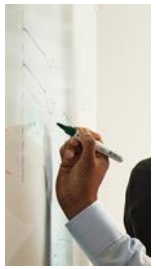
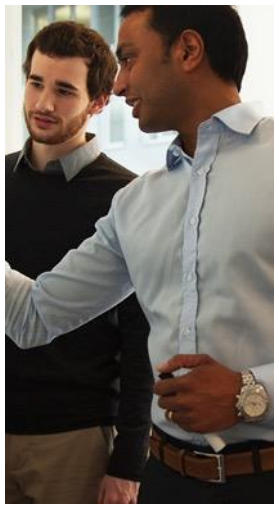




100G OSFP Cable Assemblies

Insertion Loss Analysis

Nathan Tracy

Feb 27, 2019

Model and Test Setup

The following data is from 50G OSFP MCBs with 2.55 dB of insertion loss at 26.56 GHz rather than the 2.3 dB currently being used as a placeholder in IEEE 802.3ck

There is currently an IEEE generated 17.6 dB insertion loss target placeholder for the cable assembly channel TP1 to TP4.

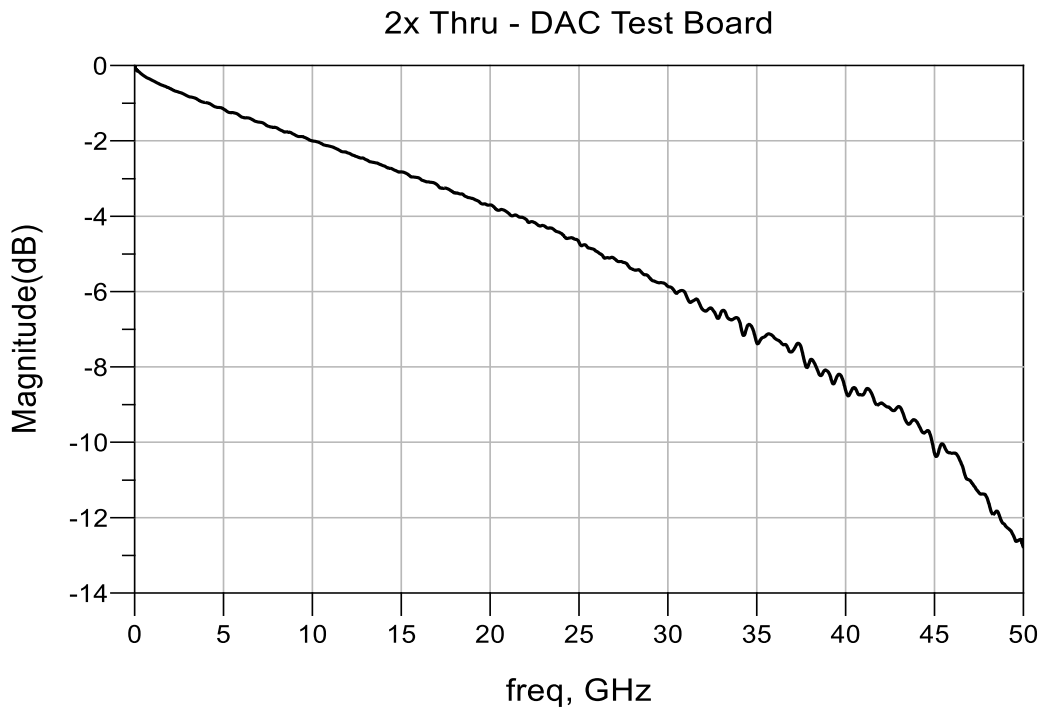
Due to the fact TE is using a **2.55 dB MCB**, the following data is referenced to an 18.1 dB IEEE target

