Method for improving Return Loss in order to reduce PHY power

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IEEE 802.3 Next Generation BASE-T Study Group March 2013, Orlando

Supporters

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- Dan Dove - APM
- Yakov Belopolsky – BelStewart
- Brad Booth – Dell
- Scott Sommers - Molex

Overview

- Goal: Improve channel Return Loss in order to reduce PHY power consumption
- Testing with RJ45 form factor got similar RL results as shown in Larsen_01_0113_ngbt
- Achieved a 9dB improvement in Return Loss using an improved connector based on IEC 60603-7-71 form factor on proposed IEEE channel (no MDI)
- Demonstrated Compatibility to 10GBASE-T

Test Configurations

- 40G to 40G (2-connector proposed IEEE channel)
  - Long Channel – 30 meters
    - 3m patch, 24m horizontal, 3m patch
  - Short Channel – 5 meters
    - 1m patch, 3m horizontal, 1m patch
- 40G to 10G (Backwards Compatibility)
  - Component test 40G Jack with 10G Plugs

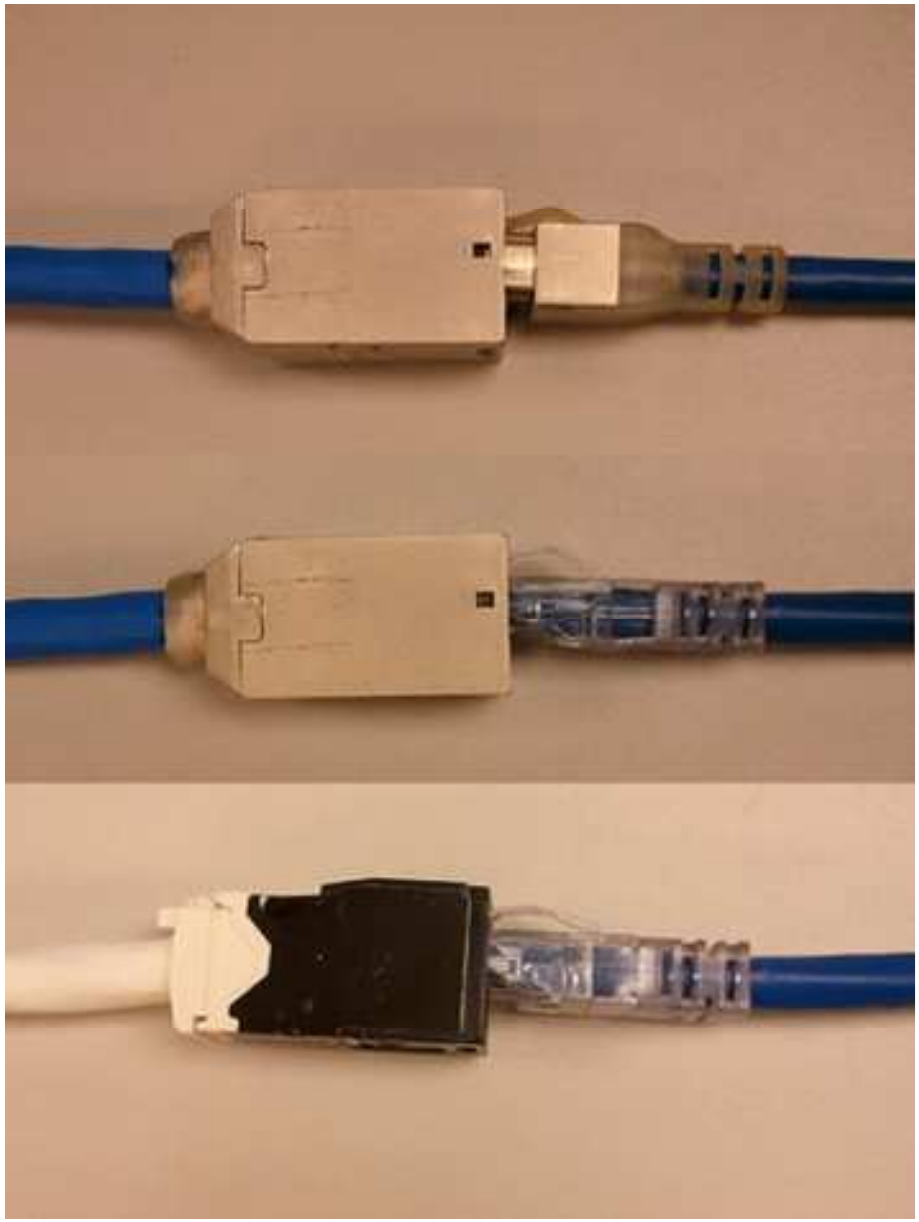
Improved Connector with Berk-Tek 40G S/FTP Cable

- Utilizes existing IEC 60603-7-71 form factor
- Improved connector performance to 2GHz
- Fully backwards compatible both mechanically and electrically with Cat 6A patch cords
- Connector fits in same faceplate footprint as RJ45
  - Capable of 2 row 48 connectors per 1U switch
- Berk-Tek plenum cable S/FTP and S/FTP patch
  - Designed for 2 GHz bandwidth
  - Shielded design limits effects of ANEXT

