



SFF-8470 (CX4) / Copper Concepts for 802.3ba

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Contributors



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- **Herb Van Deusen –WL Gore**
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IEEE 802.3ba Objectives



The following are Fujitsu's commitments to the IEEE 802.3ba Objectives

- Support full-duplex operation only
- Preserve the 802.3 / Ethernet frame format utilizing the 802.3 MAC
- Preserve minimum and maximum Frame Size of current 802.3 standard
- Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface
- Provide appropriate support for OTN
- Support a MAC data rate of 40 Gb/s
- Provide Physical Layer specifications which support 40 Gb/s operation over:
 - ✓ at least 100m on OM3 MMF
 - ✓ at least 10m over a copper cable assembly
- Support a MAC data rate of 100 Gb/s
- Provide Physical Layer specifications which support 100 Gb/s operation over:
 - ✓ at least 40km on SMF
 - ✓ at least 10km on SMF
 - ✓ at least 100m on OM3 MMF
 - ✓ at least 10m over a copper cable assembly

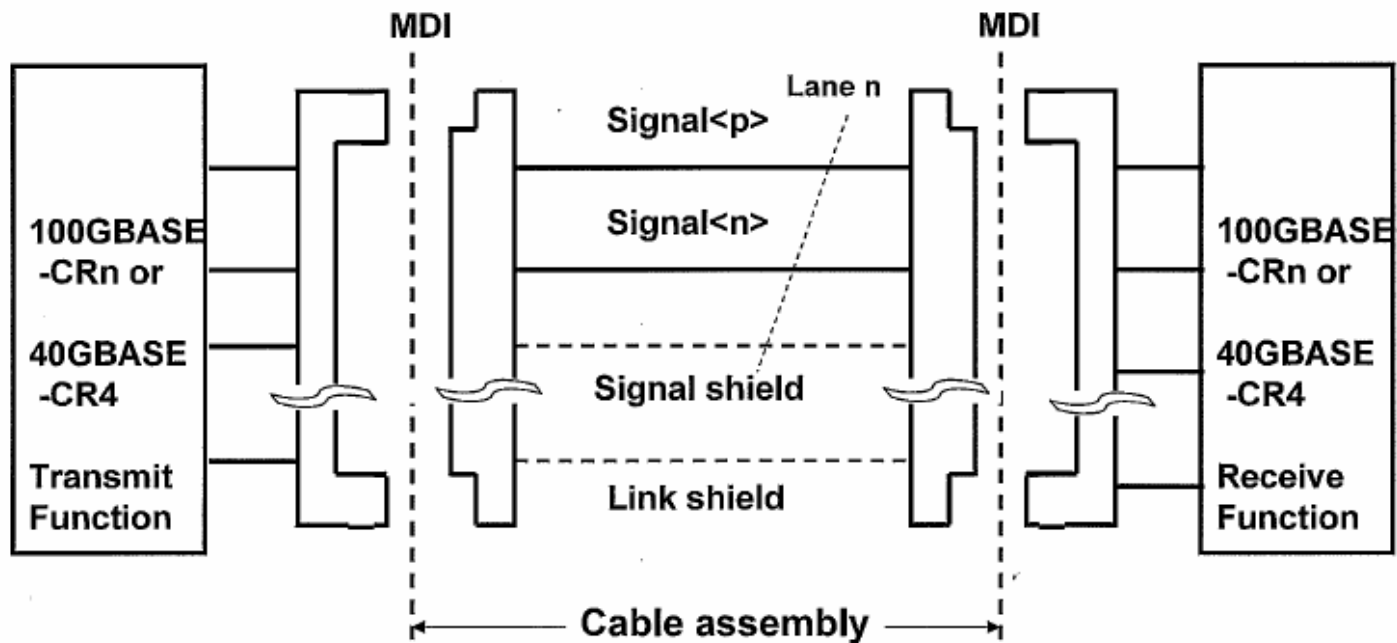
Presentation Objectives



This presentation will provide information regarding:

- The 10Gbps/lane performance adherence of the SFF-8470 (current IEEE 802.3ak CX-4 I/O interface) connector and 10 meter and 0.5 meter cable link reach according to the S-Parameter Return Loss, Insertion Loss and Cross-talk criteria as defined by 10GBASE-KR.

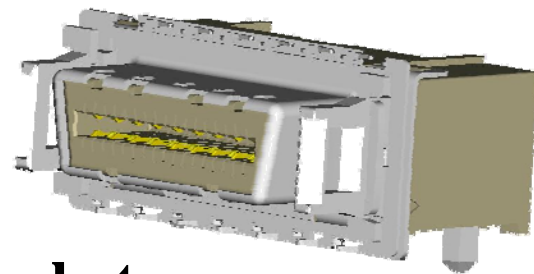
IEEE 802.3ba Link Model



SFF-8470 / CX4 Connector Structure

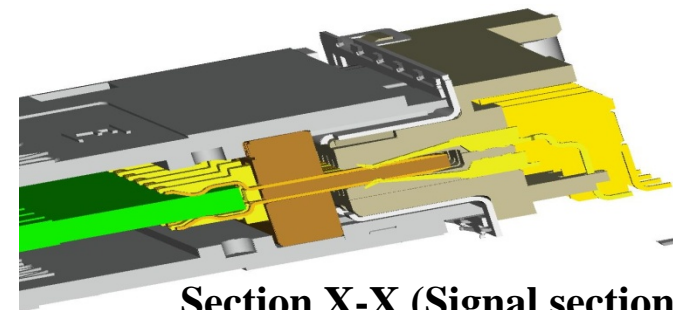
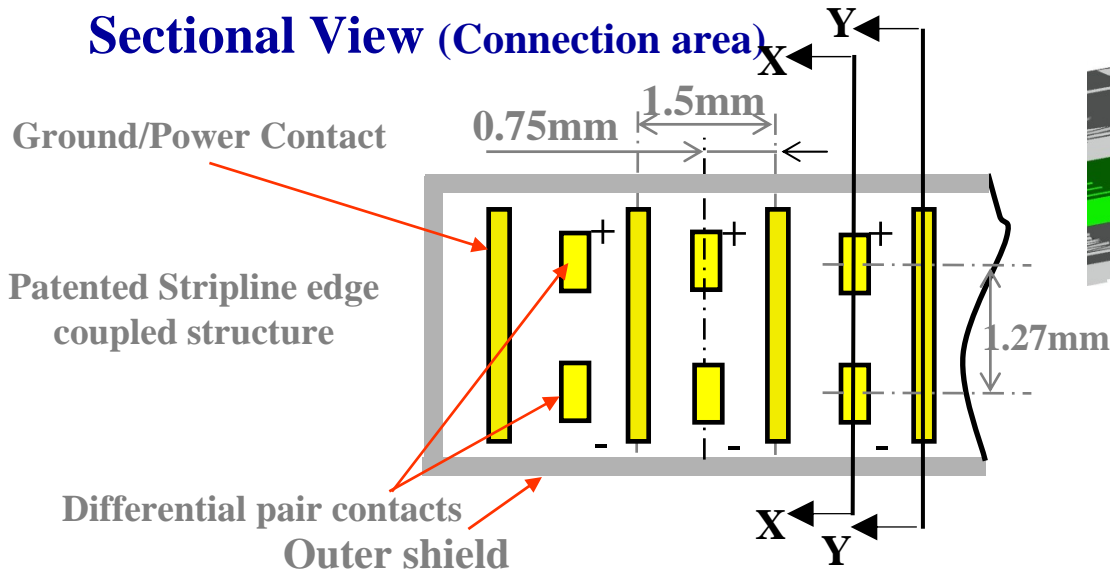