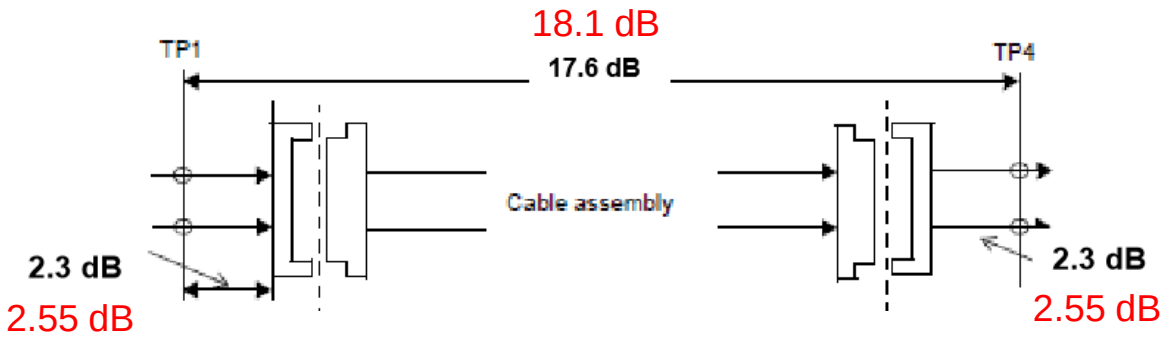
17.6 dB + (2.55 – 2.3)* 2 = 18.1 dB

TE is using a **modified 50G OSFP receptacle** (modified module mating zone, MSA compliant)

