



**Rosenberger**

802.3ch channel insertion loss AWG26 and AWG24

Thomas Müller

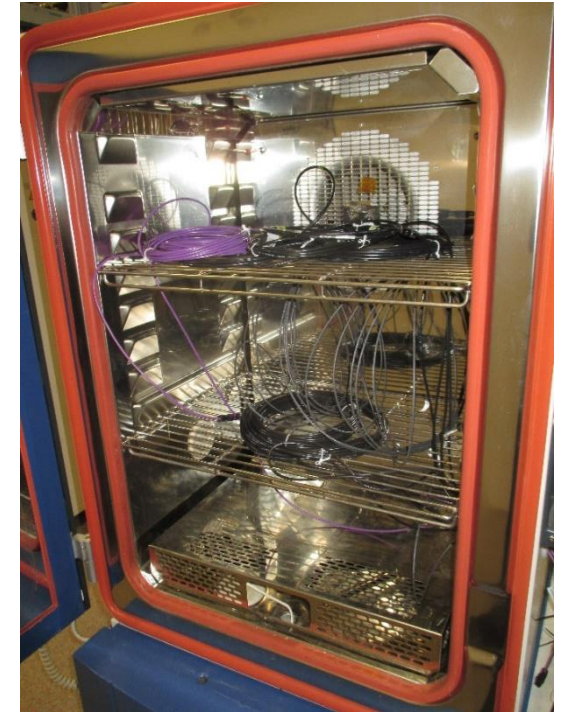
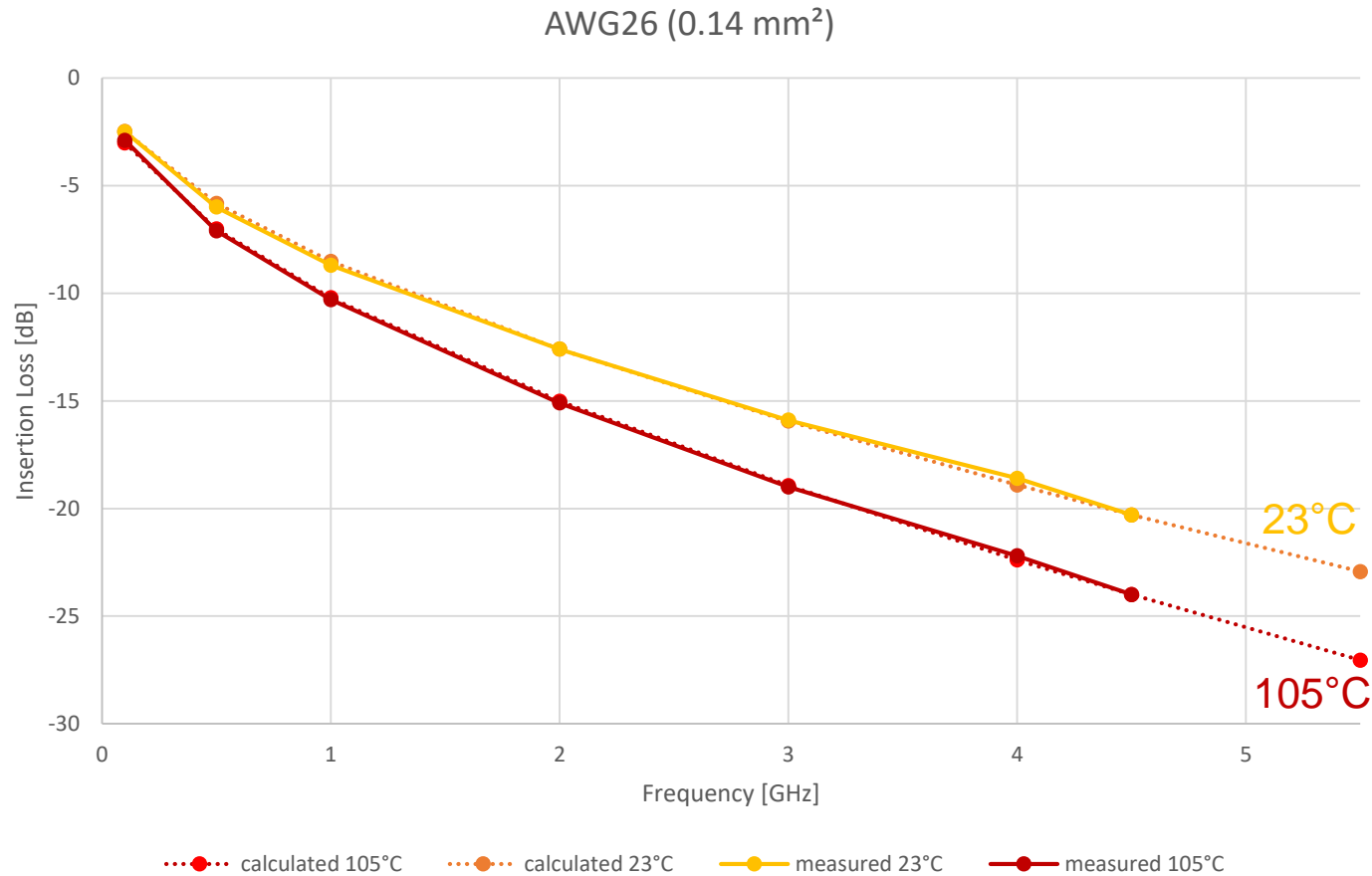
24th of May 2018