Cover , Plug

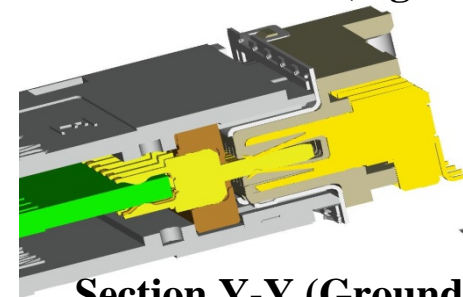


Socket

Sectional View (Connection area)



Section X-X (Signal section)

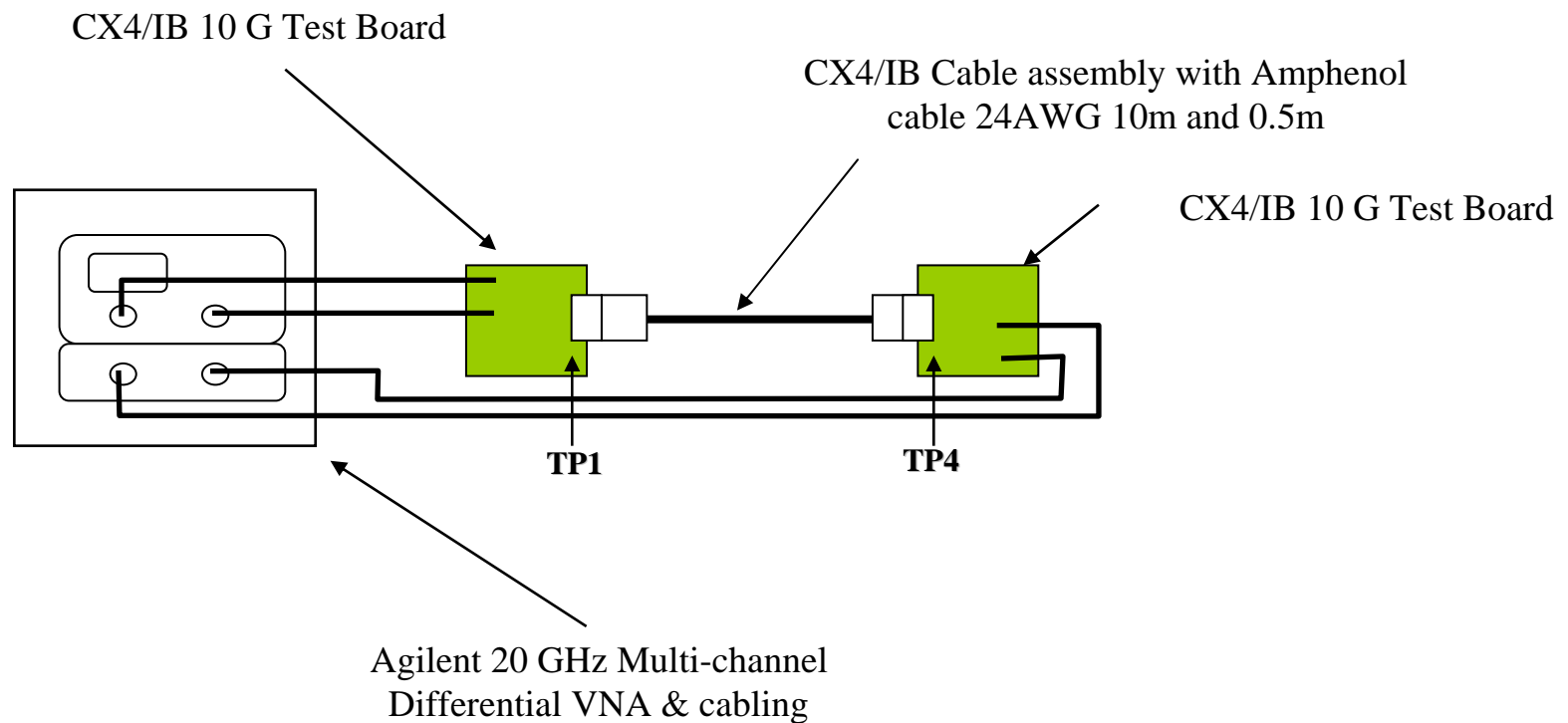


Section Y-Y (Ground section)