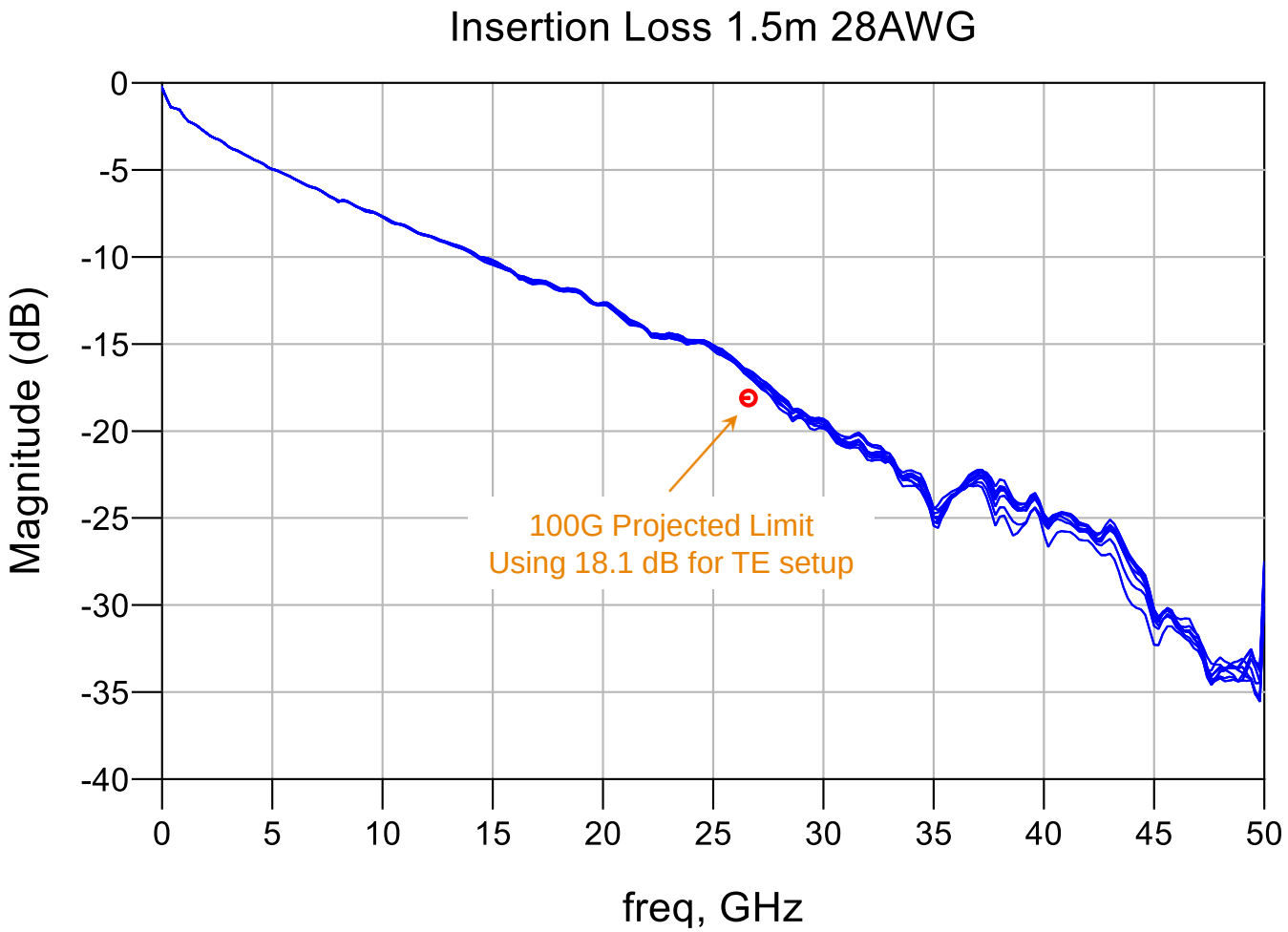
TE is using a 100G OSFP cable assembly

TE's suggested new target loss will be shared later in the slide deck





Model: 1.5 meter 28 AWG Insertion Loss



16 traces represented

1 cable assembly * 16 pairs

