



**Rosenberger**

802.3ch coupling attenuation

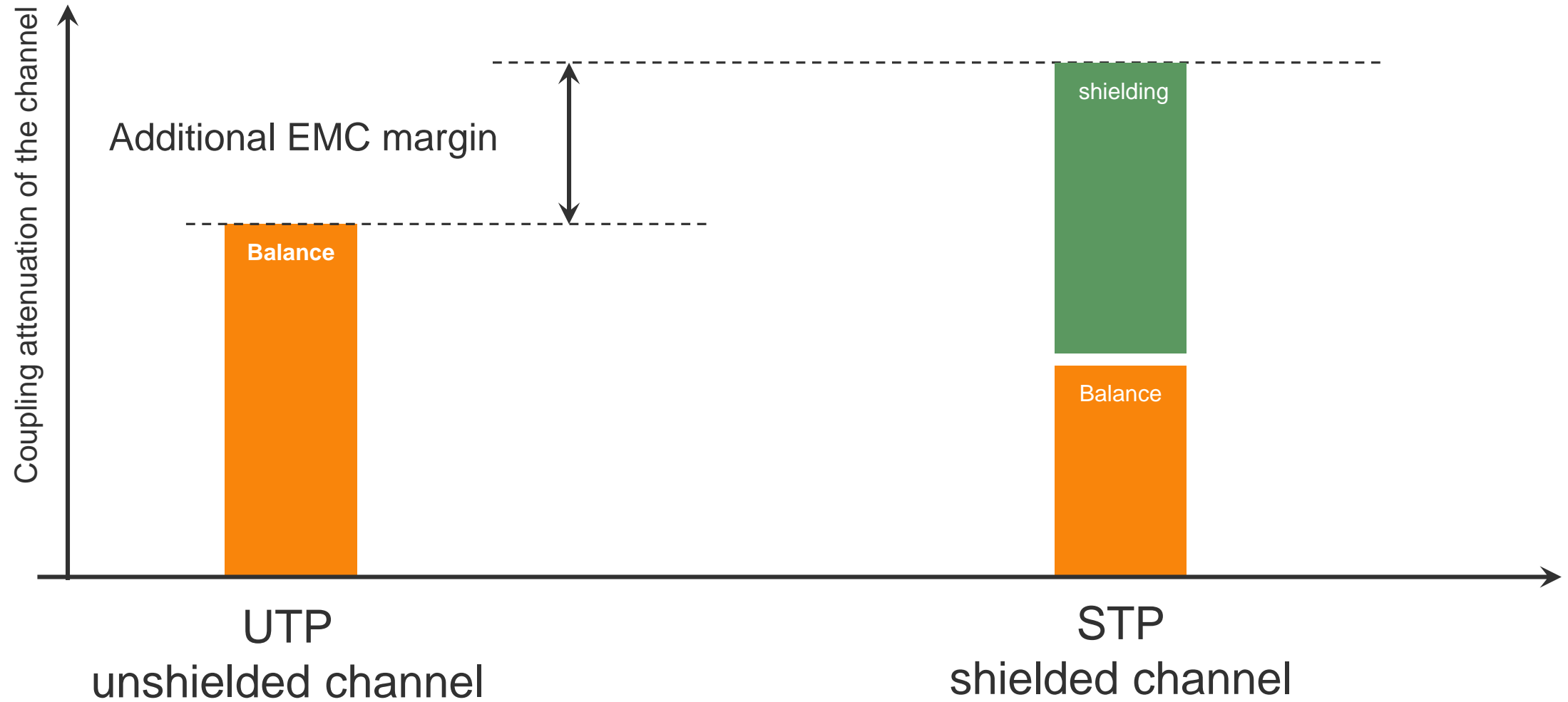
Thomas Müller

24th of May 2018



# 802.3ch channel performance

## Channel EMC budget



# 802.3ch channel performance

## Channel coupling attenuation proposal

- 802.3bp states a coupling attenuation for link segment type B (STP) of up to 60 dB for environment class E<sub>3</sub> with up to 10 V/m measured with absorbing clamp method as in IEC 62153-4-14.