# 802.3ch channel performance

## Cable Insertion Loss

10 m cable only AWG26 (0.14 mm<sup>2</sup>) at 23°C and 105°C



23°C	105°C
C1 = 0.759	C1 = 0.924
C2 = 0.094	C2 = 0.098

$$A = P \cdot (C_1 \sqrt{f_{\text{GHz}}} + C_2 \cdot f_{\text{GHz}}) [\text{dB}]$$

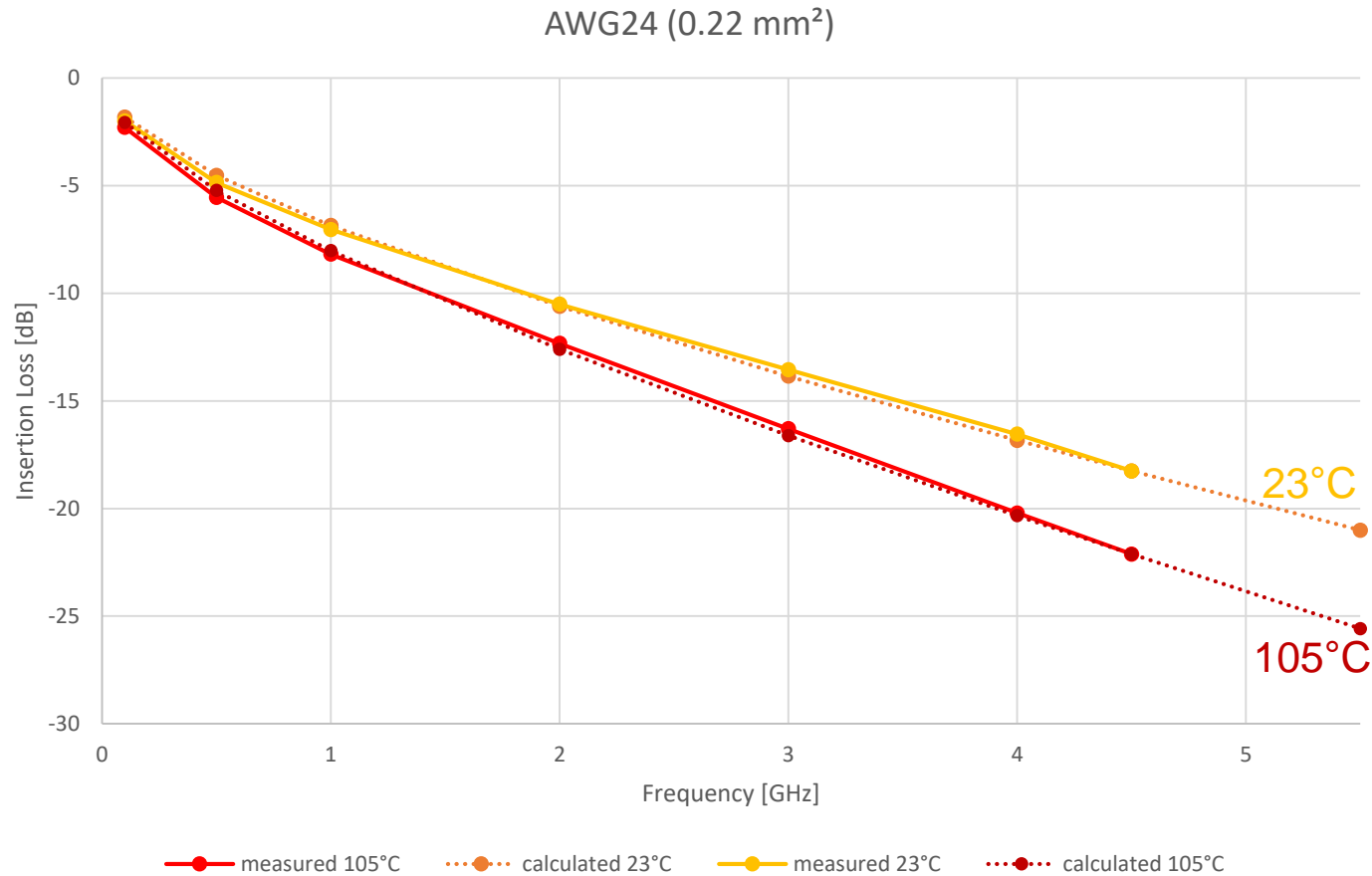
where  $f_{\text{GHz}}$  is the frequency in GHz.

- Cable parameters C1 and C2 fitted to match measurement

# 802.3ch channel performance

## Cable Insertion Loss

10 m cable only AWG24 (0.22 mm<sup>2</sup>) at 23°C and 105°C



23°C	105°C
C1 = 0.529	C1 = 0.588
C2 = 0.156	C2 = 0.214

$$A = P \cdot (C_1 \sqrt{f_{\text{GHz}}} + C_2 \cdot f_{\text{GHz}}) [\text{dB}]$$

where  $f_{\text{GHz}}$  is the frequency in GHz.

- Cable parameters C1 and C2 fitted to match measurement

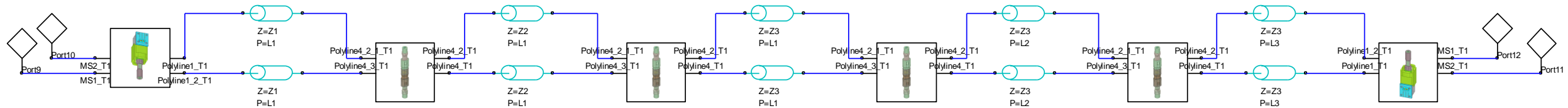
# 802.3ch channel performance

## Channel Insertion Loss

- Channel simulation topology 15 m with two PCB- and four inline connectors as shown