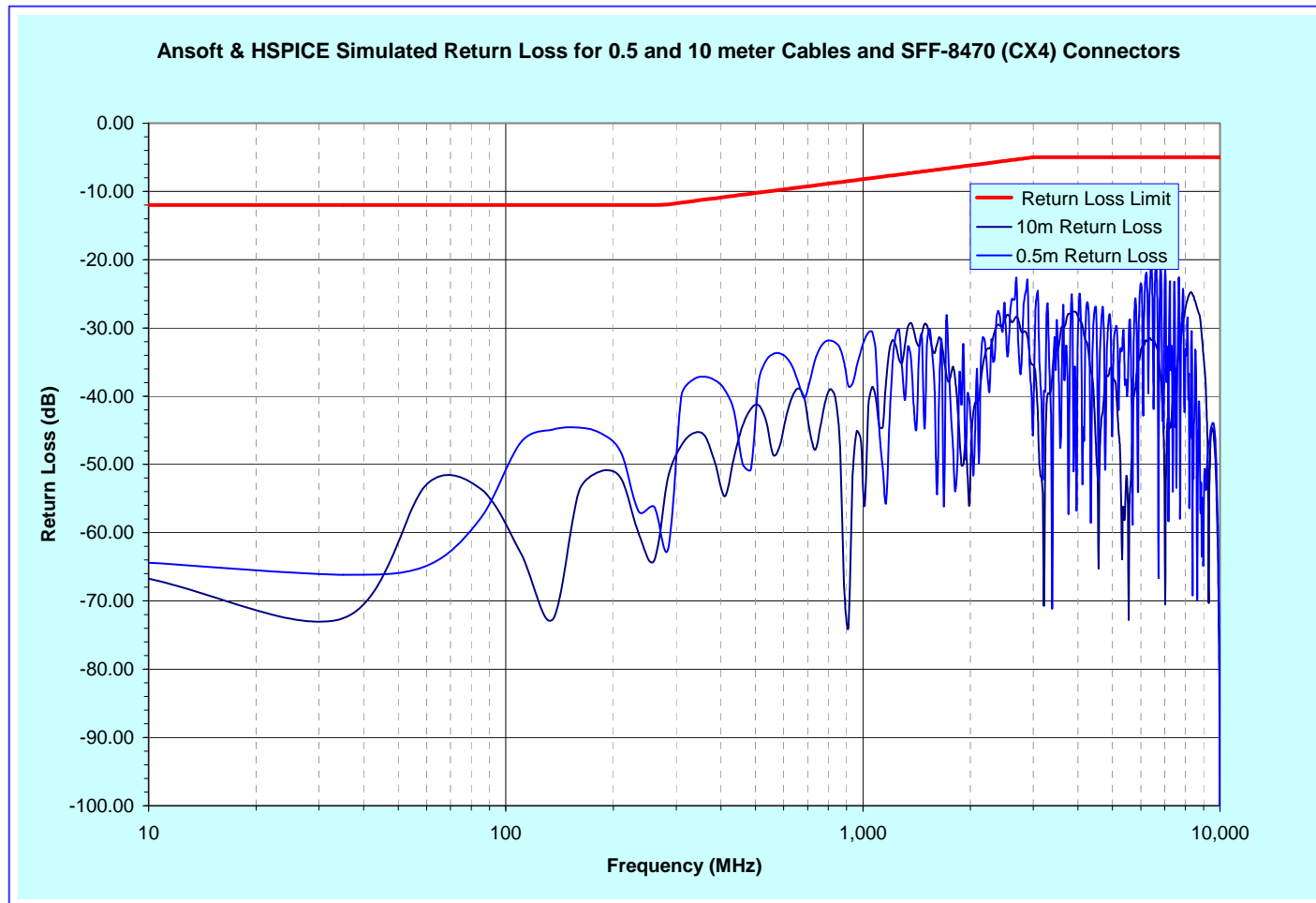
Connector and Cable assembly 24AWG 10m and 0.5m Frequency Domain Measurement Set-up



Return Loss $RL(f)$ Measurement



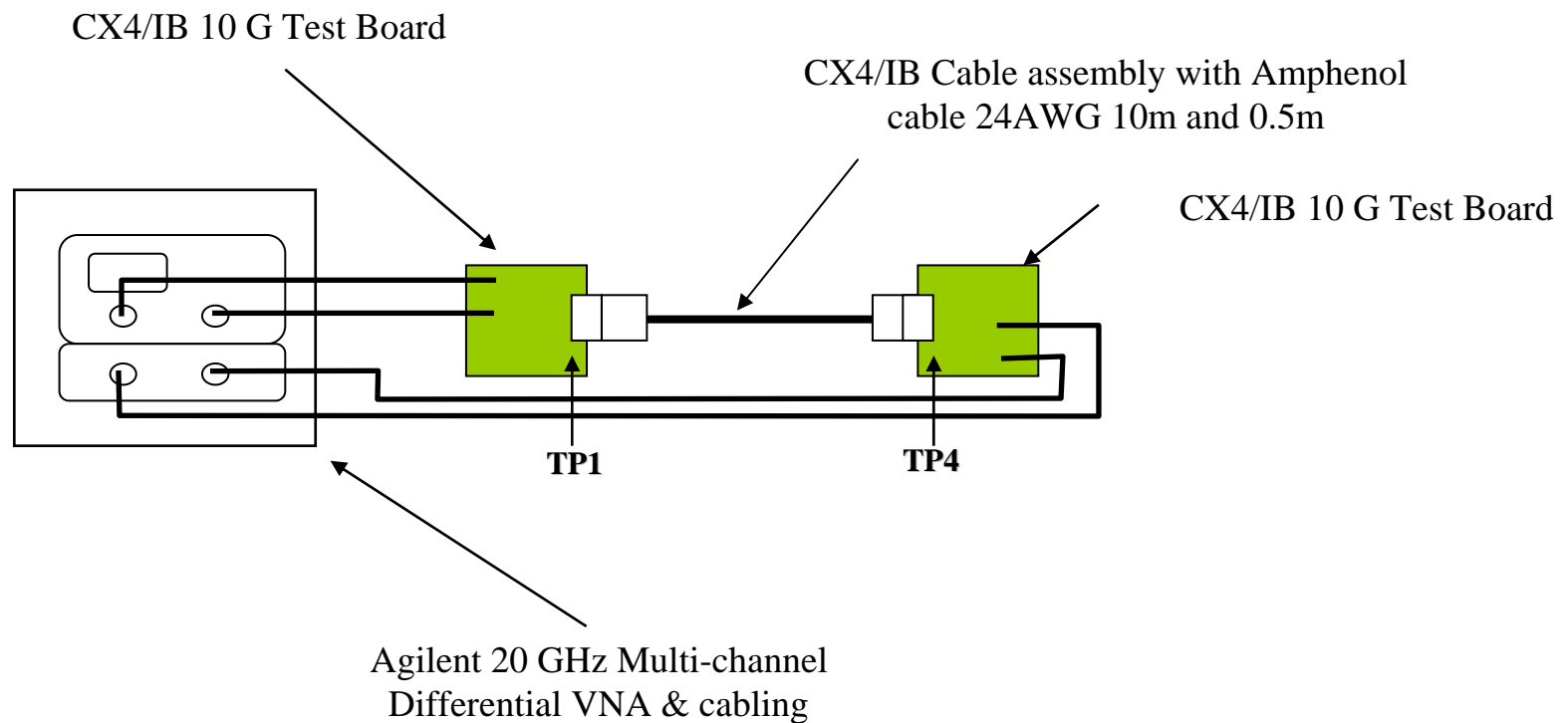
SFF-8470 (CX4) + 10 and 0.5 meter SkewClear EXD Cable Channel Return Loss Compliance