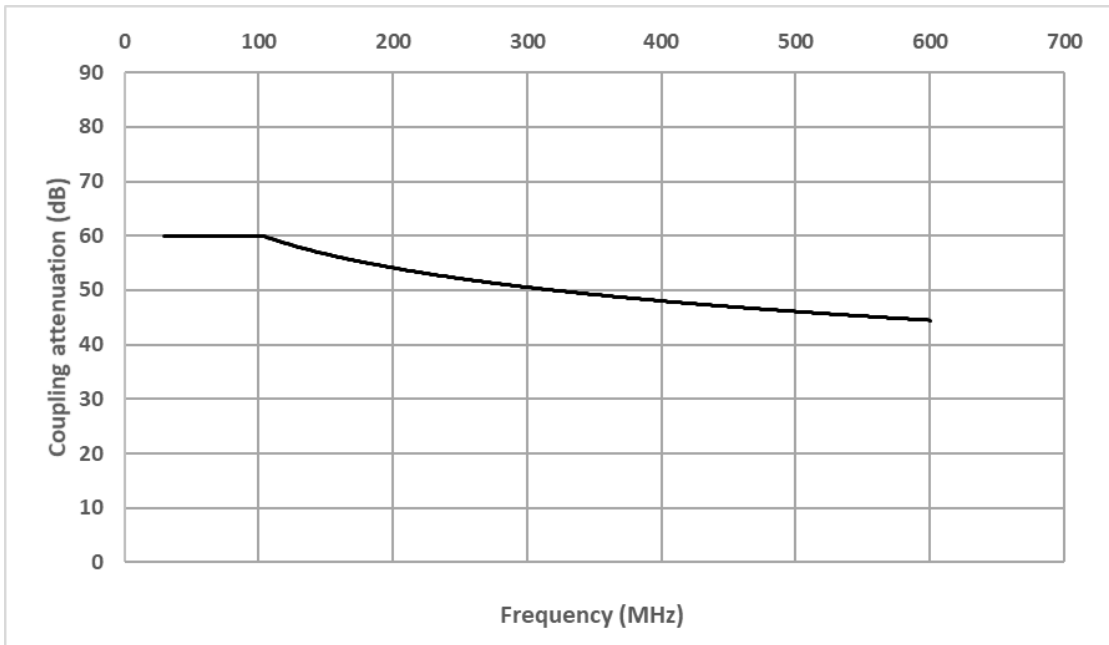


Table 97-14—Coupling attenuation Type B link segment

Frequency (MHz)	Minimum (dB)		
	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>
$30 \leq f \leq 600$	$80 - 20\log_{10}(f)$ (Max 40 dB)	$90 - 20\log_{10}(f)$ (Max 50 dB)	$100 - 20\log_{10}(f)$ (Max 60 dB)

Table 97-15—Electromagnetic classifications Type B link segment

Electromagnetic	Minimum (dB)		
	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>
Radiated RF – AM	3 V/m at (80 MHz to 1000 MHz) 3 V/m at (1400 MHz to 2000 MHz) 1 V/m at (2000 MHz to 2700 MHz)	3 V/m at (80 MHz to 1000 MHz) 3 V/m at (1400 MHz to 2000 MHz) 1 V/m at (2000 MHz to 2700 MHz)	10 V/m at (80 MHz to 1000 MHz) 3 V/m at (1400 MHz to 2000 MHz) 1 V/m at (2000 MHz to 2700 MHz)
Conducted RF	3 V at 150 kHz to 80 MHz	3 V at 150 kHz to 80 MHz	10 V at 150 kHz to 80 MHz