Comparison of RJ45 and IEC 606030-7-71

Shielded Cat 6A RJ45

IEC 606030-7-71

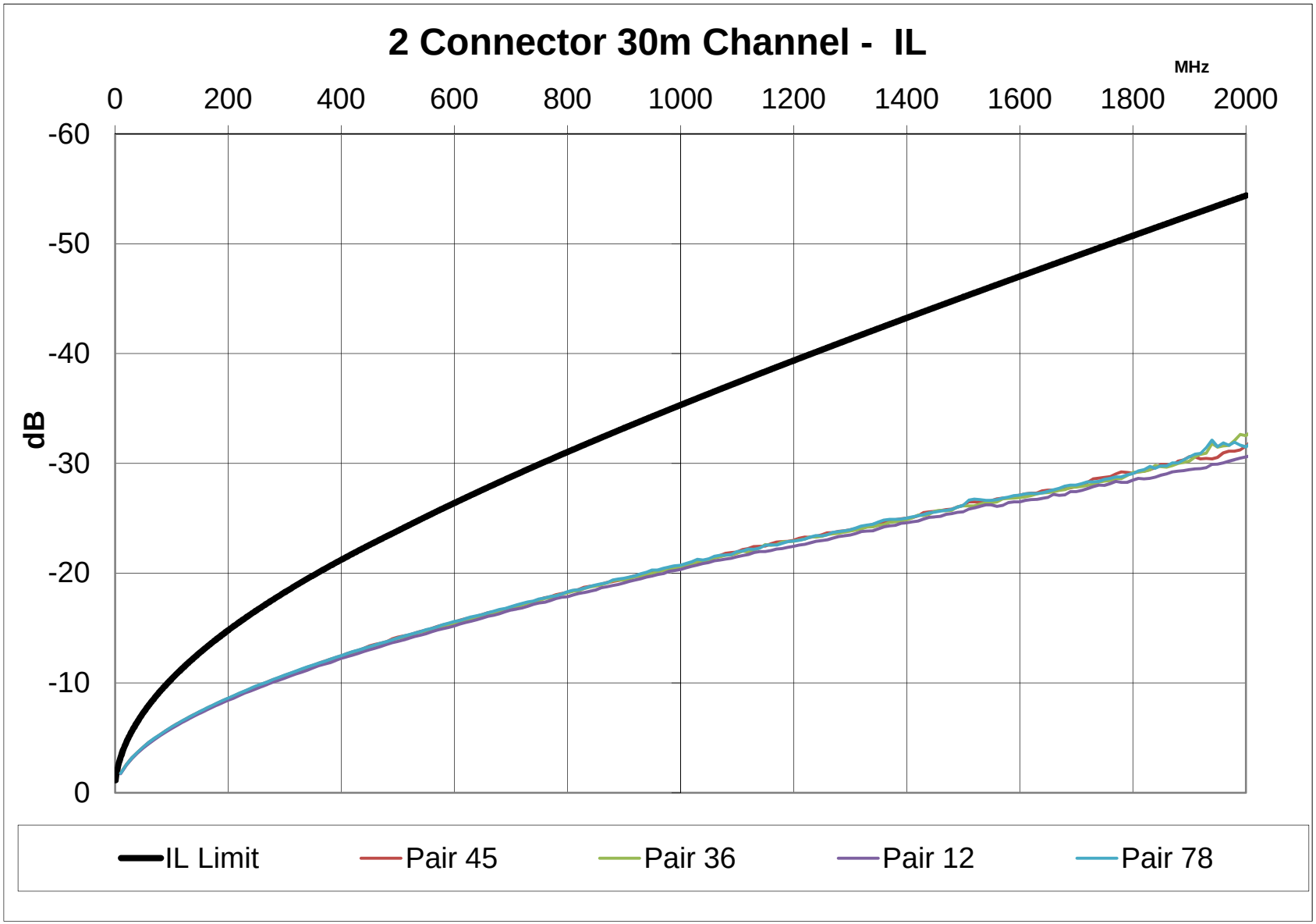


40G plug to 40G jack