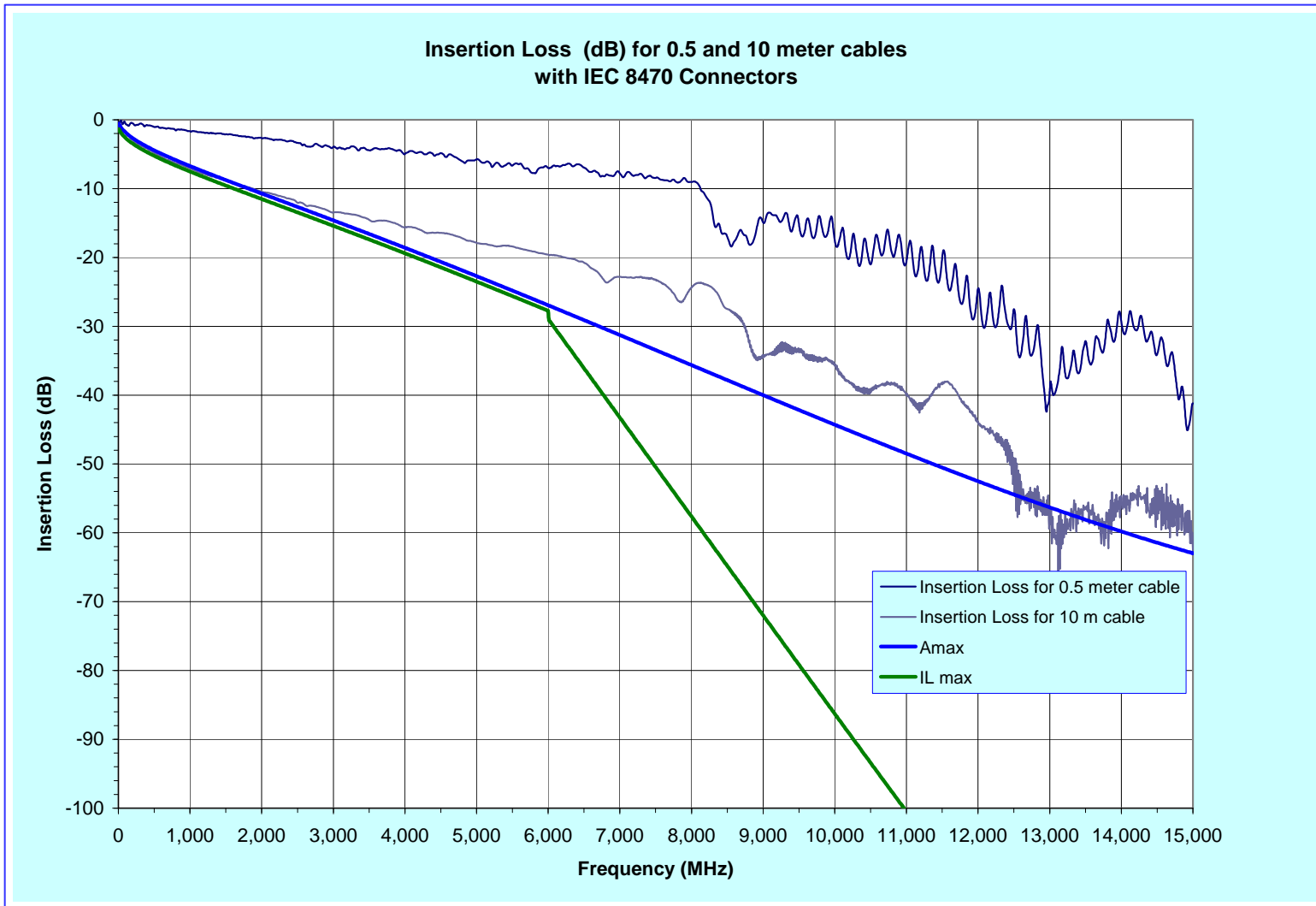
Connector and Cable assembly 24AWG 10m and 0.5m Frequency Domain Measurement Set-up



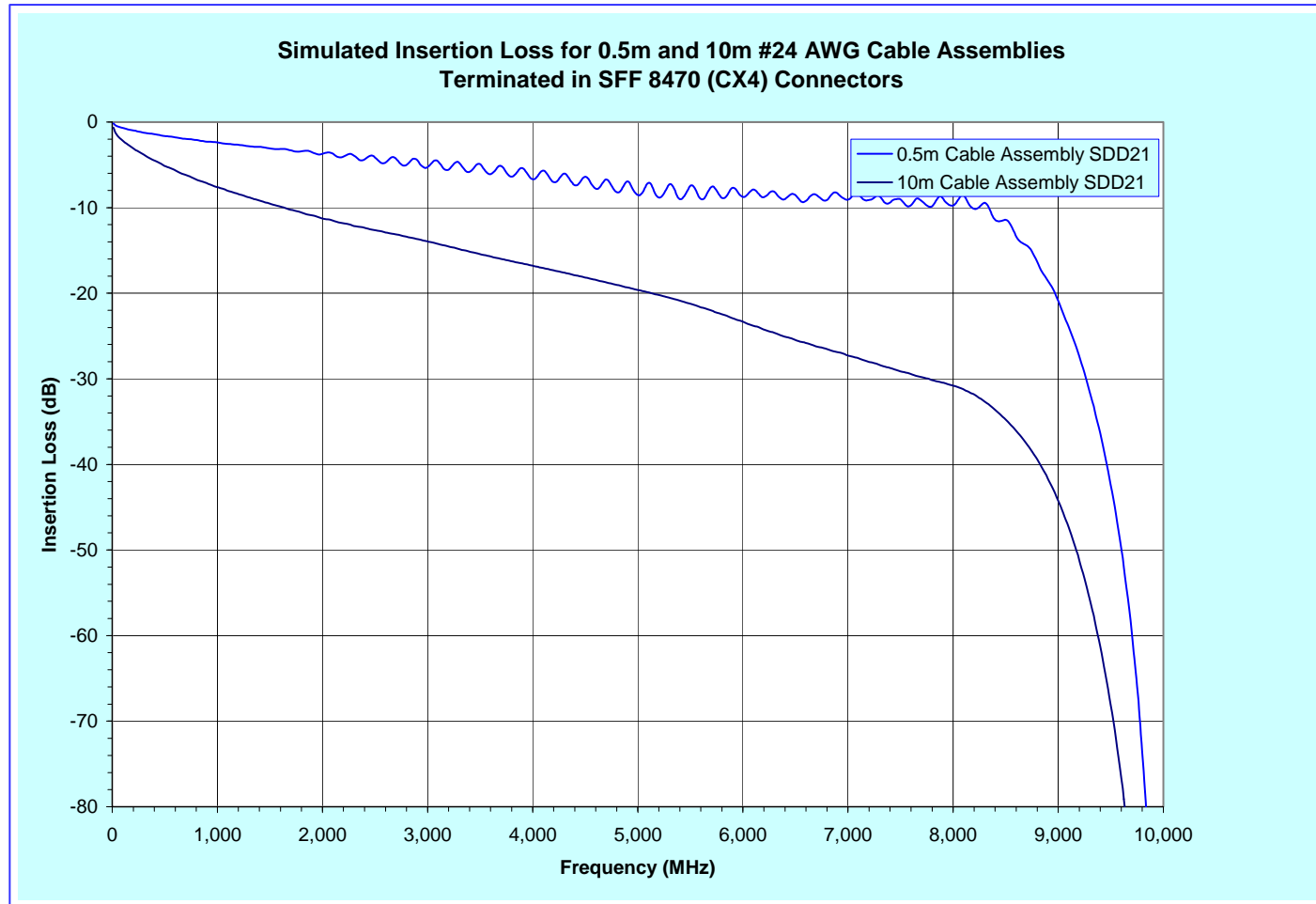
Insertion Loss $IL(f)$ Measurement Set-up