# 802.3ch channel performance

## Channel coupling attenuation proposal

- In automotive EMC testing, the applied electric field strength can be significantly higher than 1 V/m to 10 V/m for structural cabling, e.g. 150 V/m during vehicle testing
- Therefore the coupling attenuation for automotive application needs to be higher than for structural cabling
- 20 dB of additional coupling attenuation reduces the introduced noise voltage or radiated signal by a the factor of 10
- With existing cables and connectors a introduced differential noise level of a few mV (4 mV or lower) is achievable in a BCI test with 200 mA interfering current

[http://www.ieee802.org/3/ch/public/nov17/Cohen\\_Shirani\\_3ch\\_01\\_1108.pdf](http://www.ieee802.org/3/ch/public/nov17/Cohen_Shirani_3ch_01_1108.pdf)

[http://www.ieee802.org/3/ch/public/nov17/mueller\\_3ch\\_01\\_1117.pdf](http://www.ieee802.org/3/ch/public/nov17/mueller_3ch_01_1117.pdf)

[http://www.ieee802.org/3/ch/public/nov17/DiBiaso\\_Bergner\\_3ch\\_01\\_1117.pdf](http://www.ieee802.org/3/ch/public/nov17/DiBiaso_Bergner_3ch_01_1117.pdf)

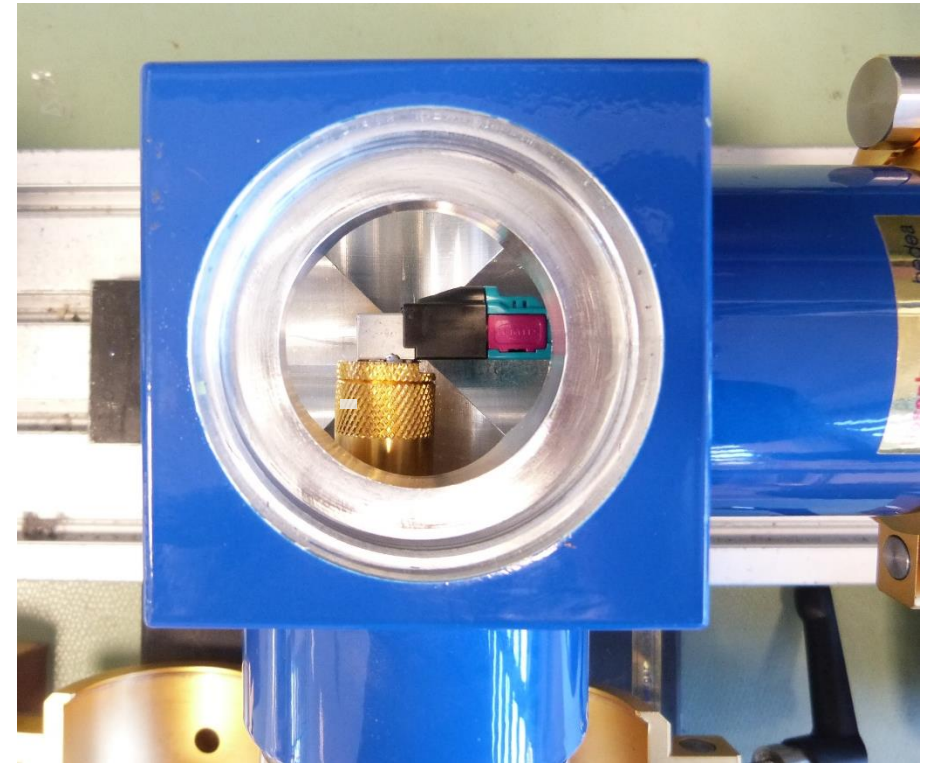
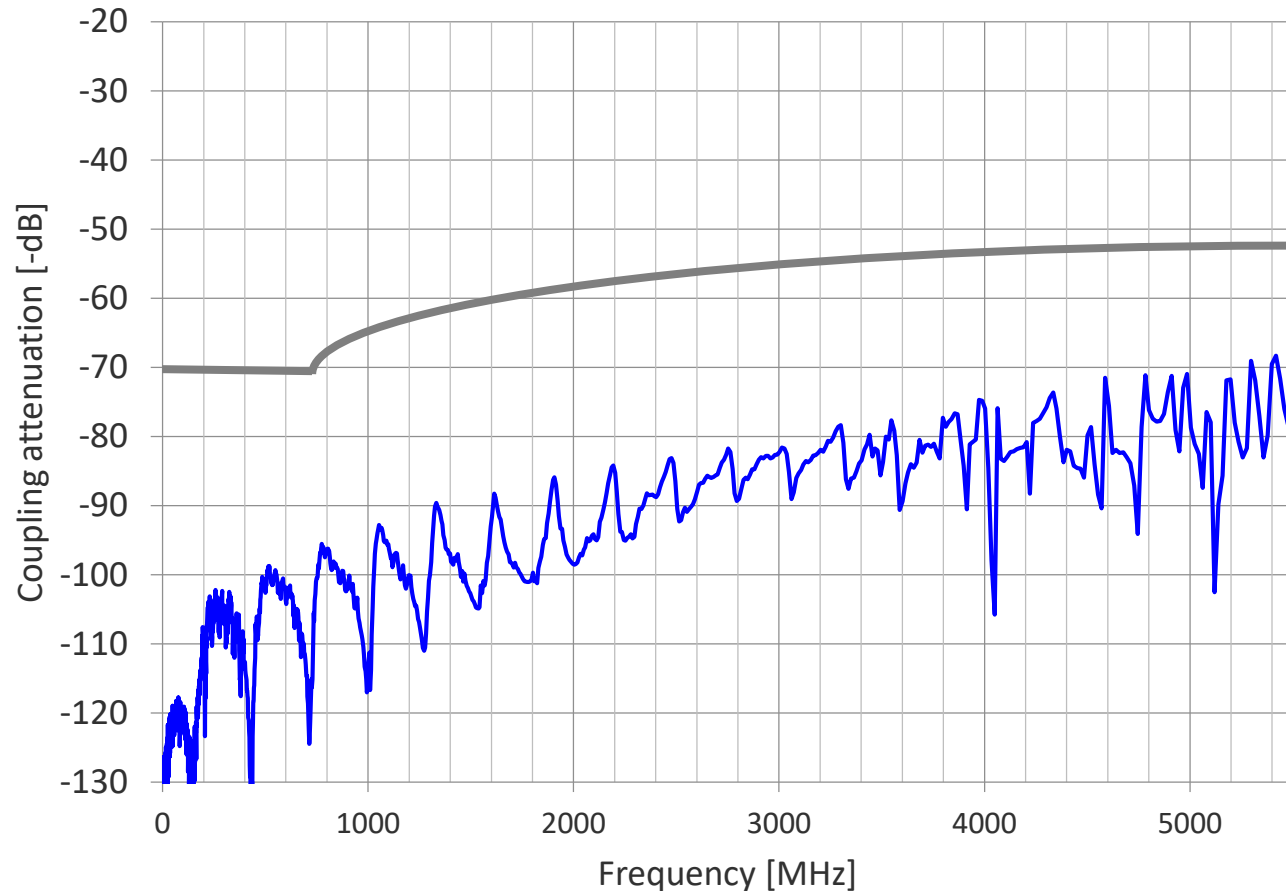
[http://www.ieee802.org/3/ch/public/jul17/cohen\\_shirani\\_3ch\\_01\\_0717.pdf](http://www.ieee802.org/3/ch/public/jul17/cohen_shirani_3ch_01_0717.pdf)

<http://www.ieee802.org/3/ch/public/adhoc/Measurement%20of%20Coupling%20Attenuation%20for%20ONGAUTO.pdf>