10G plug to 40G jack

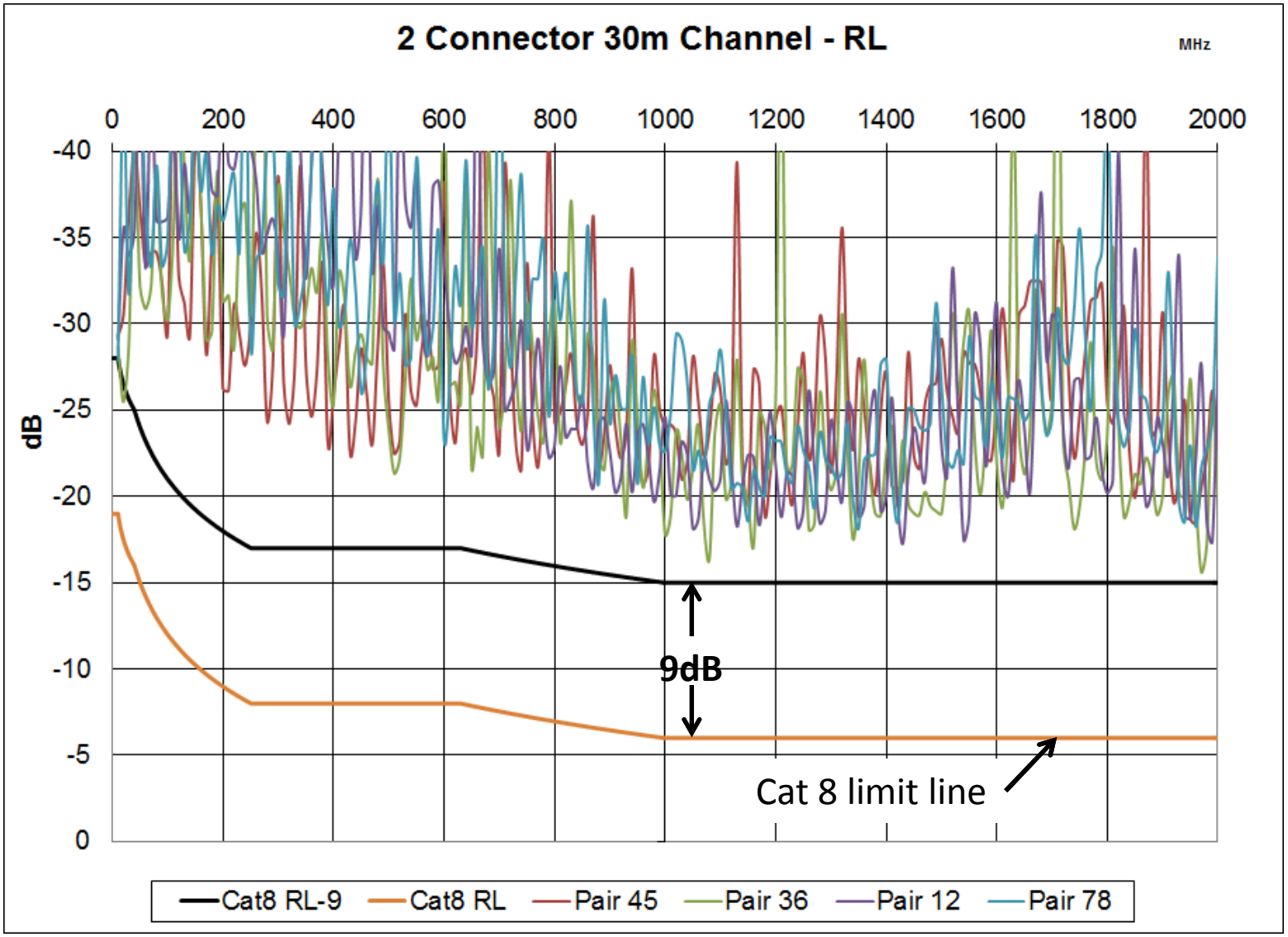
10G plug to 10G RJ45 jack

Long Channel Insertion Loss