Nominal Geometry

17.6 dB IEEE setup = 18.1 dB TE setup

Average = 16.7 dB at 26.56 GHz

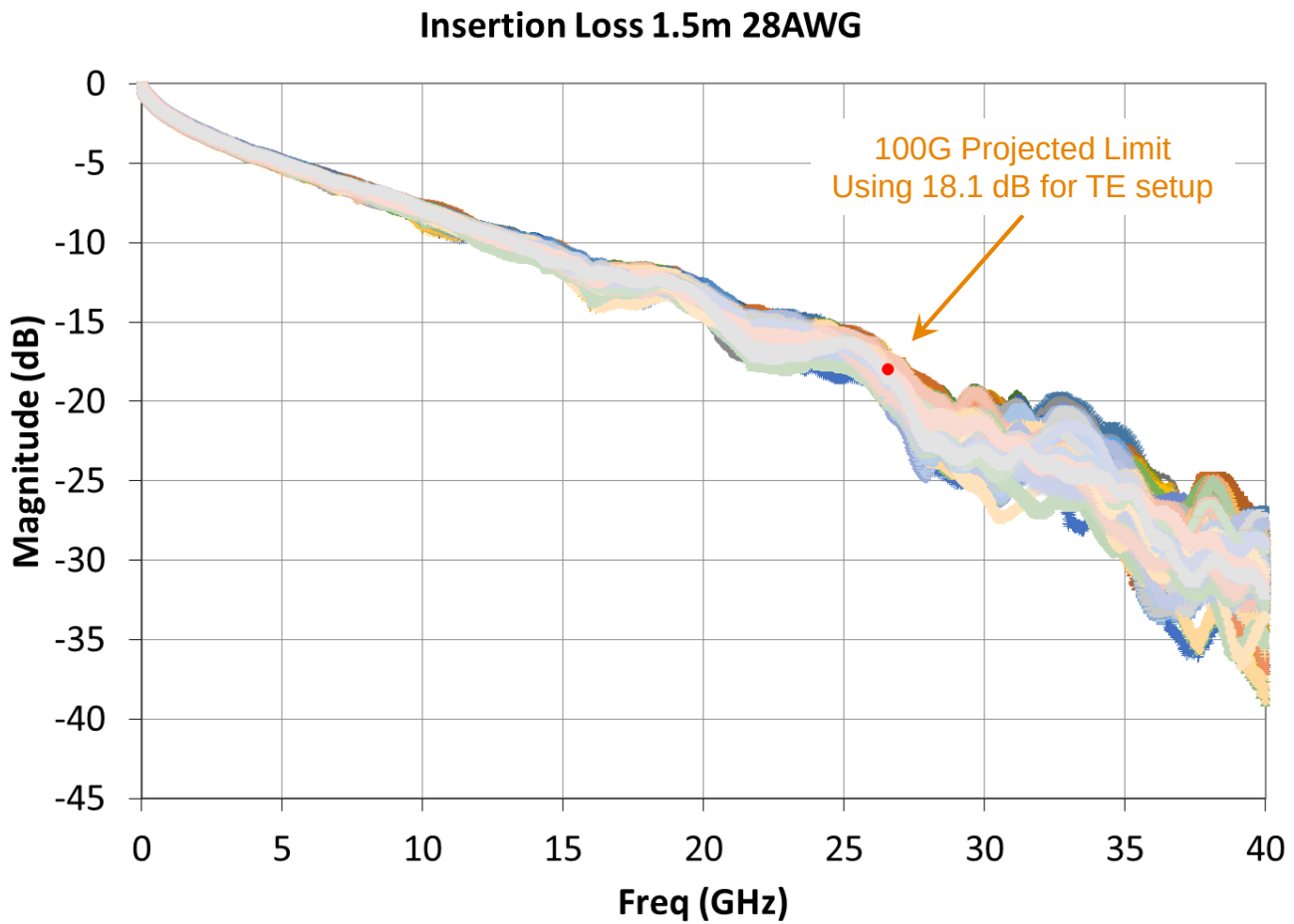
Minimum = 16.5 dB at 26.56 GHz

Maximum = 16.9 dB at 26.56 GHz

Passing with margin

Should we be confident? No!