# 802.3ch channel performance

## Channel coupling attenuation proposal

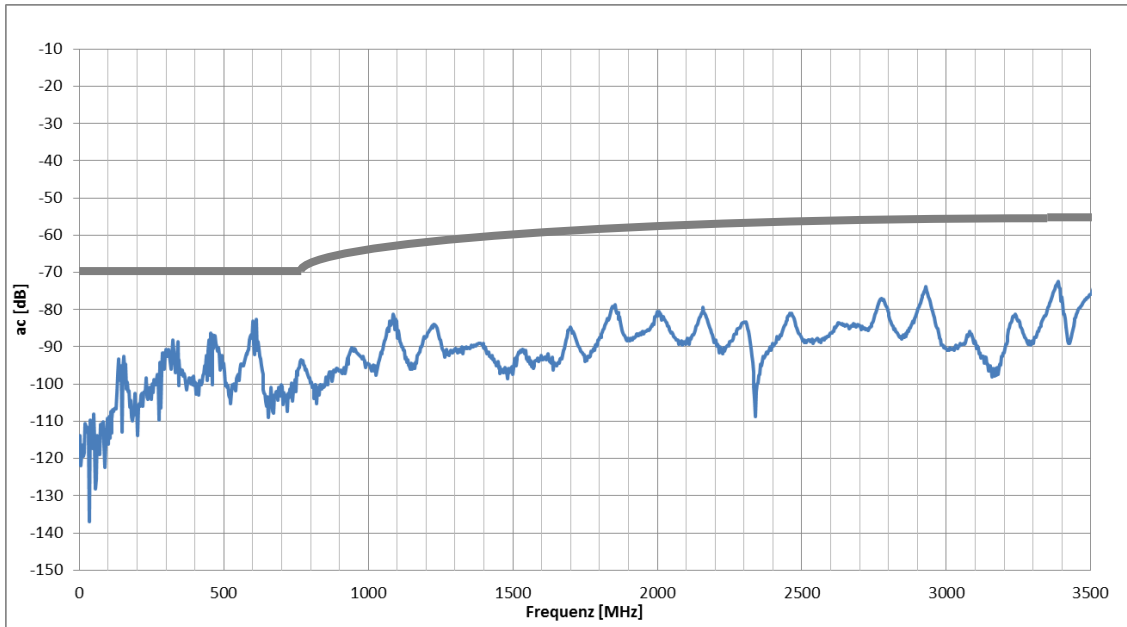
- Individual components and assemblies can be evaluated according the Triaxial Tube measurement method as gives in IEC 62153-4-x, which is industry standard in automoc
- Measurement result for PCB plug mated with cable jack