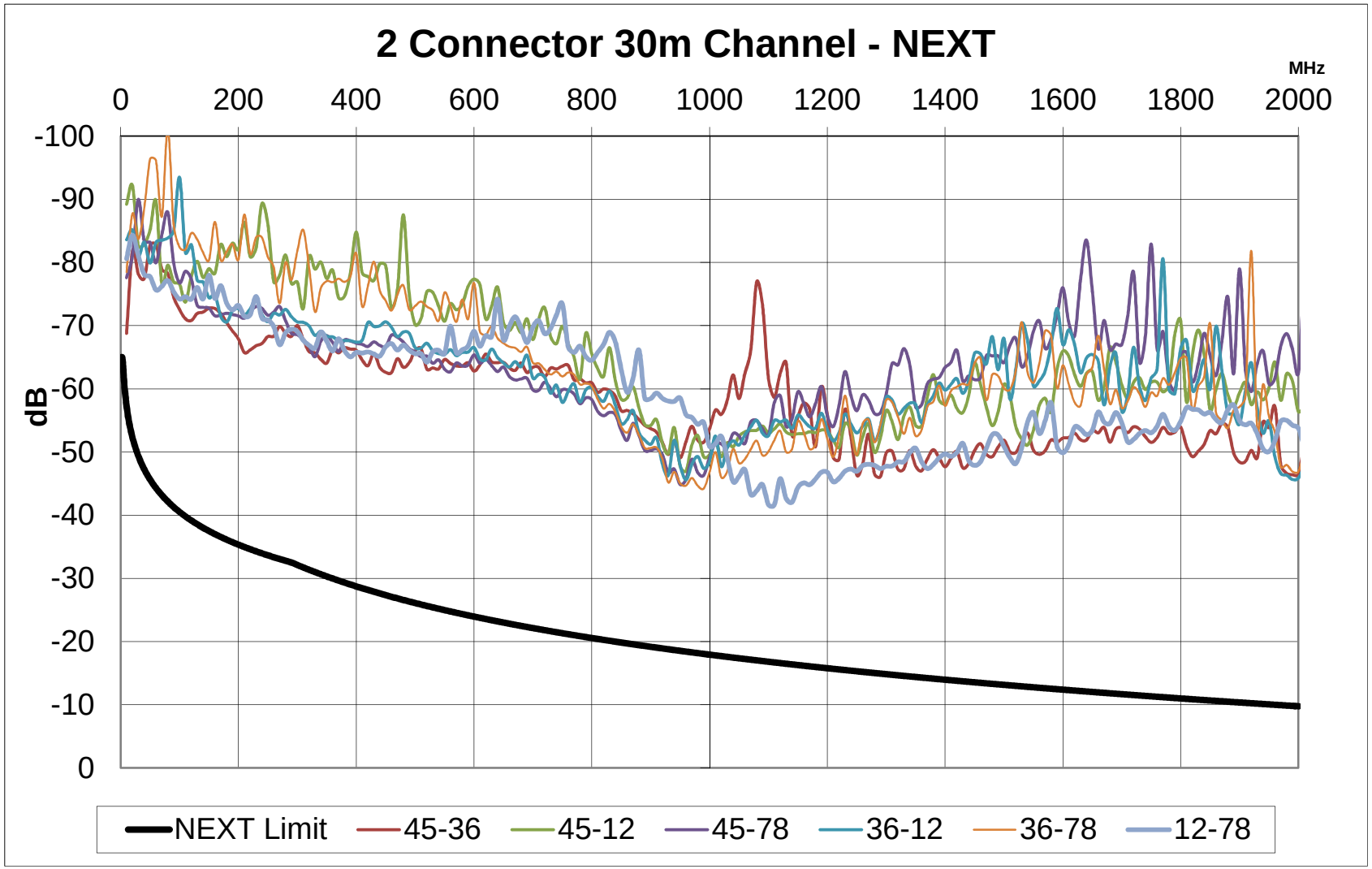


Long Channel Return Loss

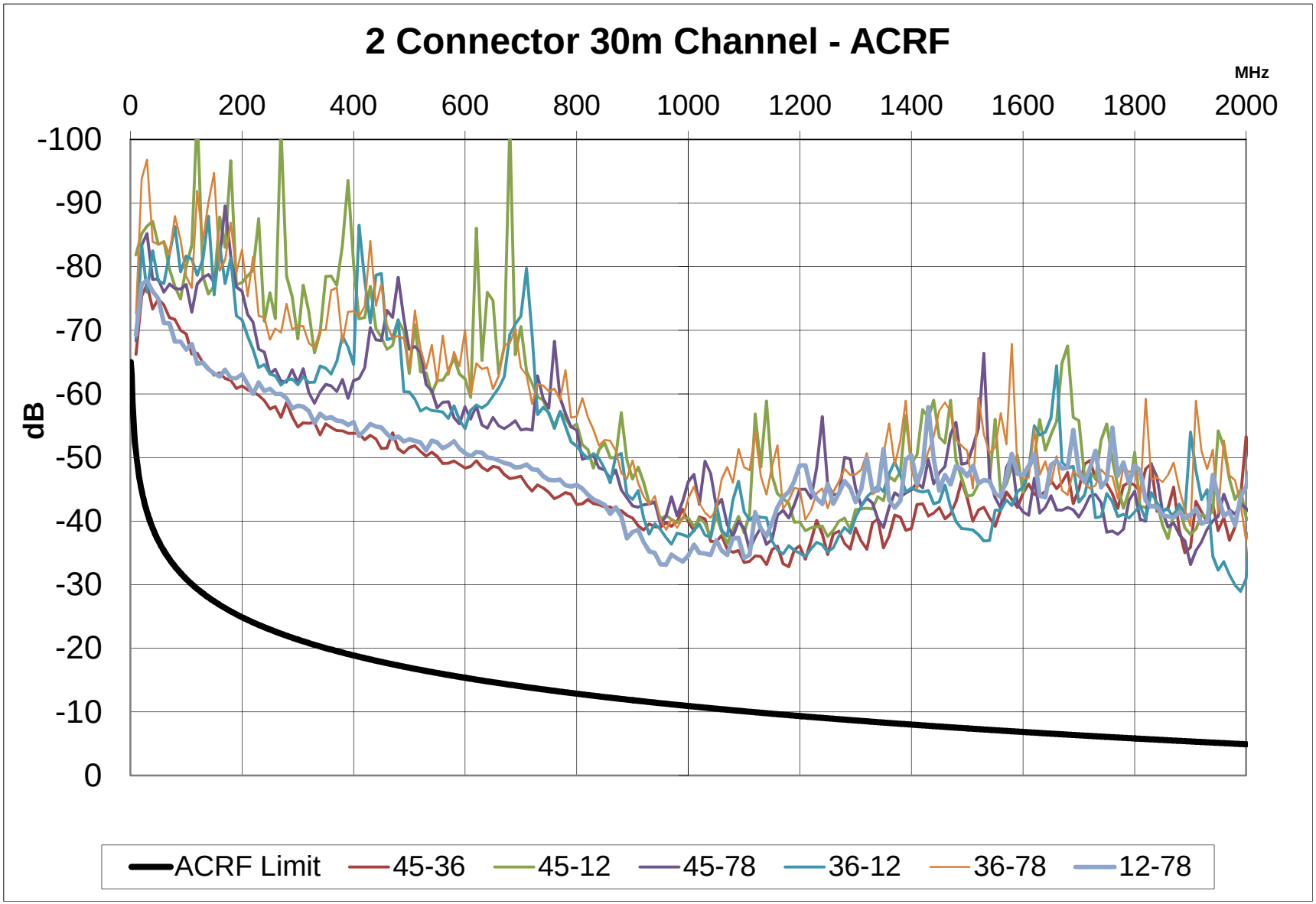
9dB improvement over proposed TIA Cat 8 spec