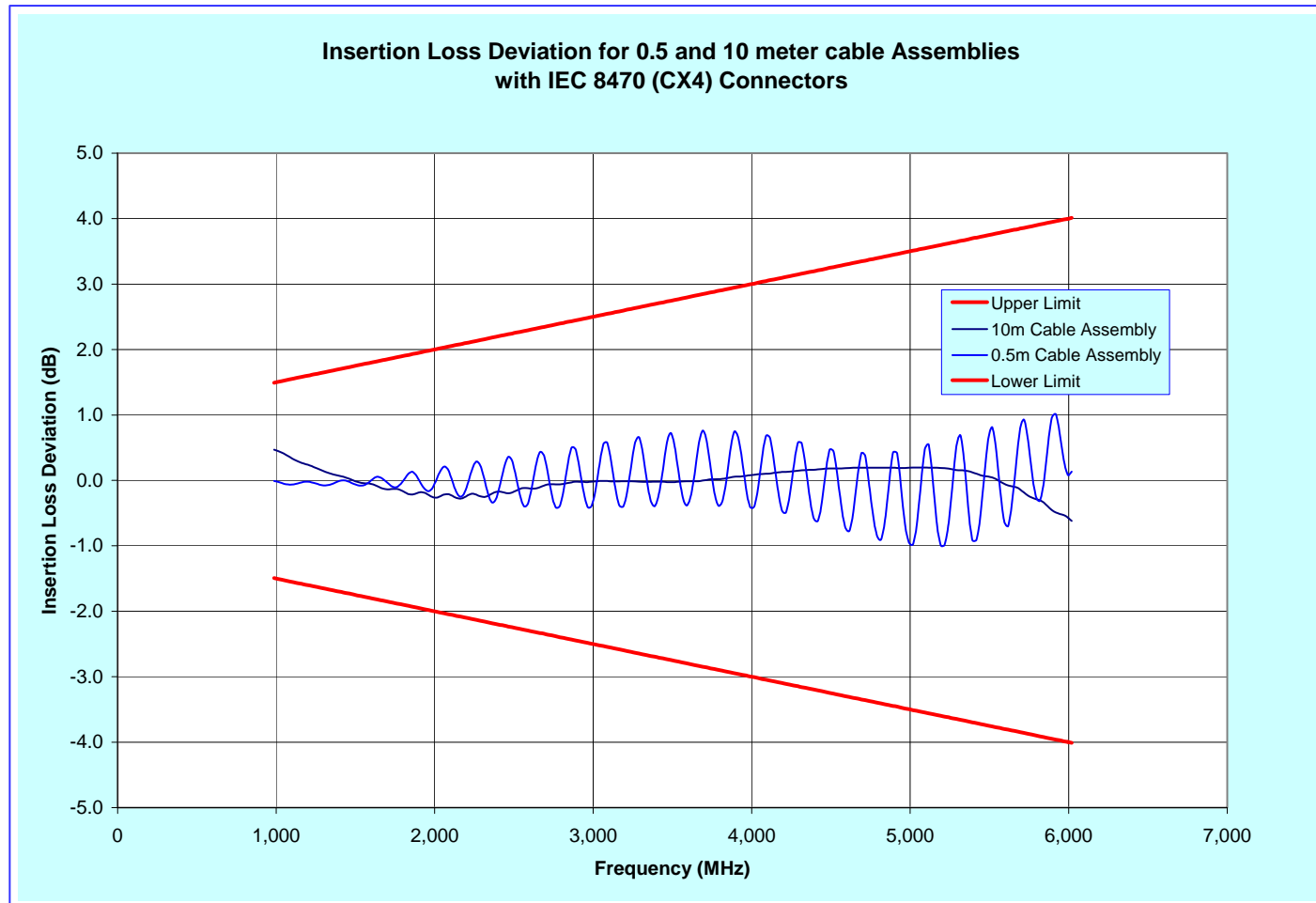
SFF-8470 (CX4) + 10 and 0.5 meter SkewClear EXD Cable Channel Insertion Loss Compliance