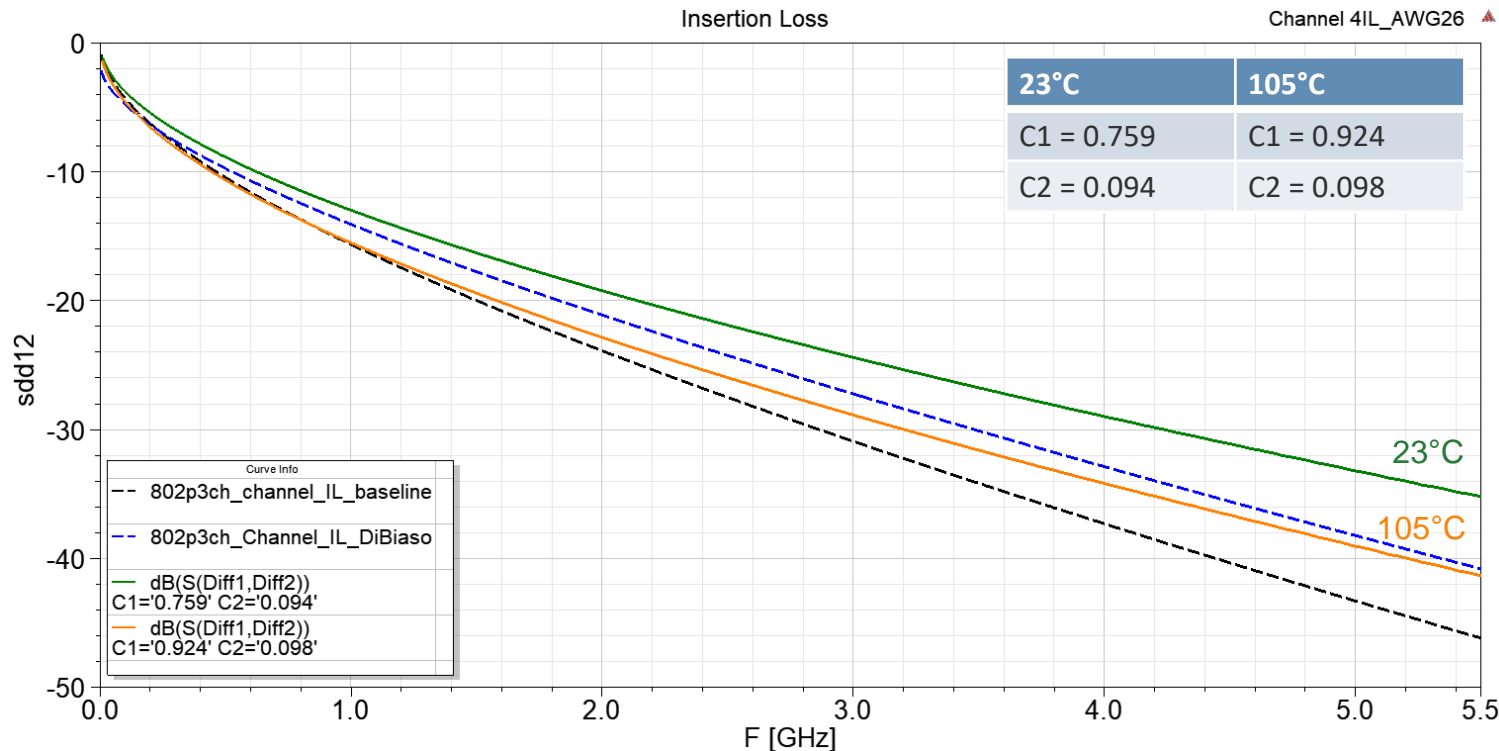
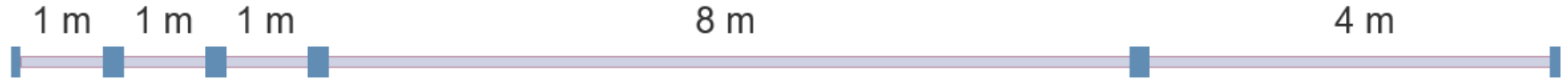
- Fitted cable model for AWG24 and AWG26 at 105°C
- Connector s-parameters of two PCB- and four inline connectors as actually designed (H-MTD type)