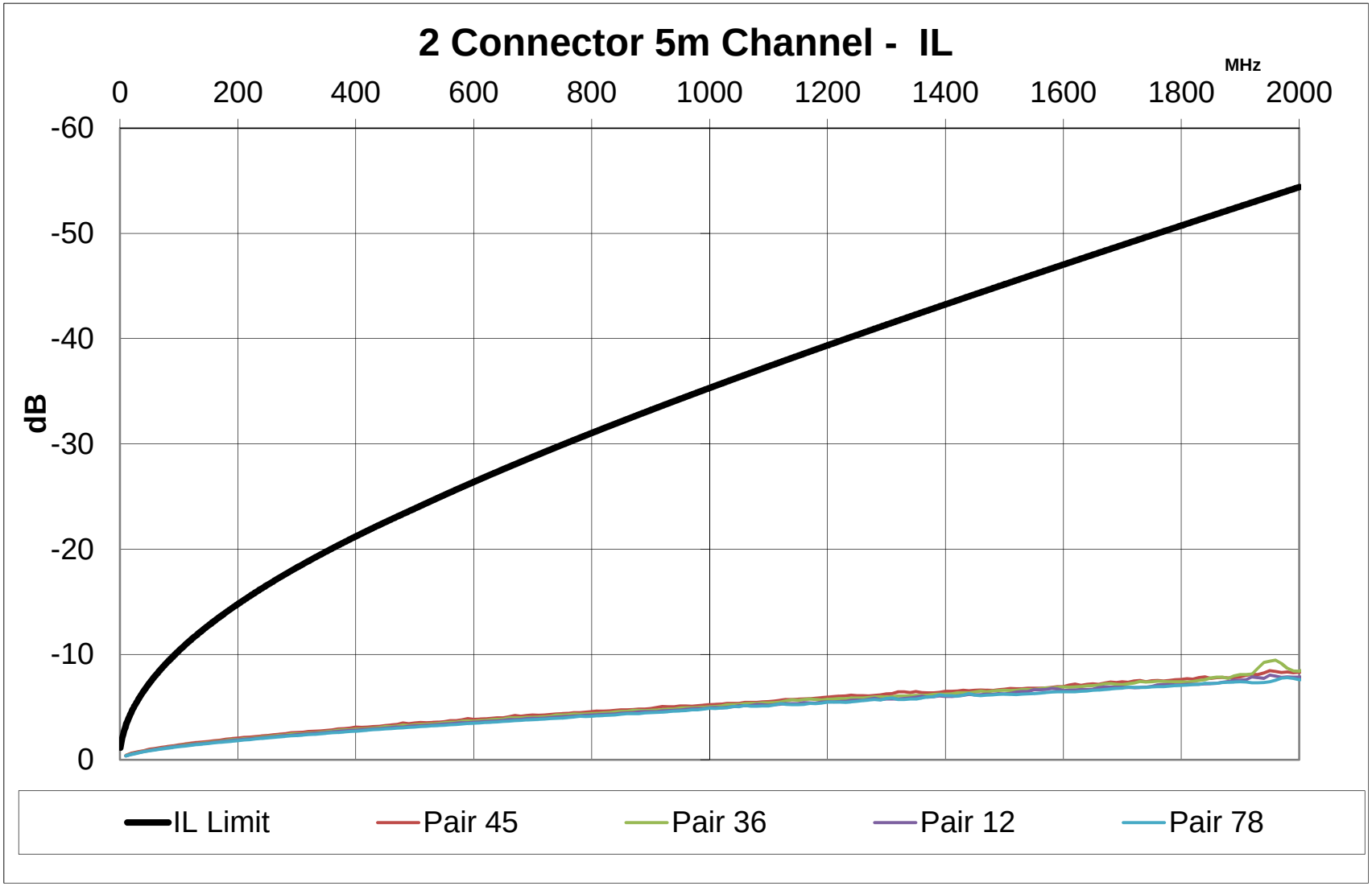
Long Channel NEXT



Long Channel ACRF

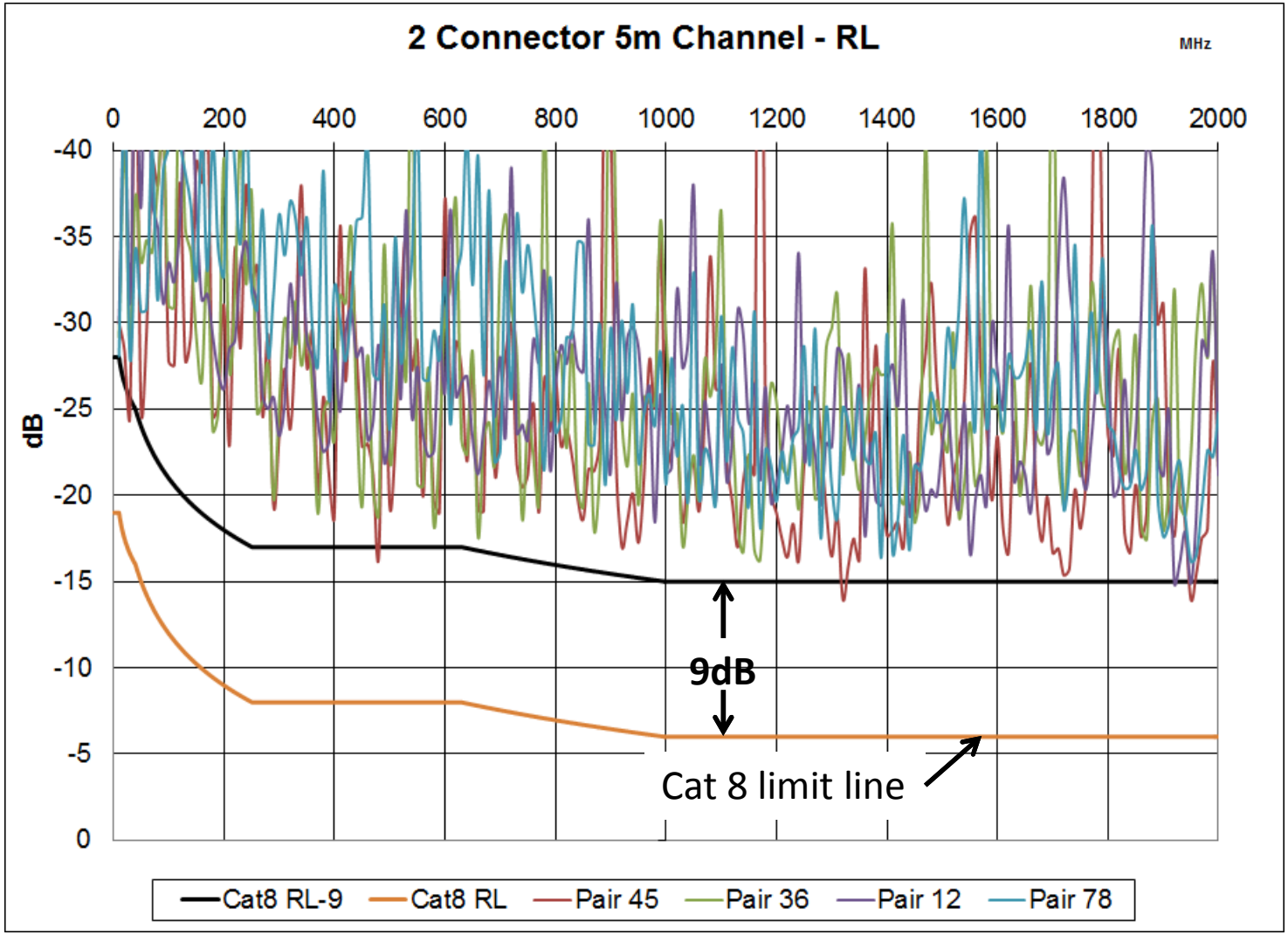