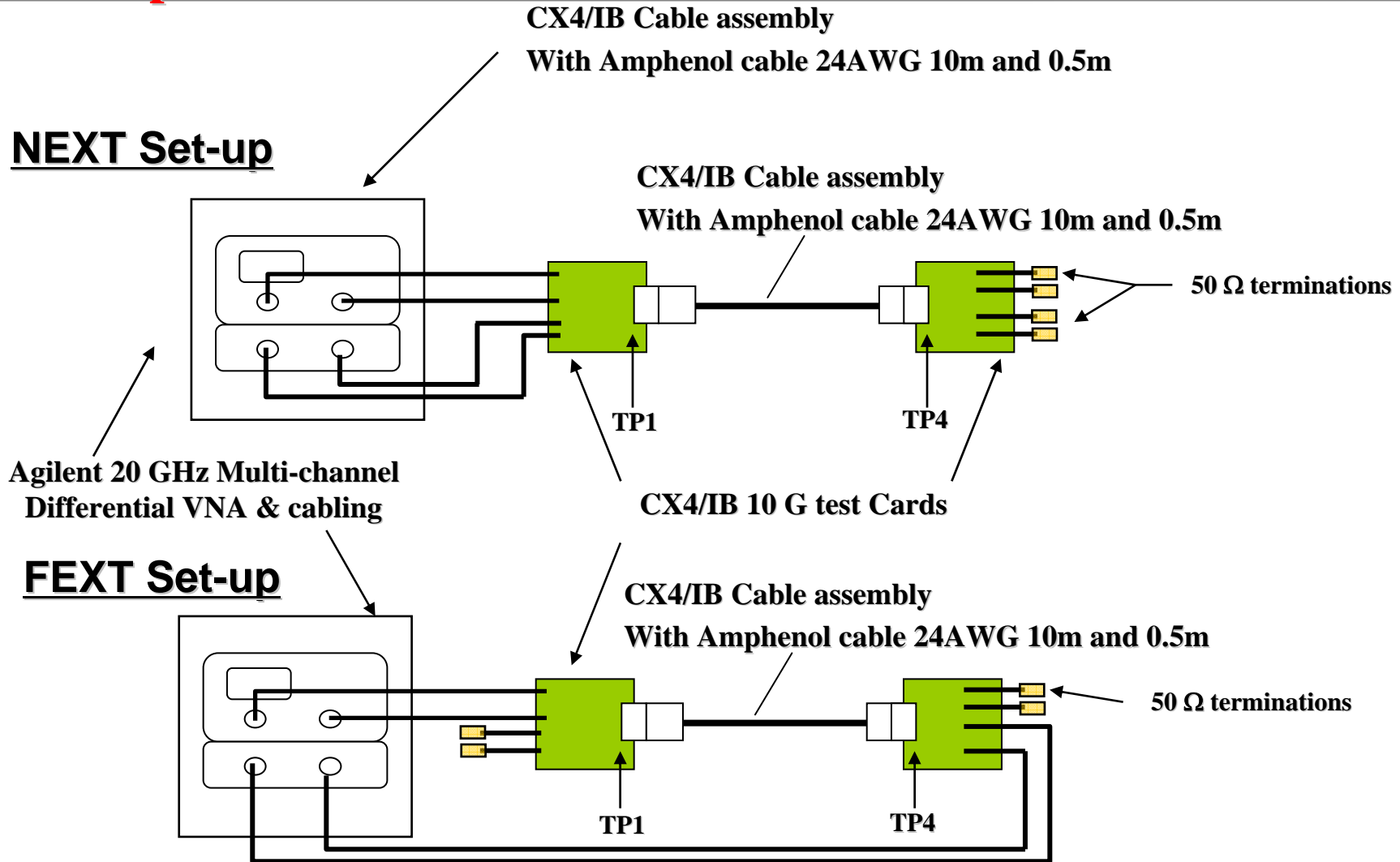
SFF-8470 (CX4) + 10 and 0.5 meter SkewClear EXD Cable Channel Insertion Loss Compliance



SFF-8470 (CX4) + 10 and 0.5 meter SkewClear EXD Cable Insertion Loss Deviation



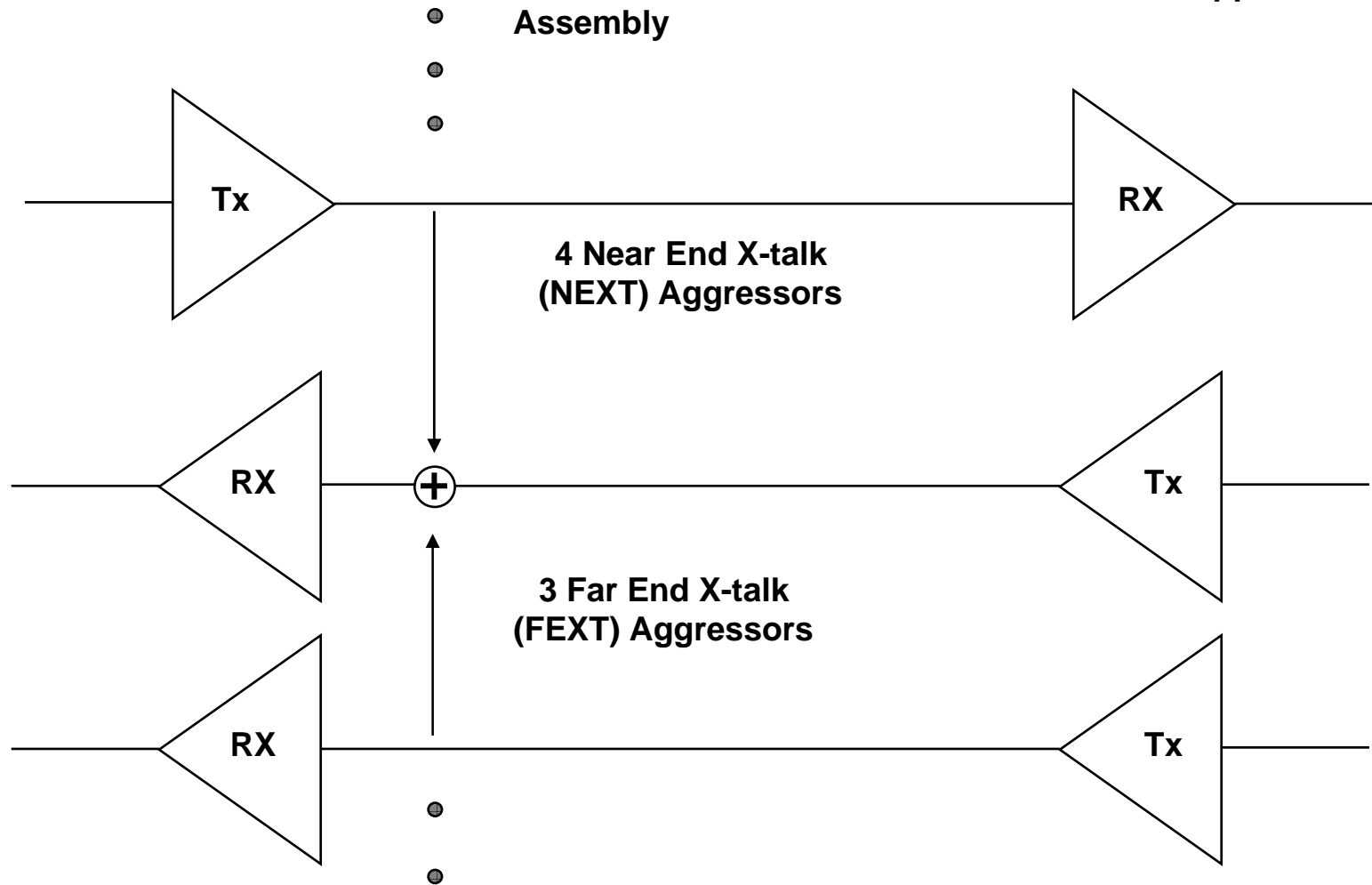
SFF-8470 (CX4 CN) NEXT/FEXT Measurement Set-ups