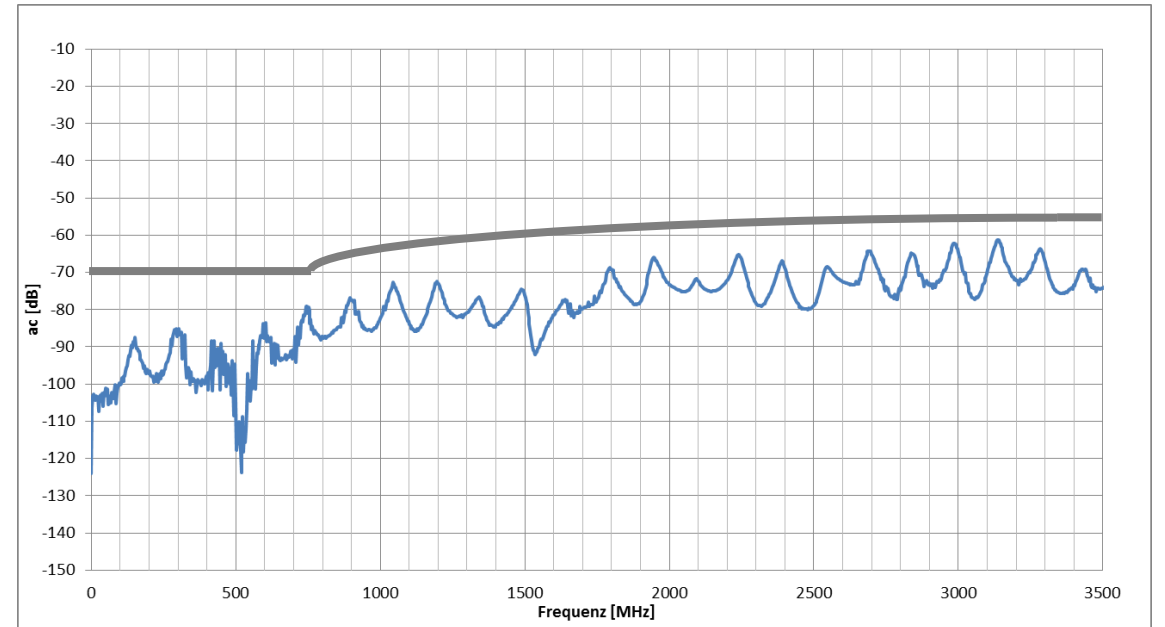
# 802.3ch channel performance

## Channel coupling attenuation proposal

- Measurement result for STP / SPP cables
- Coupling attenuation 3 m exposed length



cable type 1

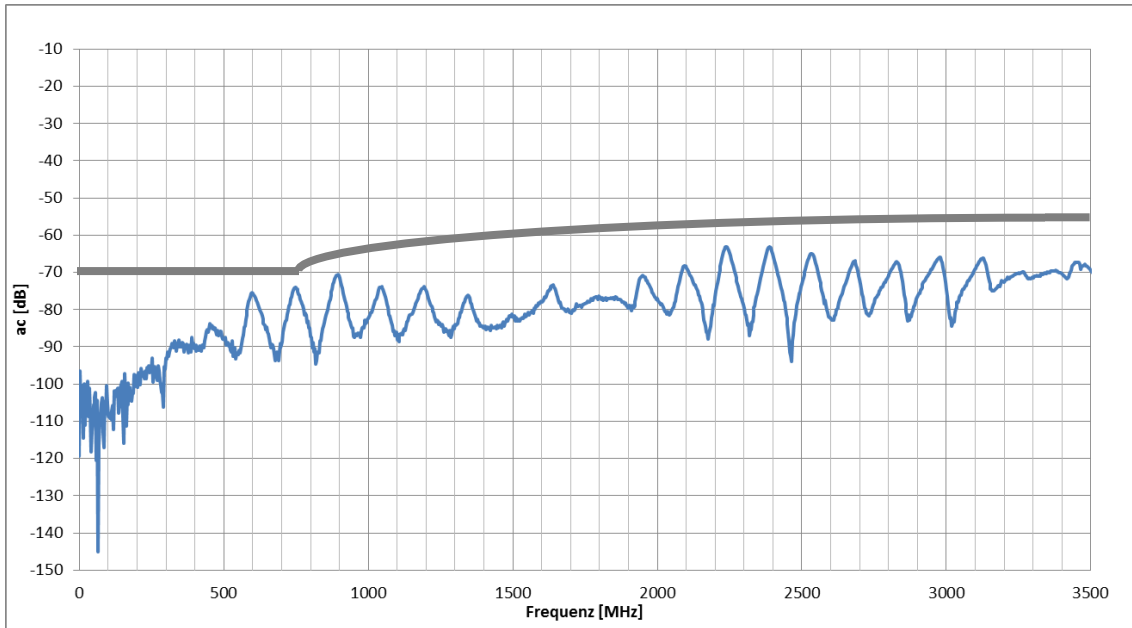


cable type 2

# 802.3ch channel performance

## Channel coupling attenuation proposal

- Measurement result for STP / SPP cables
- Coupling attenuation 3 m exposed length