Test: 1.5 meter 28 AWG Insertion Loss



128 traces represented

8 cable assemblies * 16 pairs

17.6 dB IEEE setup = 18.1 dB TE setup

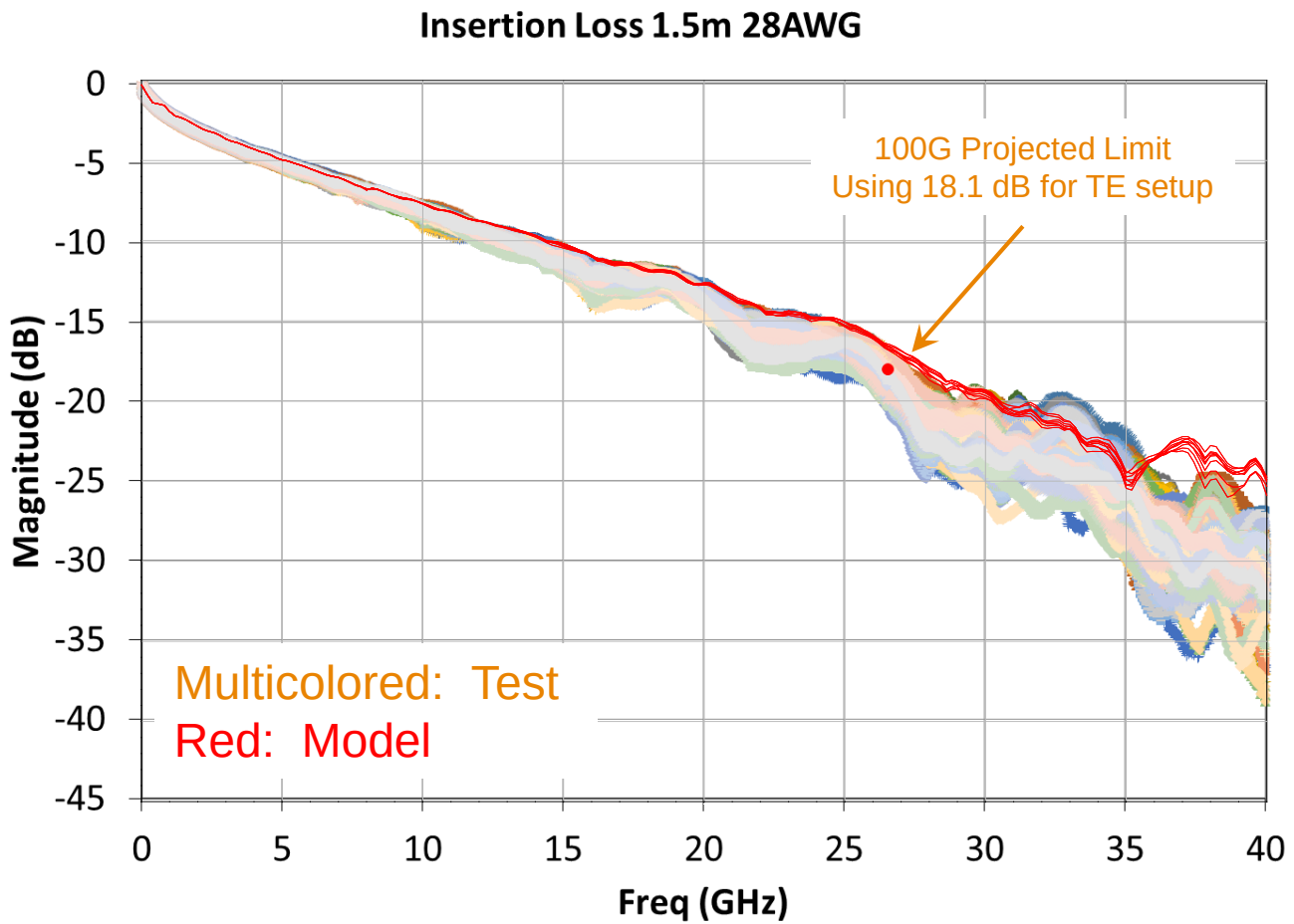
Average = 18.4 dB at 26.56 GHz

Minimum = 17.0 dB at 26.56 GHz

Maximum = 20.5 dB at 26.56 GHz

Manufacturing variation causes a spread in the insertion loss data

Model vs Test: 1.5 meter 28 AWG Insertion Loss



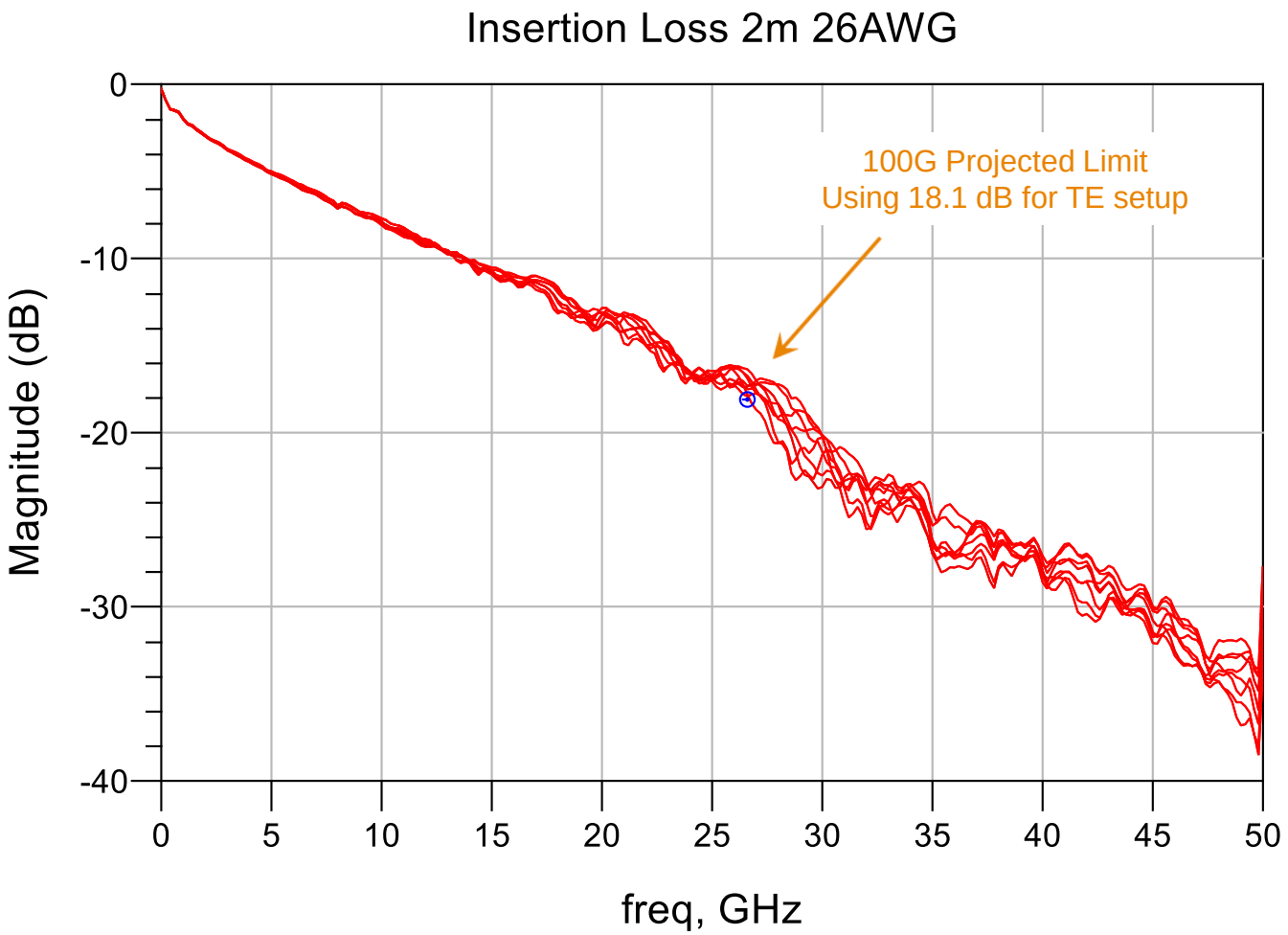
Model matches best case in test which is expected for a nominal model

Test data will include all manufacturing tolerances and variations. This data includes multiple raw cable lots and multiple paddlecard lots

Spread of test data at 26.56 GHz is much larger than at previous nyquist frequency of 13.28 GHz

Must consider variation in the ability for a cable assembly to meet the IEEE requirement

