

IEEE 802.3CY – BEYOND 10G ELECTRICAL AUTOMOTIVE ETHERNET PHY TF

Insertion Loss Margin Evaluation

Eric DiBiaso and Emilio Cuesta

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Purpose of the Analysis

- Report IL performance of 11 meter link segment using 24AWG solid conductor cable. Results presented showing margin to the proposed insertion loss limit at both room temperature and 105C.

https://www.ieee802.org/3/cy/public/adhoc/diminico_et_all_3cy_01a_05_18_21.pdf

Updated Link Segment Strawman IL

An adjustment to the Link Segment IL proposal was put fourth by Thomas Muller in *mueller_3cy_01_05_18_21.pdf*

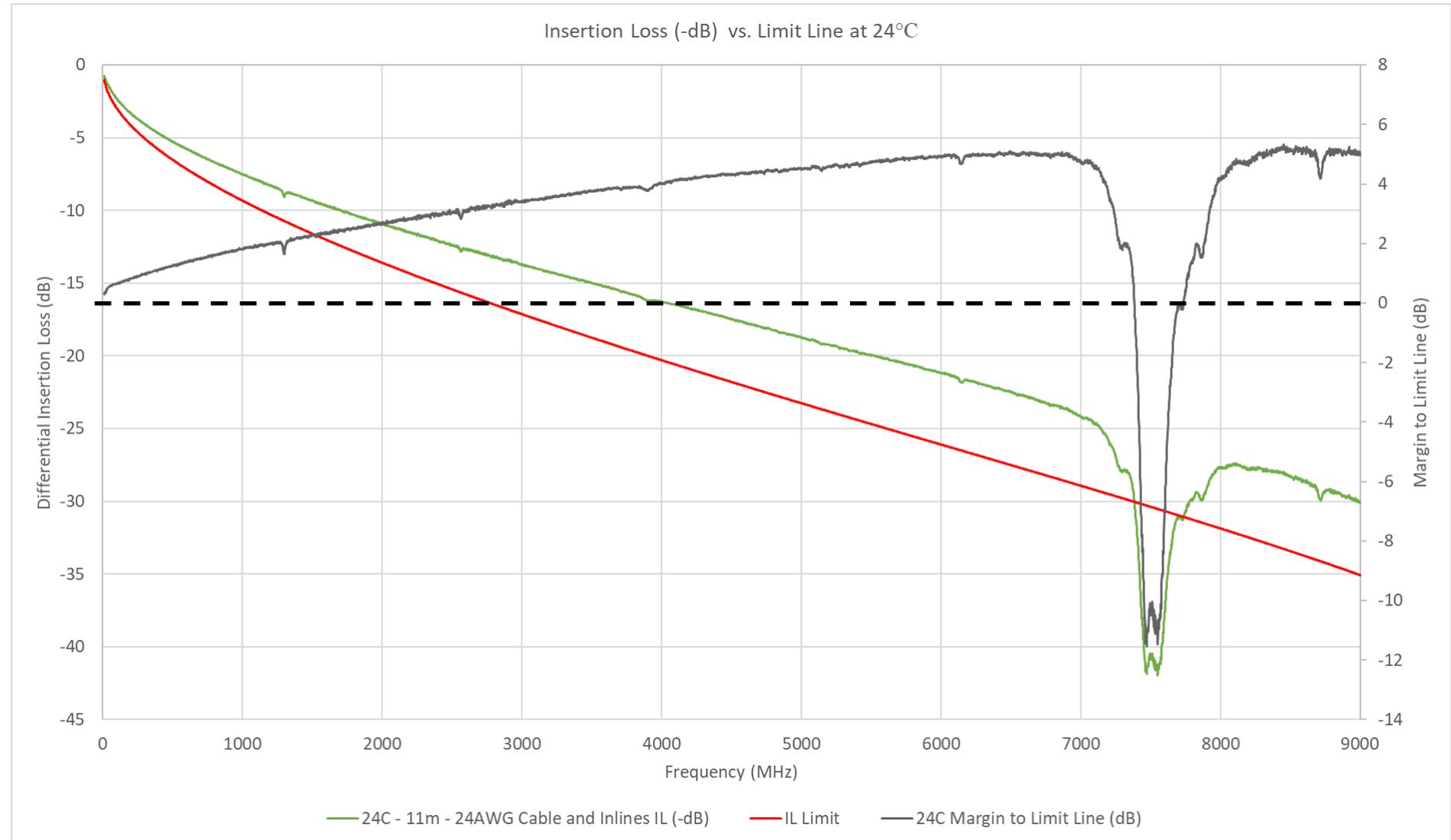
$$IL_{LinkSegment}(dB) \leq 0.00135(f_{MHz}) + 0.3564(f_{MHz})^{0.45} + 0.495\left(\frac{f_{MHz}}{7500}\right)^6$$

