# 3GHZ BANDWITDH STP CABLES USE FOR 2,5/5/10GB/S SPEED GRADES

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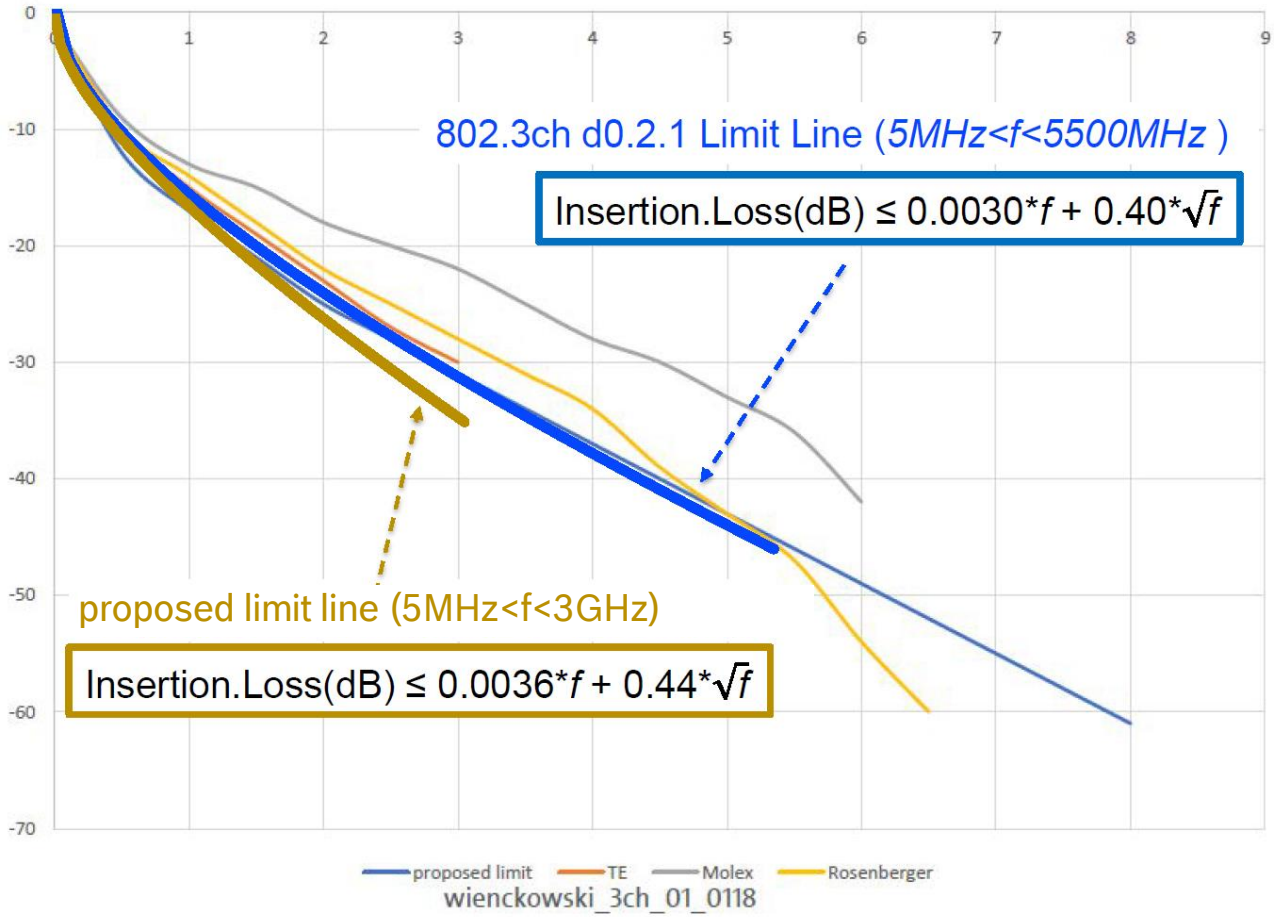
# BW of STP cables used for 2.5/5/10Gb/s
## Defined cable BW limits