Short Channel Insertion Loss

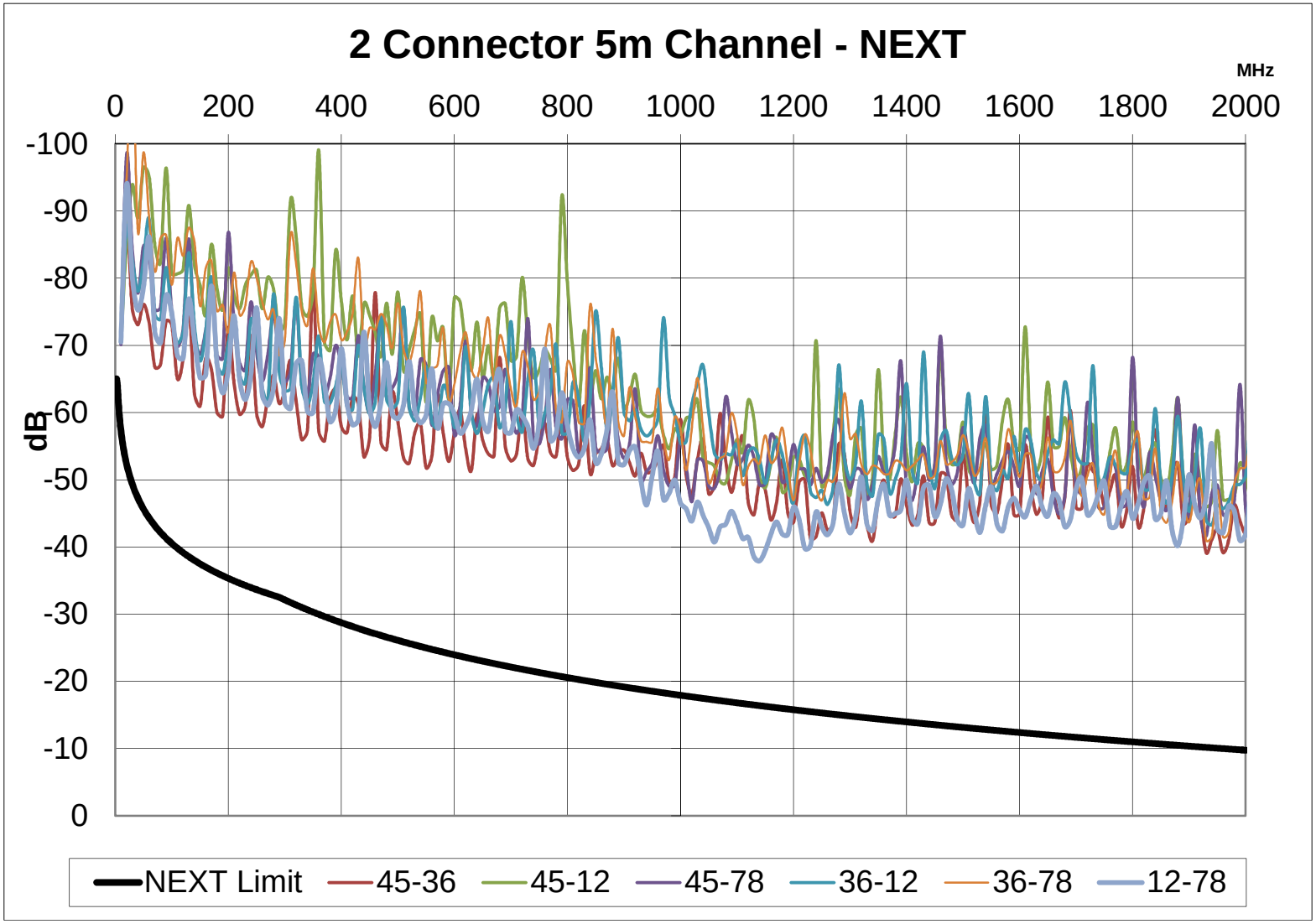