where f is the frequency in MHz; $10 \leq f \leq 9000$



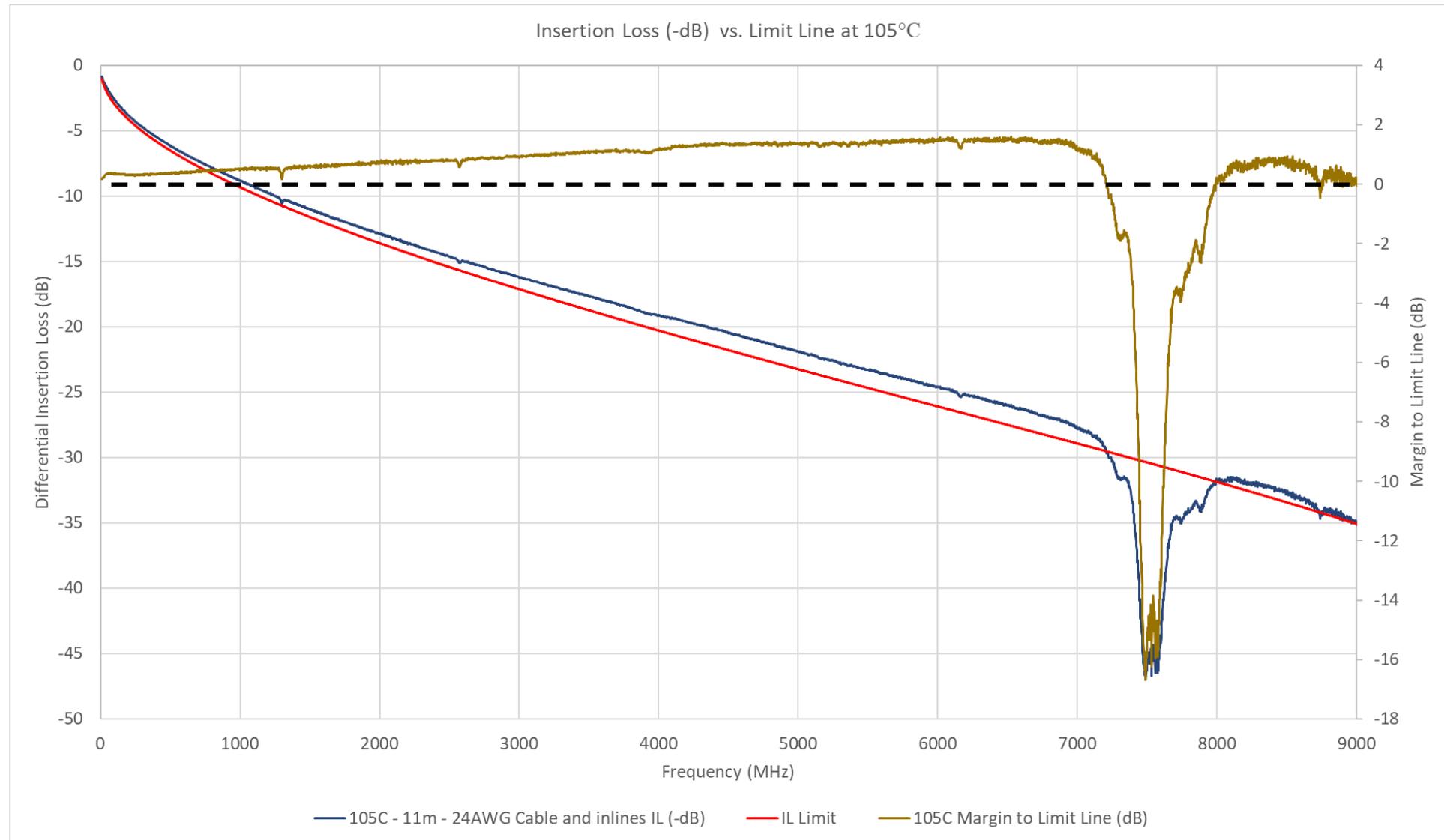
Insertion Loss vs. Limit Line (24°C)

- 11 meter 24AWG solid conductor cable with IL included for 2 inline connectors. (Loss from Inline connectors not directly measured with this cable assembly.)
- IL from PCB Fixtures Removed
- All 11 meters at 24°C
- Cables not aged.