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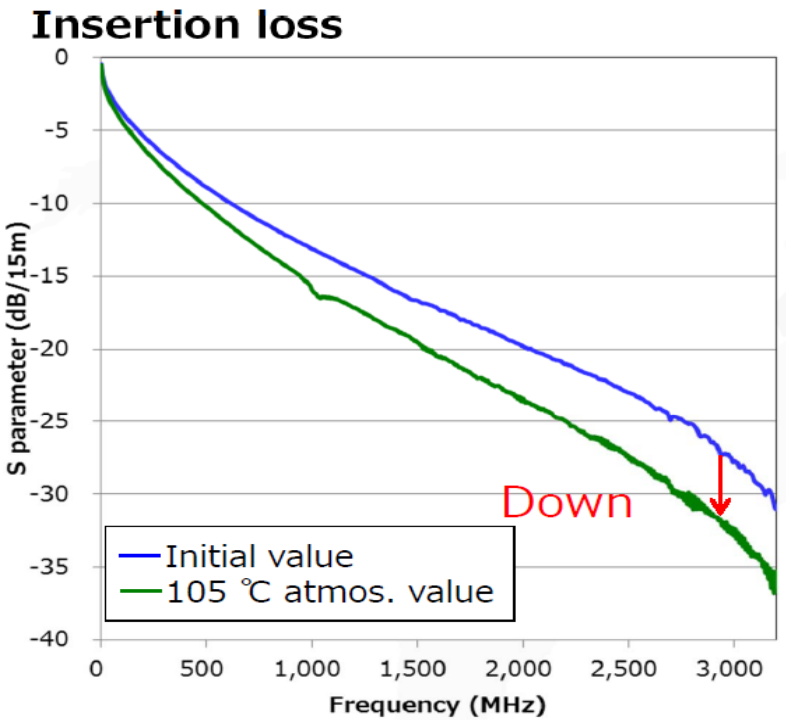
## Cable degradation

- As we can see in http://www.ieee802.org/3/ch/public/nov17/kumada_3ch_01_1117.pdf cabling degradation in high temperature surroundings is an issue




Graph 5: Insertion loss

| Frequency | Initial value | 105 ℃ atmos. | |
|---|---|---|---|
| | IL | IL | Change rate |
| MHz | dB / 15m | dB / 15m | % |
| 10 | -1.46 | -1.63 | 11.2 |
| 100 | -3.95 | -4.39 | 11.1 |
| 1000 | -13.5 | -16.0 | 18.5 |
| 2000 | -19.8 | -23.4 | 18.0 |
| 3000 | -28.5 | -32.7 | 14.4 |
| 3200 | -29.1 | -36.1 | 24.0 |

$$Change\ rate = \frac{(IL_{105\,℃\ atmos.} - IL_{Initial\ value})}{IL_{Initial\ value}}$$



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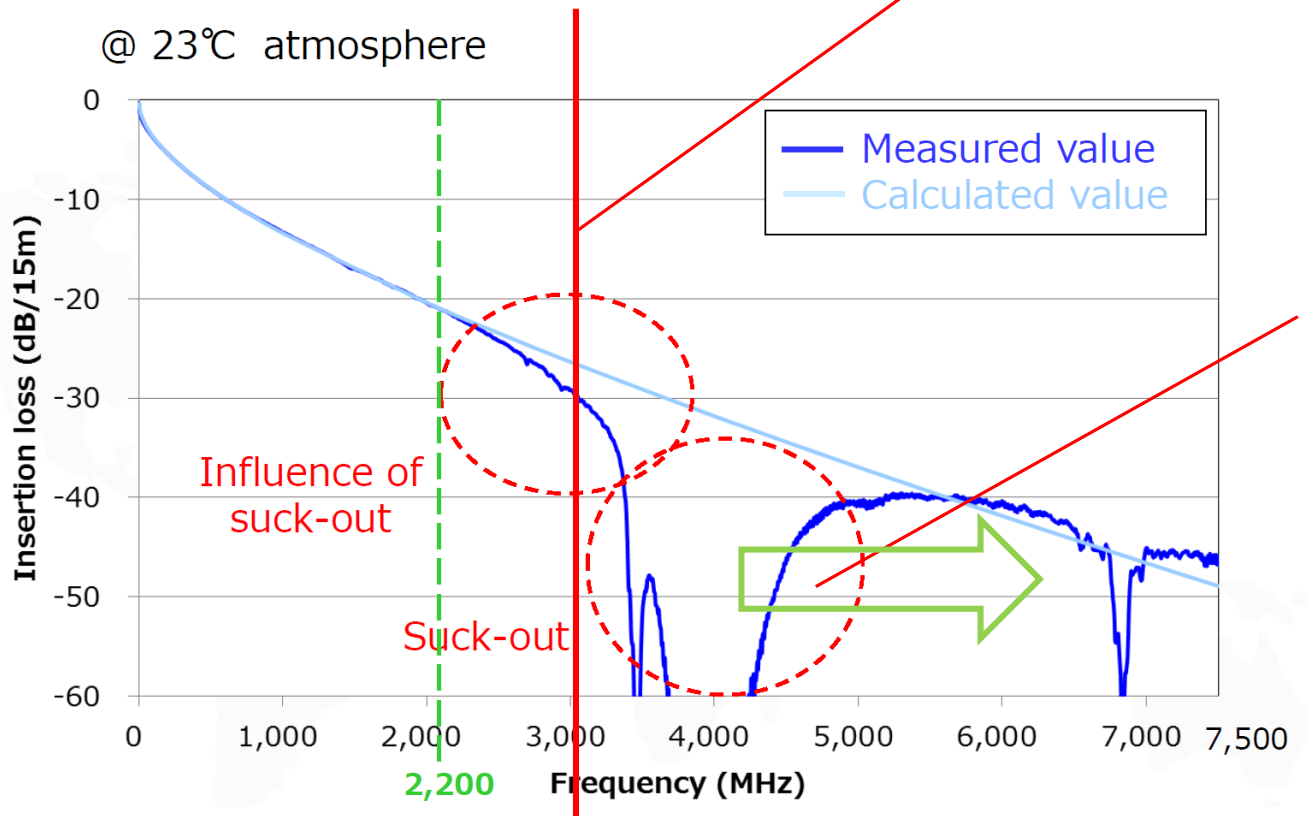
## Expected cable issues