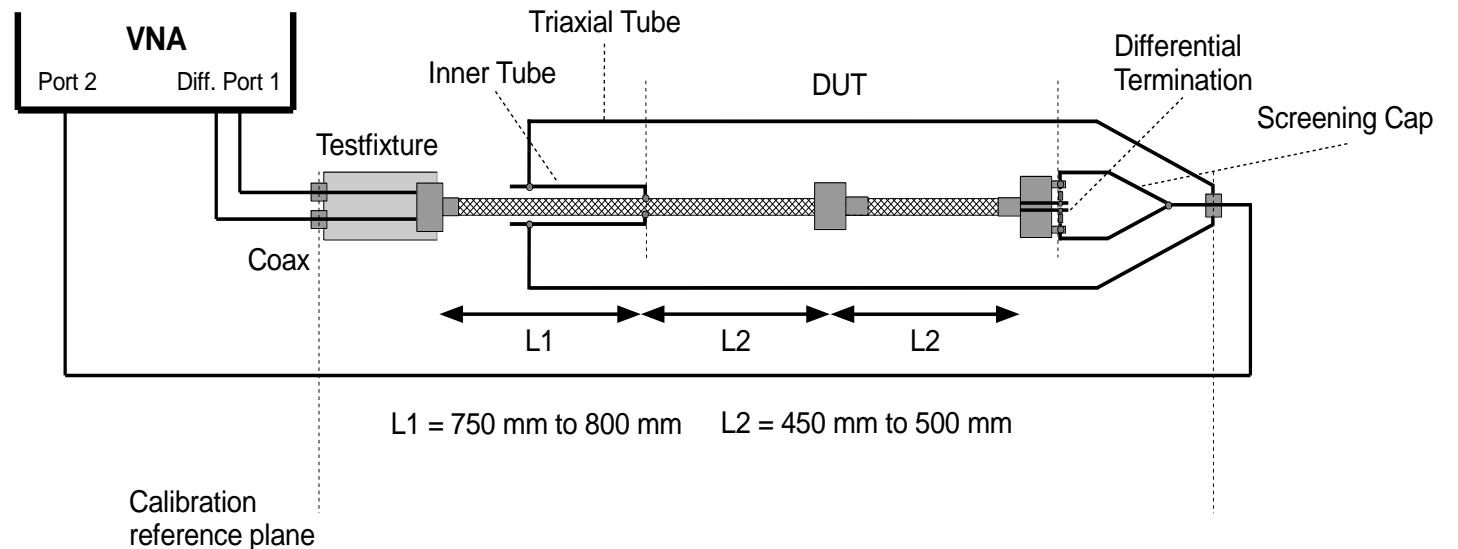


cable type 3

# 802.3ch channel performance

## Channel coupling attenuation proposal

- Propose to use the following topology to evaluate the channel coupling attenuation and to add it to the annex as reference
- Tube in tube method as in IEC 62153-4-7
- 1 m cable length exposed, 1 Inline and 1 PCB connector
- To ensure that cable and connector properties are matched in terms of shielding and balance and all type of connector is considered