Short Channel Return Loss

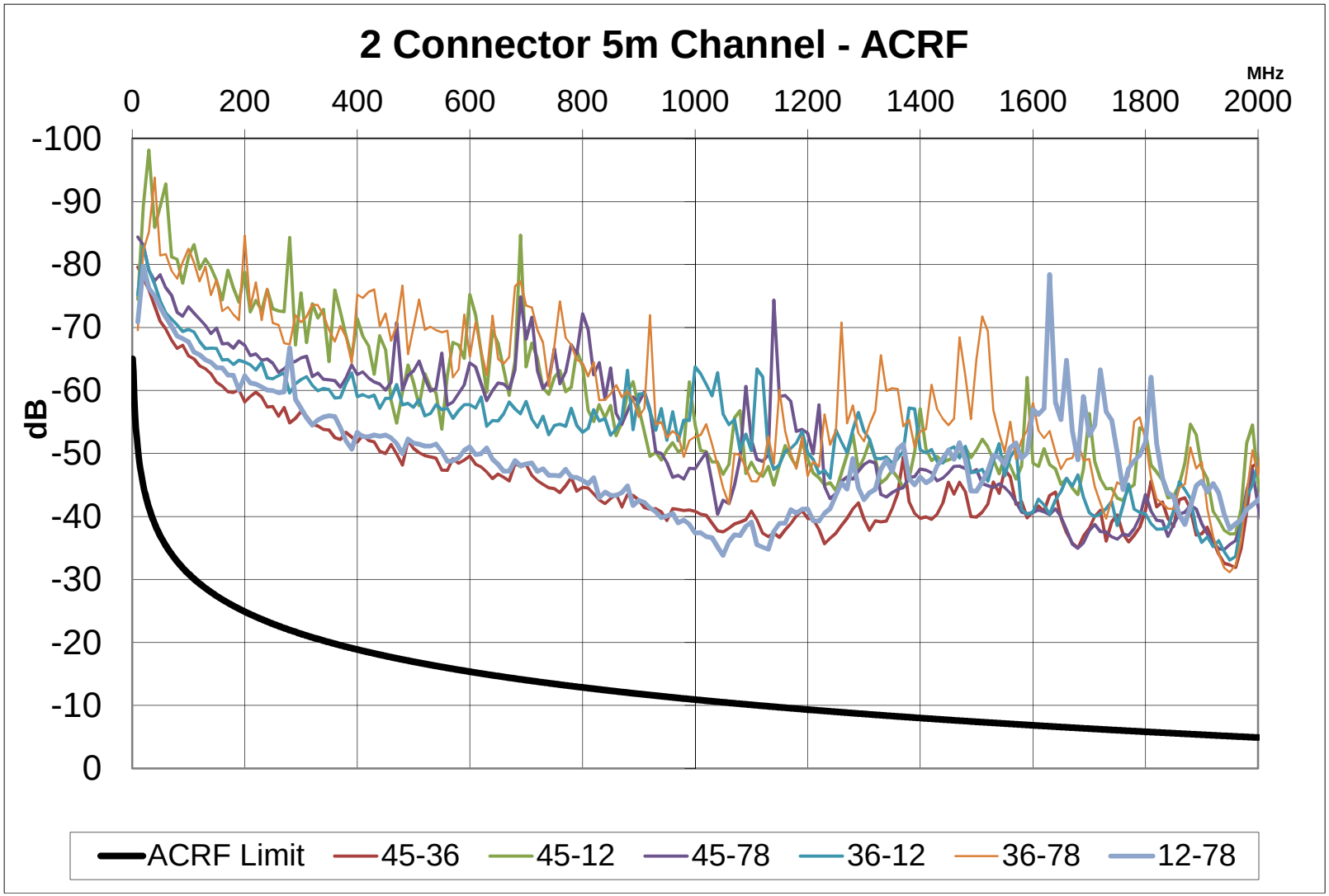
9dB improvement over proposed TIA Cat 8 spec