# 802.3ch channel performance

## Channel Insertion Loss

AWG26



Existing IL baseline proposal

$$Insertion\ loss_{dB}(f) \leq 0.0030 f + 0.40\sqrt{f}$$

where  
f is the frequency in MHz;  $5 \leq f \leq 5500$

IL baseline proposal by DiBiaso

$$Insertion\ loss_{dB}(f) \leq 0.0031 f + 0.30\sqrt{f} + 1.5$$

where  
f is the frequency in MHz;  $5 \leq f \leq 5500$

← IL baseline proposal by DiBiaso

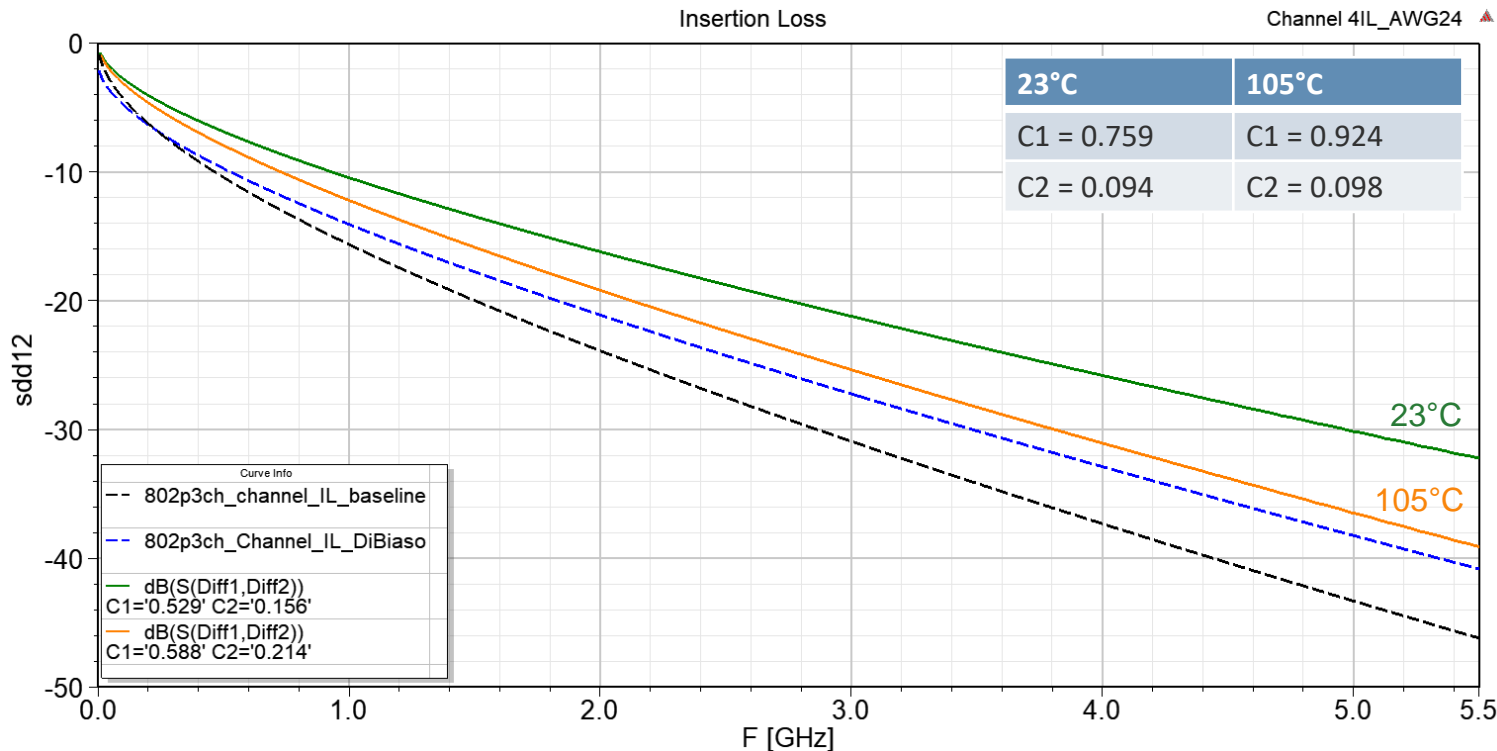
← Existing IL baseline proposal

- Existing channel IL baseline proposal is not met with AWG26 over 15 m channel length at 105°C, as presented before in mueller\_3ch\_01\_0318.pdf