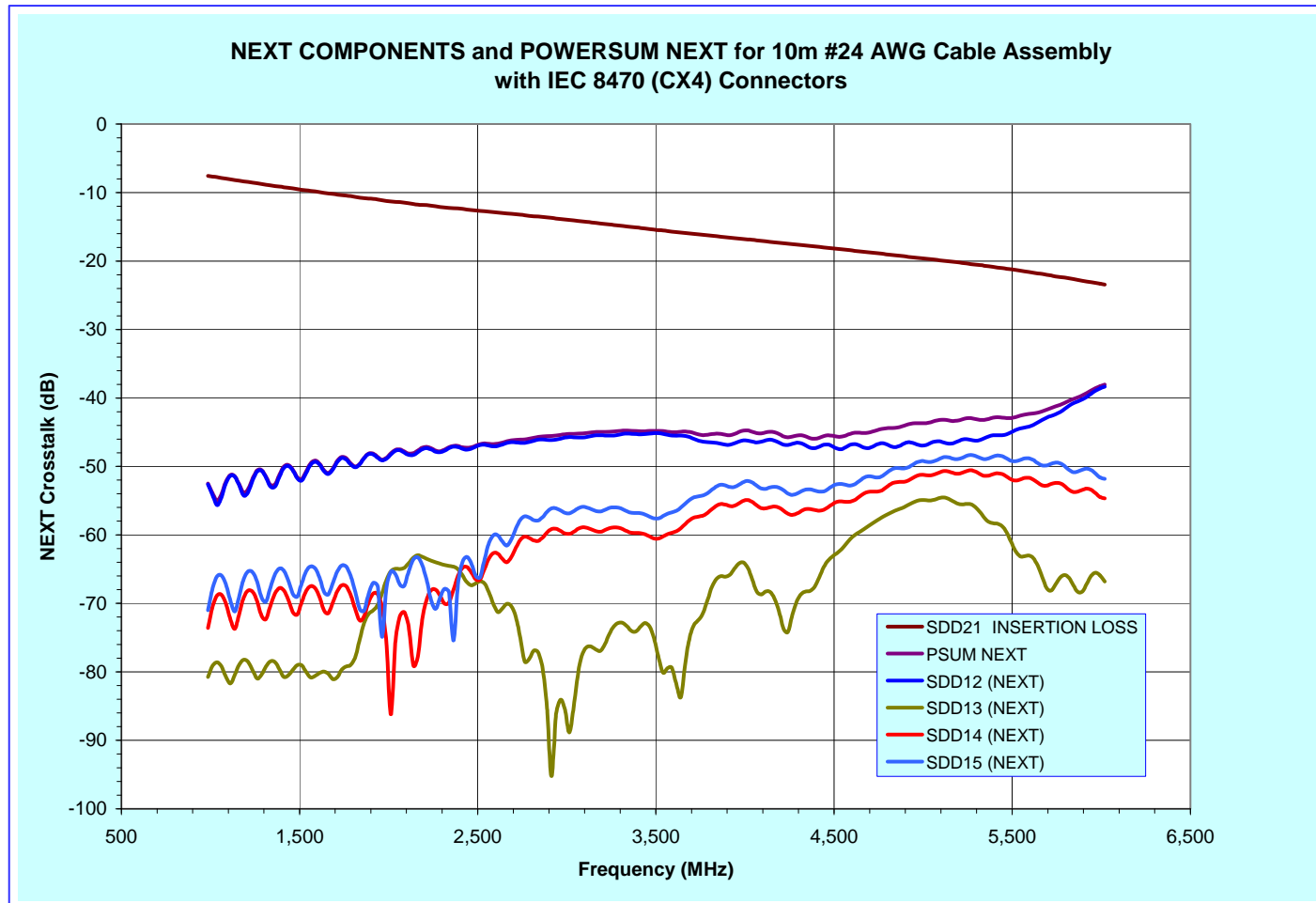
802.3 CX4 Channel Insertion Loss to Crosstalk Ratio



