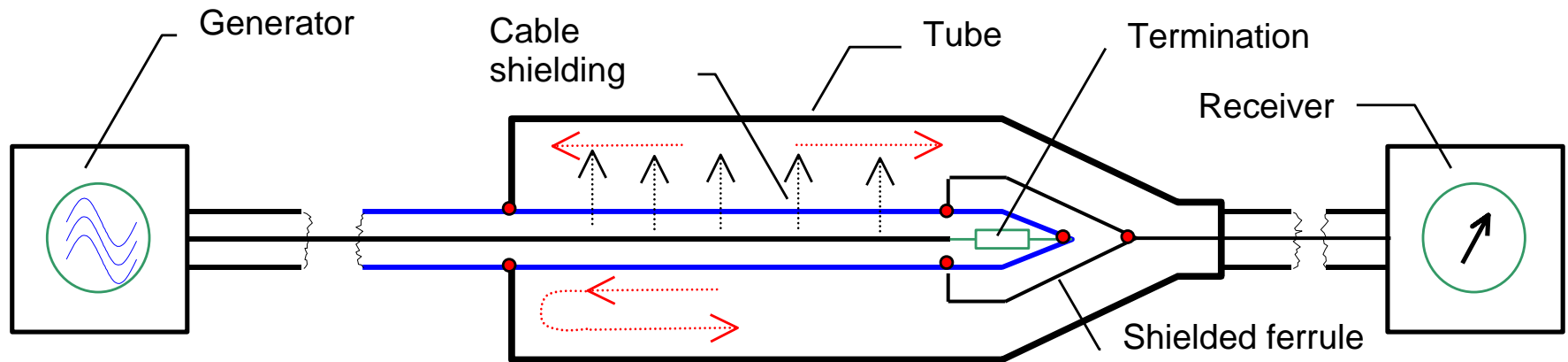
Cable

IEC 62153-4-7

Inline connections

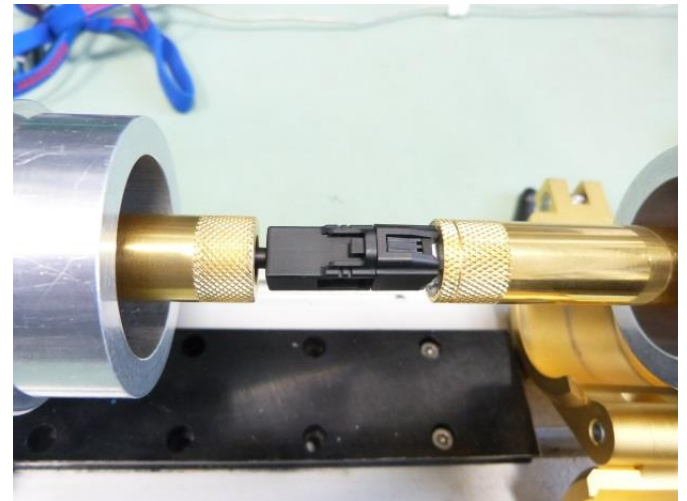
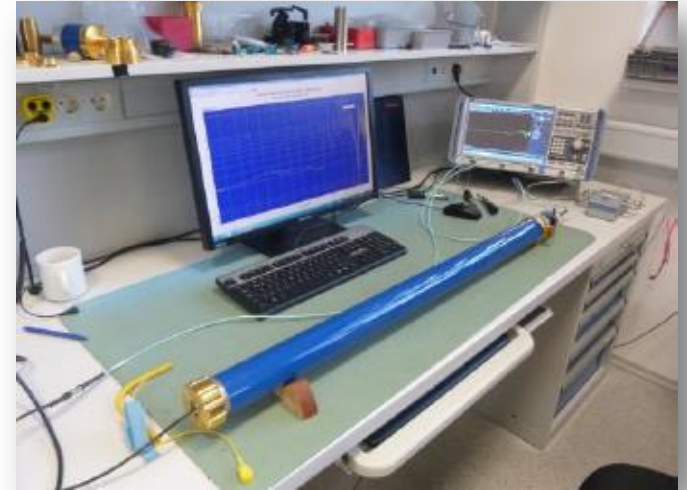
IEC 62153-4-10