Insertion Loss vs. Limit Line (105°C)

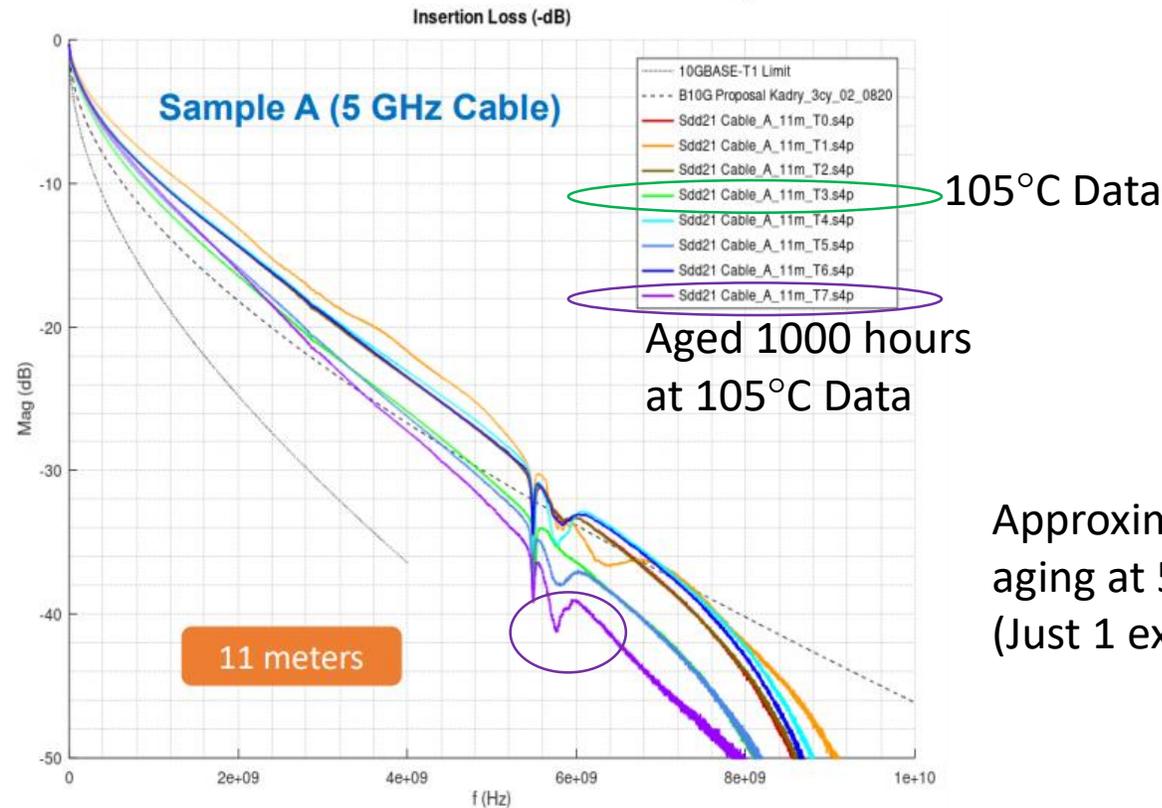
- 11 meter 24AWG solid conductor cable with IL included for 2 inline connectors. (Loss from Inline connectors not directing measured with this cable assembly.)
- IL from PCB Fixtures Removed
- All 11 meters at 105°C
- Cables not aged.



Example of Heat Aging

- 24 AWG cable has not been heat aged; however, please reference the previous contribution for 26 AWG heat aging example.

https://www.ieee802.org/3/cy/public/adhoc/DiBiaso_Bergner_Cuesta_3cy_adhoc_01b_10_28_20.pdf



Approximately 2dB additional loss from heat aging at 5 GHz when compared to 105°C data. (Just 1 example, other cables may be different)

Conclusion

- Less than 1.6dB margin to the limit line when entire cable is at 105°C across entire frequency range.
- This margin can increase when only 5 meters of cable is exposed to 105°C.
- This margin can decrease when cable is exposed to heat aging .
- This analysis demonstrates the proposed link segment insertion loss limit seems appropriate and will have minimal margin when an 11 meter 24AWG solid conductor cable is exposed to the automotive environment.