# 802.3ch channel performance

## Channel Insertion Loss

AWG24



Existing IL baseline proposal

$$Insertion\ loss_{dB}(f) \leq 0.0030 f + 0.40\sqrt{f}$$

where  
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IL baseline proposal by DiBiaso

$$Insertion\ loss_{dB}(f) \leq 0.0031 f + 0.30\sqrt{f} + 1.5$$

where  
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← IL baseline proposal by DiBiaso

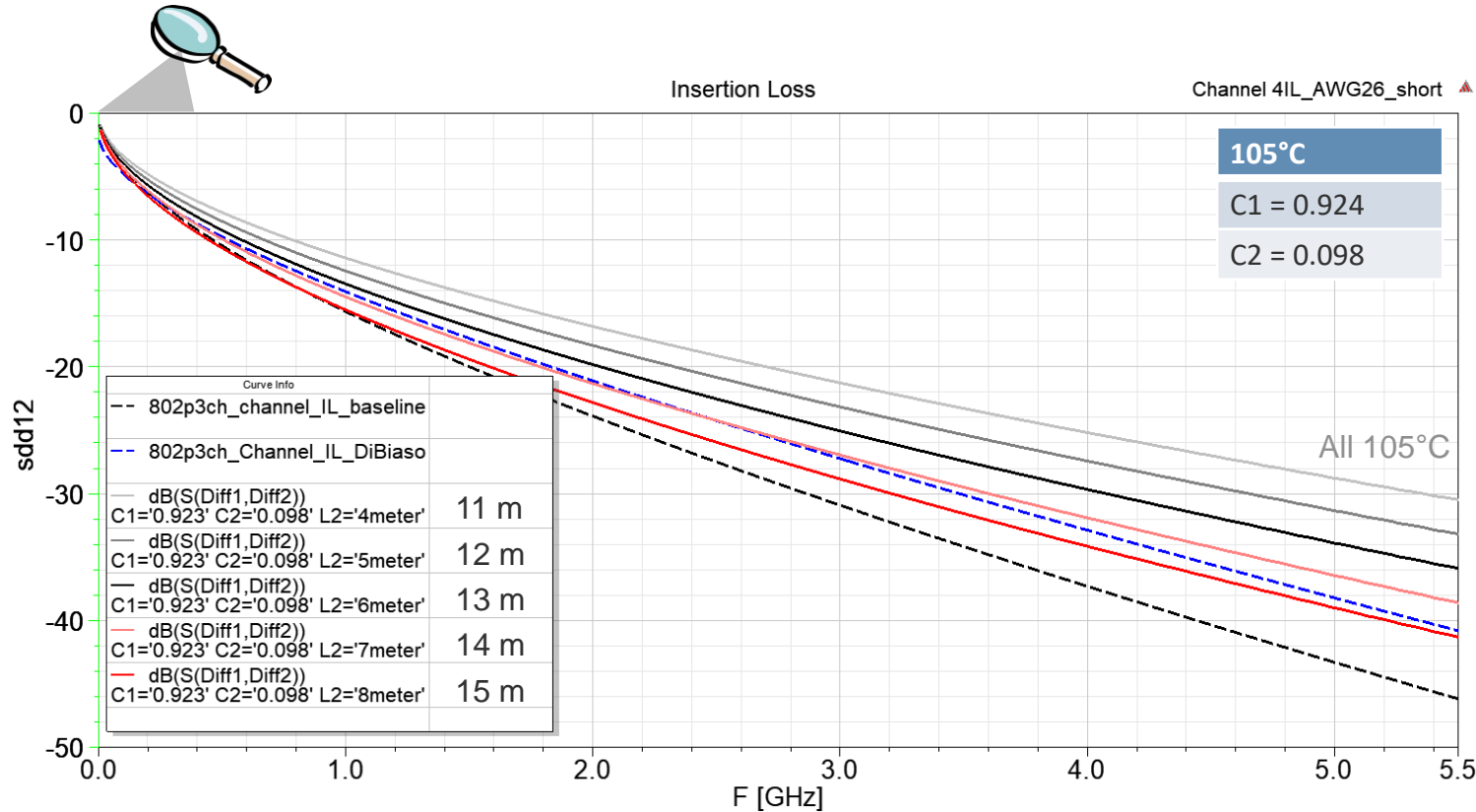
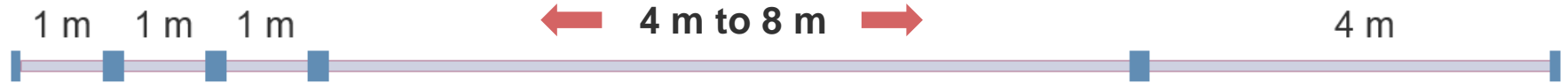
← Existing IL baseline proposal