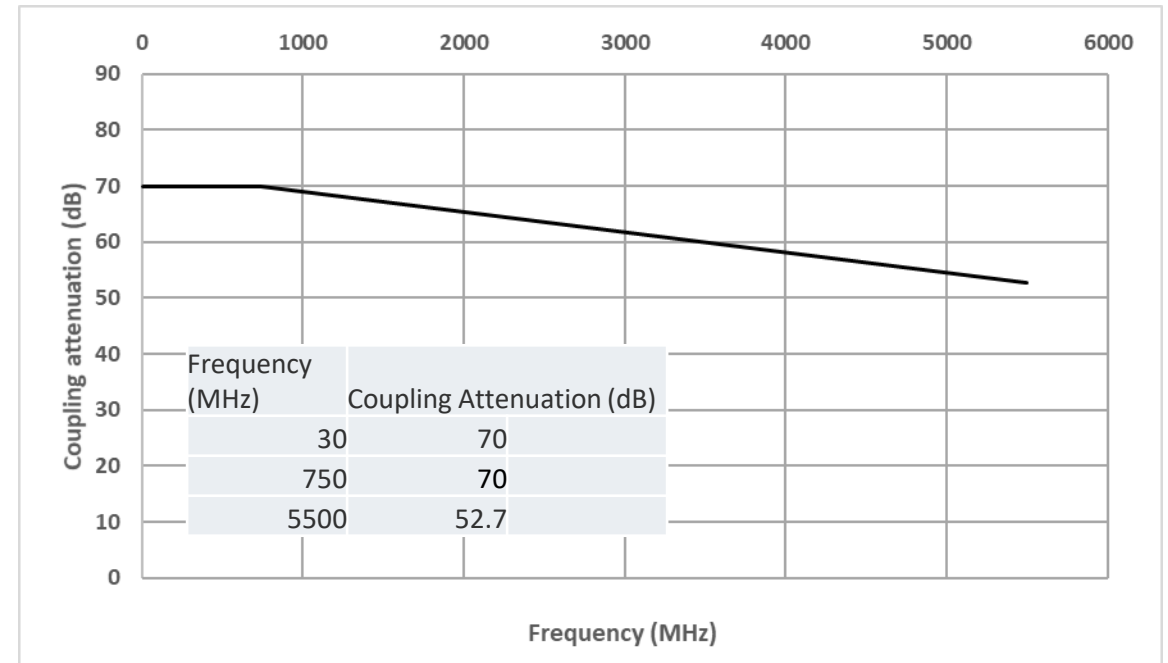
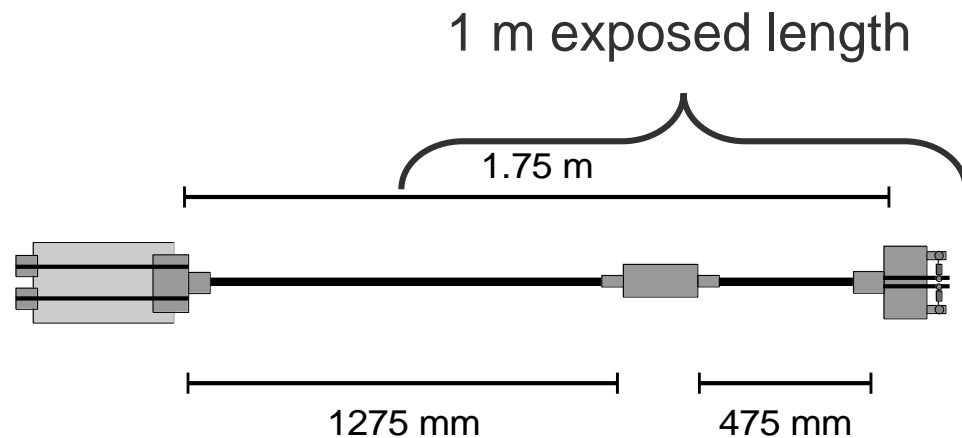
# 802.3ch channel performance

## Channel coupling attenuation proposal

- Proposal to adopt the following coupling attenuation for the channel measured with tube in tube method, based on the shown topology with 1 m cable, 1 PCB connector and 1 Inline connector in the middle exposed

$$\left( \begin{array}{cc} 70 & 30 \leq f < 750 \\ 50 - 20\log(f/7500) & 750 \leq f \leq 5500 \end{array} \right) dB$$

$30 \leq f \leq 5500$  frequency  $f$  in MHz



## Motion #

- Move to adopt Coupling Attenuation Limit given by the equation:

$$\left( \begin{array}{ll} 70 & 30 \leq f < 750 \\ 50 - 20\log(f/7500) & 750 \leq f \leq 5500 \end{array} \right) dB$$

$30 \leq f \leq 5500$  frequency  $f$  in MHz

as shown on page 9 of mueller\_3ch\_channel\_02\_0518.pfd  
for all 3 speeds for frequencies from 30 MHz to 5500 MHz.

- M: Thomas Müller
- S:
- (Technical  $\geq 75\%$ )
- Y: N: A:
- Motion Passes/Fails