Feedthroughs

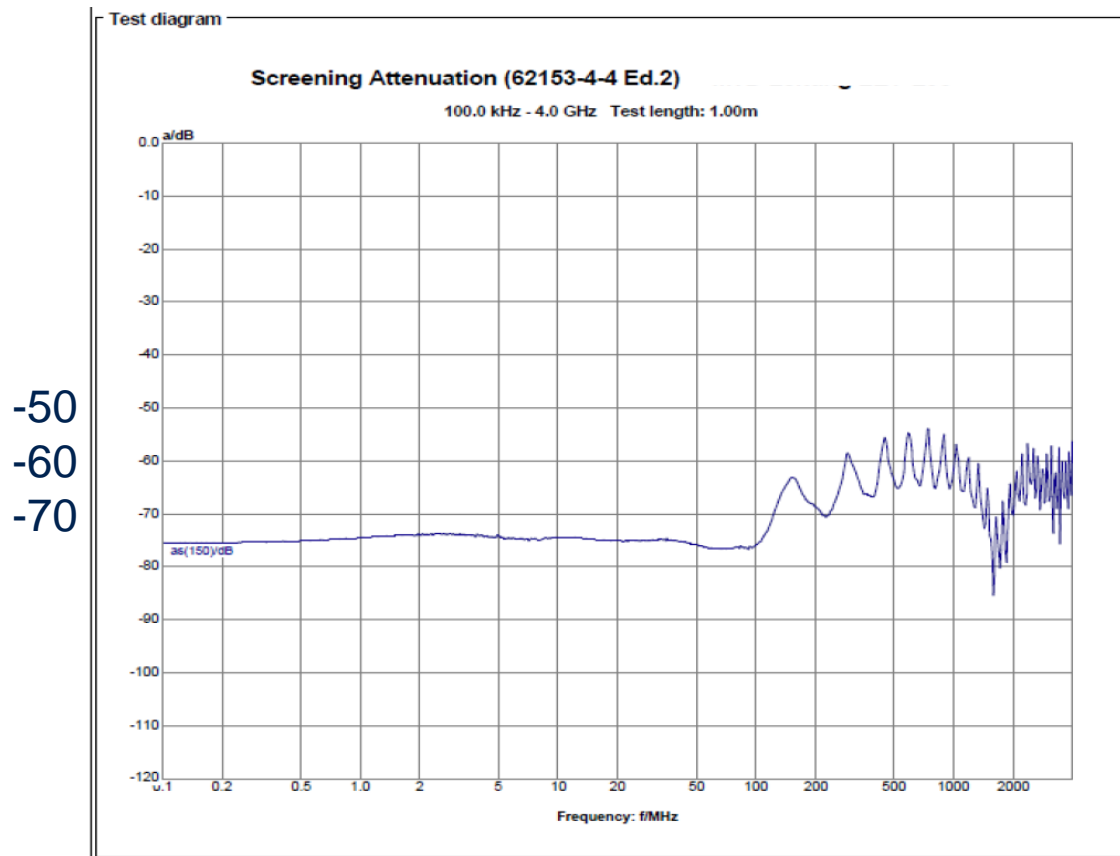


- Coupling attenuation measurement also possible with precise differential feed and termination (more challenging)

- Screening and coupling attenuation measurement with triaxial tube on component level
- Cable acc. to IEC 62153-4-4
- DUT cable length 1 m length exposed inside tube
- Connector acc. to IEC 62153-4-7 (tube-in-tube)



- Shielding attenuation of typical STP cable (AWG26)
- Foil and braid shield



- Can be measured up to 9 GHz depending on setup

- Automotive connector and cables up to ≥ 7.5 GHz RF bandwidth are available for differential 1 pair, 2 pairs and coax
 - 10 Gbps are supported from cable and connector side
 - Wire gauge for differential cables should not exceed 0.21 mm^2 to keep cable diameter $\leq 4.6 \text{ mm}$. Preferred wire gauge is 0.14 mm^2 . 0.35 mm^2 cables should be not used as baseline as the cable diameter is $\geq 5.4 \text{ mm}$
 - Wire gauge for coaxial cables should not exceed 0.4 mm^2 to keep cable diameter $\leq 3.6 \text{ mm}$
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