- Existing channel IL baseline and proposed limit by DiBiaso is met with AWG24 over 15 m channel length at 105°C with small margin left

# 802.3ch channel performance

## Channel Insertion Loss

AWG26



Existing IL baseline proposal

$$Insertion\ loss_{dB}(f) \leq 0.0030 f + 0.40\sqrt{f}$$

where  
f is the frequency in MHz;  $5 \leq f \leq 5500$

IL baseline proposal by DiBiaso

$$Insertion\ loss_{dB}(f) \leq 0.0031 f + 0.30\sqrt{f} + 1.5$$

where  
f is the frequency in MHz;  $5 \leq f \leq 5500$

← IL baseline proposal by DiBiaso

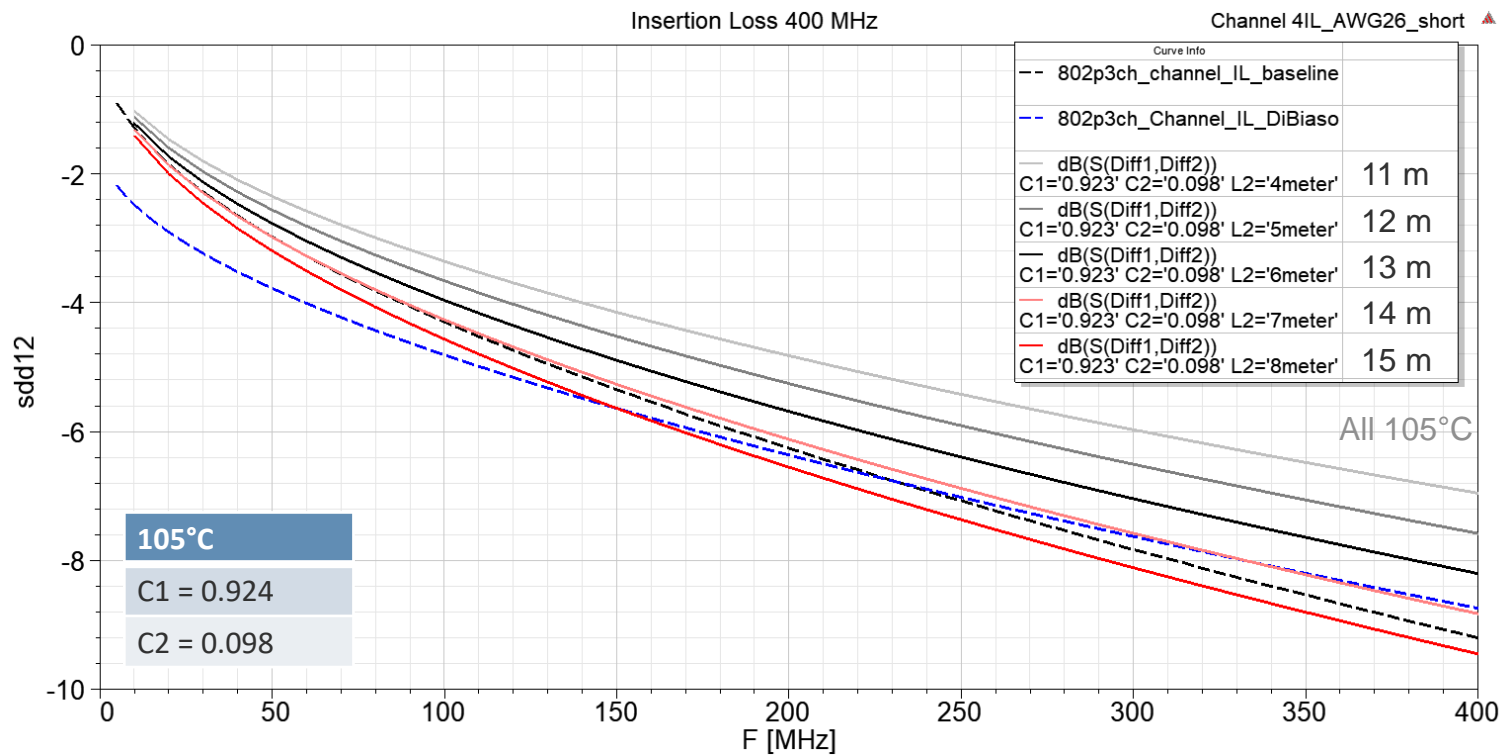
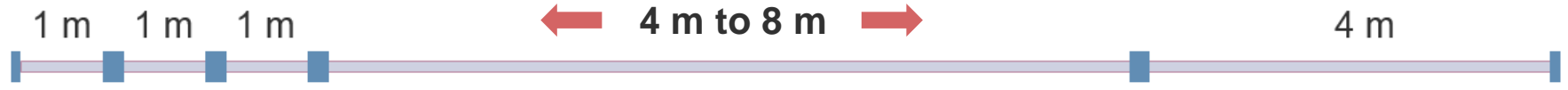
← Existing IL baseline proposal

- When using AWG26 cable, the maximum channel length has to be reduced by at least two meters to 13 m, depending on the specific cable IL

# 802.3ch channel performance

## Channel Insertion Loss

AWG26  
up to 400 MHz



Existing IL baseline proposal

$$Insertion\ loss_{dB}(f) \leq 0.0030 f + 0.40\sqrt{f}$$

where  
f is the frequency in MHz;  $5 \leq f \leq 5500$

IL baseline proposal by DiBiao

$$Insertion\ loss_{dB}(f) \leq 0.0031 f + 0.30\sqrt{f} + 1.5$$

where  
f is the frequency in MHz;  $5 \leq f \leq 5500$

- ← IL baseline proposal by DiBiao
- ← Existing IL baseline proposal

- When using AWG26 cable, the maximum channel length has to be reduced by at least two meters to 13 m, depending on the specific cable IL



# 802.3ch channel performance

## Summary

- The proposed channel insertion loss limit by DiBiaso based on AWG24 seems to be feasible for temperatures up to 105°C for a channel length of 15 m, including two PCB- and four inline connectors
- The proposed channel insertion loss limit provides only small additional margin
- When AWG26 cable is used, the channel length needs to be reduced to 13 m or less, depending on the specific cable IL