Model: 2 meter 26 AWG Insertion Loss



16 traces represented

1 cable assembly * 16 pairs

Nominal Geometry

17.6 dB IEEE setup = 18.1 dB TE setup

Average = 17.3 dB at 26.56 GHz

Minimum = 16.4 dB at 26.56 GHz

Maximum = 17.9 dB at 26.56 GHz

Tight to limit

Larger spread due to termination constraints and larger conductor size

Test Expectations: 2 meter 26 AWG Insertion Loss

1.5m 28AWG model comparison to 2m 26 AWG model

- Worst case pair 16.9 dB versus 17.9 dB
- Delta of 1 dB

1.5m 28AWG model comparison to 1.5m 28AWG test

- Worst case pair 16.9 dB versus 20.5 dB
- Delta of 3.6 dB

2m 26AWG test expectation

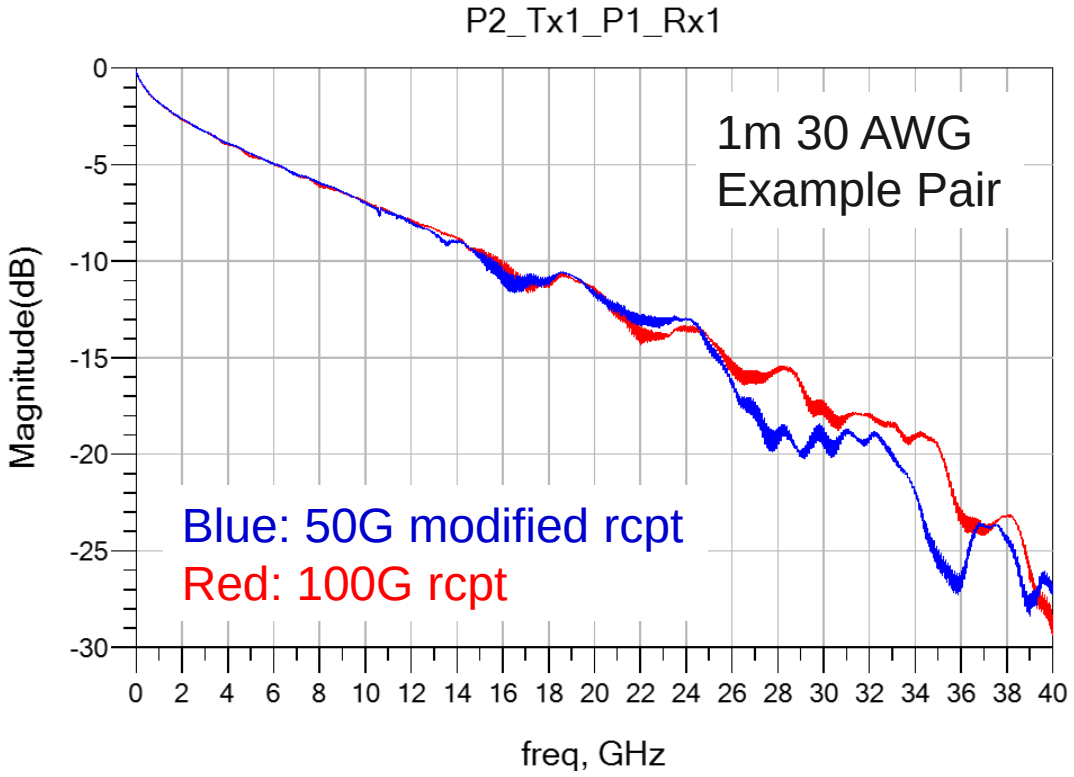
- 20.5 dB (1.5m28 test) + 1 dB (delta 1.5m28 and 2m26 models) = 21.5 dB (18.1 dB target)
- 17.9 dB (2m26 model) + 3.6 dB (delta worst case test and model 1.5m28) = 21.5 dB (18.1 dB target)
- Adjusting for MCB differences = 21.5 dB – (2.55 – 2.3)* 2 dB = **21 dB (17.6 dB target)**

Improvements using 100G Receptacle

TE has recently built our first 100G receptacle prototypes. No conditioning, no refinements

Comparison testing between the 50G modified receptacle and 100G receptacle has been limited to date

Improvements are expected, but not enough statistical data to make a firm recommendation



1m 30 AWG Cable Assembly

	100G receptacle	50G modified receptacle	Delta	21 dB Improves to…
Worst Pair	-16.3	-17.9	1.6	19.4
Average	-15.3	-16.0	0.7	20.3
Best Pair	-14.4	-15.0	0.6	20.4

2m 28 AWG Cable Assembly

	100G receptacle	50G modified receptacle	Delta	21 dB Improves to…
Worst Pair	-22.5	-24.3	1.8	19.2
Average	-21.1	-22.7	1.6	19.4
Best Pair	-19.9	-20.8	0.8	20.2

* Improvement subtracted delta from 21 dB

Conclusions

- The current 17.6 dB placeholder does not allocate enough insertion loss to the cable assembly channel TP1 to TP4
- TE would recommend increasing this insertion loss budget by several dB to 19.4 – 20.4 dB
- There is manufacturing variation that needs to be accounted for when setting the TP1-TP4 budget
- Note that the analysis conducted by TE does not include other known variables such as temperature