- Real measurement results show a suck out area:




3GHz operating point

Suck out area may can be shifted to higher frequencies by using more advanced connectors and cables structure which are maybe not matured in a automotive environment

www.ieee802.org/3/ch/public/jan18/kumada_3ch_01a_0118.pdf



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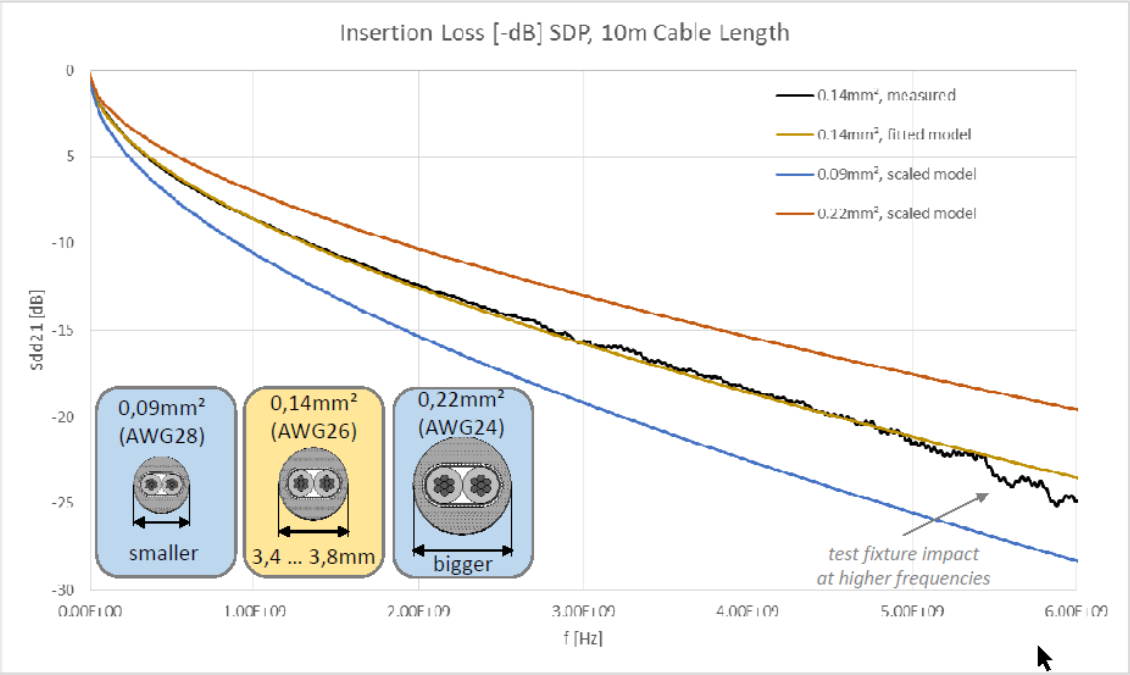
# BW of STP cables used for 2.5/5/10Gb/s

## Raw material trends: copper

- Cable BW depends also on wire diameter (higher BW -> more copper) http://www.ieee802.org/3/ch/public/may17/DiBiaso_3NGAUTO_01_0517.pdf




- Although the relative cost development of copper is hard to predict, current trends showing a increase the next few years (electro mobility trends, 3 times more copper in a car) www.finanzen.net/rohstoffe/kupferpreis/chart

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# BW of STP cables used for 2.5/5/10Gb/s
## Raw material trends: silicon

- Continued advancement in silicon process technology allows implementing more functionality/complexity in PHYs by keeping the relative cost equal or lower

- Silicon does not have such a dynamic market value development like copper

https://www.boerse.de/zertifikate/Silizium-Basket-auf-Silizium-Basket-Raiffeisen-Centrobank-AG-/AT0000A01FP0

| silicon technology outlook | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| year | 2008 | 2010 | 2012 | 2014 | 2016 | 2018 | 2020 | 2022 |
| Technology in nm | 45 | 32 | 22 | 16 | 11 | 8 | 6 | 4 |




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## Conclusion

- It is highly recommended to keep signal BW within 3 GHz to keep the link operation away from existing STP cabling suck out regions
- By using a suitable PAM modulation, there is enough SNR margin to use a 3 GHz STP cable ()
- Using a SPP cable in automotive environment is quite challenging (connectors and length matching)
- If the 10Gb/s link quality relays more on a more improved/robust PHY design than on an improved link segment (cable) the OEM has the freedom to change the link segment in trouble cases (changing a PHY in an ECU is not so easy)

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Thank You !!!

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## Supporters:

- Tbd