Short Channel NEXT

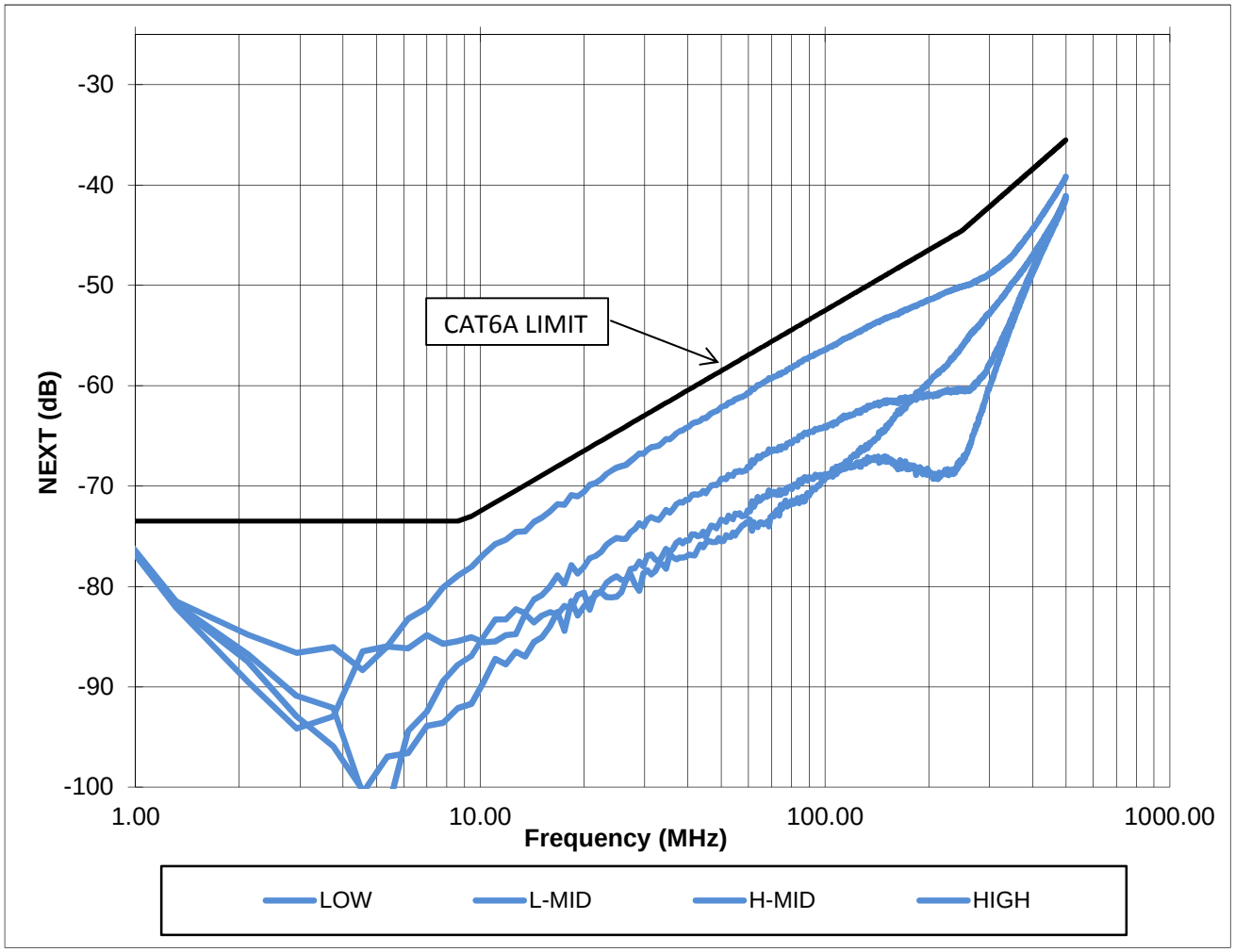


Short Channel ACRF



40G Jack to 10G Plug

Component Backward Compatibility



Potential Power Savings

- 9dB Return Loss improvement has strong potential for significant reduction in PHY power
  - Echo cancellation
- Determination of power savings is complex
  - Numerous impairments need to be fully analyzed
  - Depends on system performance assumptions
  - Estimate for power savings (Grimwood_01_0113_NGBT p. 17)

    For a fixed bandwidth, a change in SNR_marginRL results in the following percentage change in PRL:

$$\Delta PRL\% = 100 * [2^{(\Delta SNRmarginRL / 6.02)} - 1]$$

Potential Further Actions

- Continue work towards an agreement for estimating/determining PHY power consumption
- Determine effects of impairments from other components
- Have Magnetics vendors to supply data on possible RL performance
- Need to include MDI including magnetics, board traces, BGA package as part of the PHY-to-PHY channel