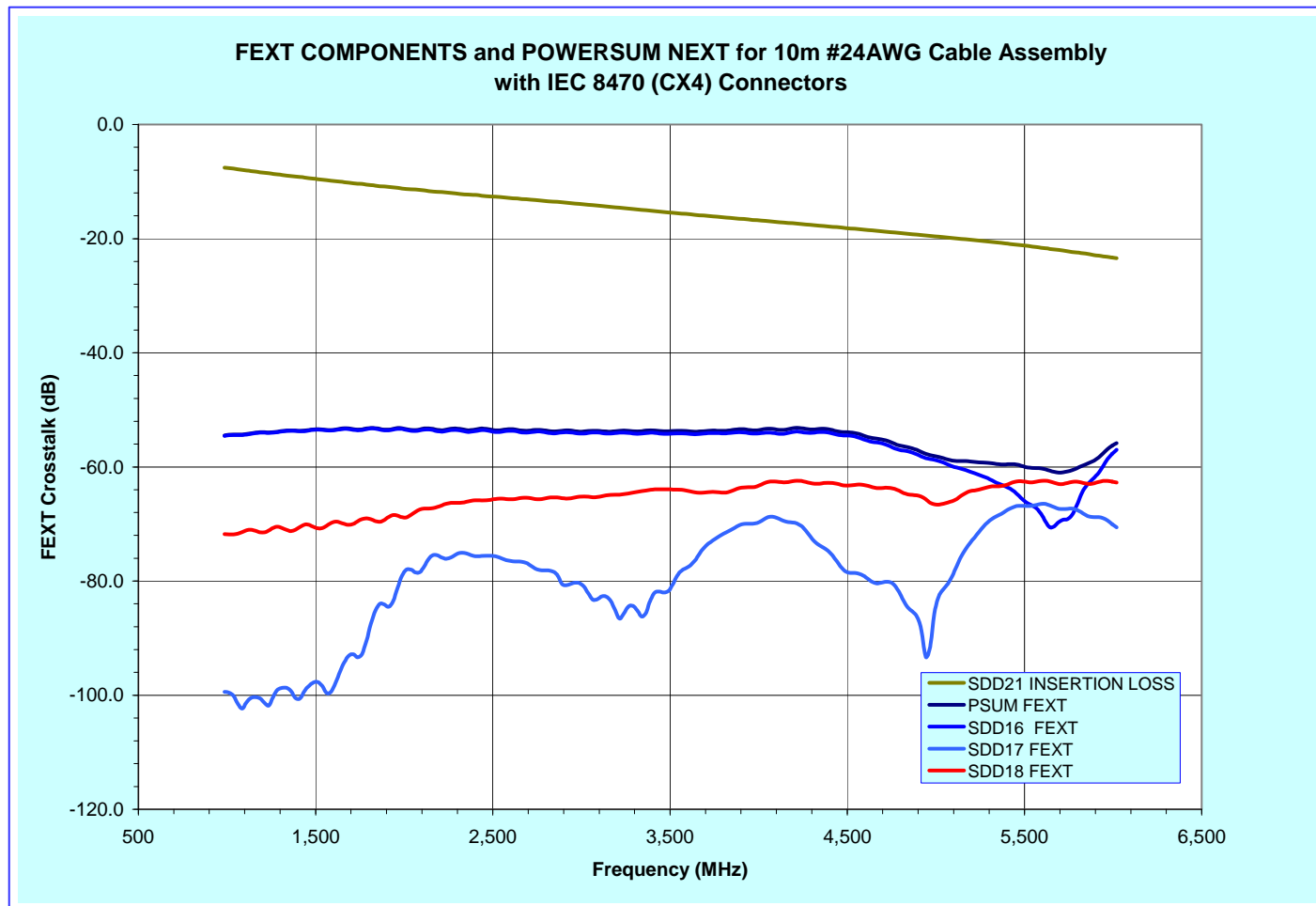
Insertion Loss to Crosstalk Ratio computed from S-Parameter Insertion Loss and Crosstalk Components of the 10 and 0.5 meter CX4 SkewClear EXD Copper Cable Assembly



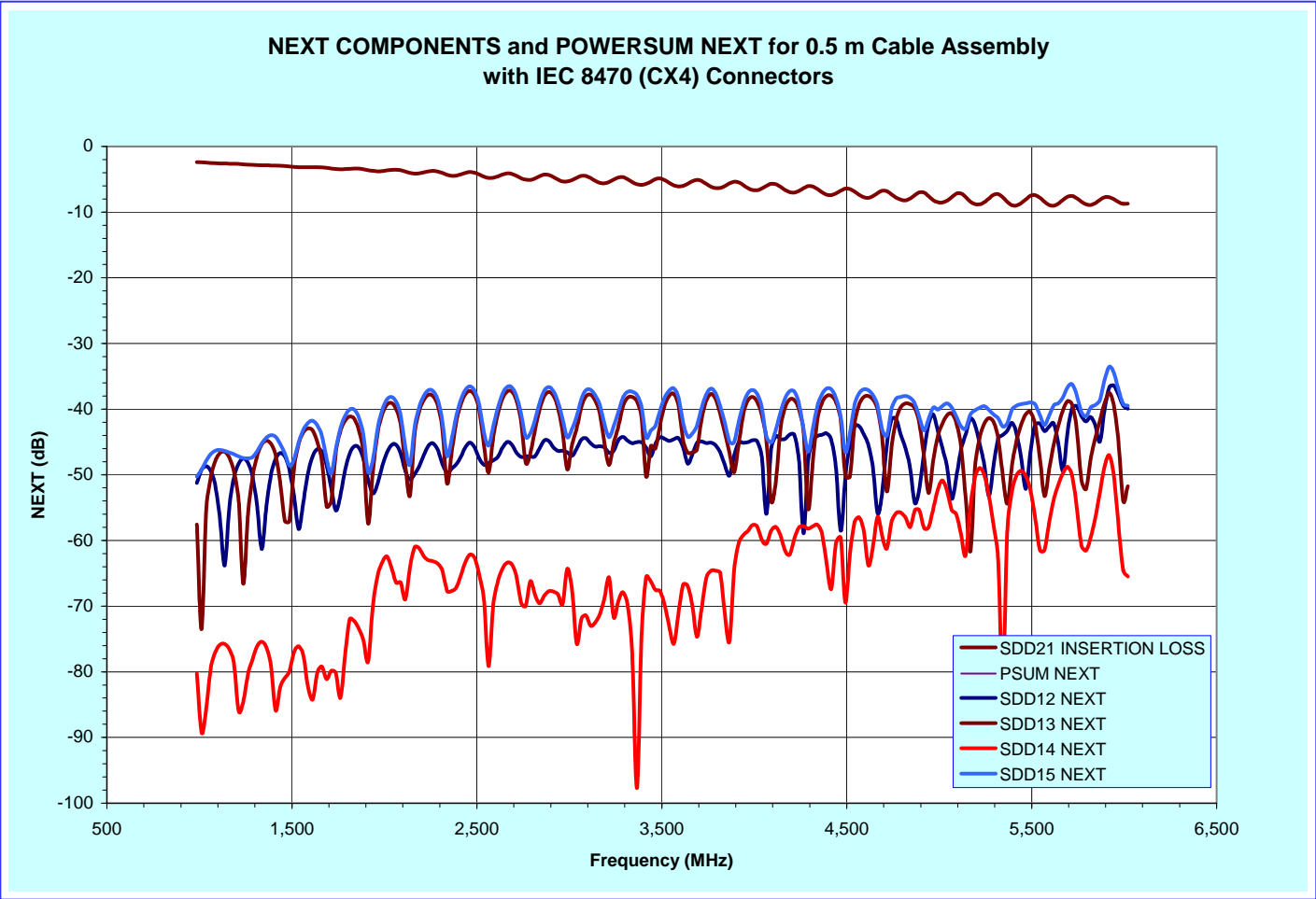
SFF-8470 Insertion Loss and Crosstalk Parameters: 10 meter NEXT, PSNEXT



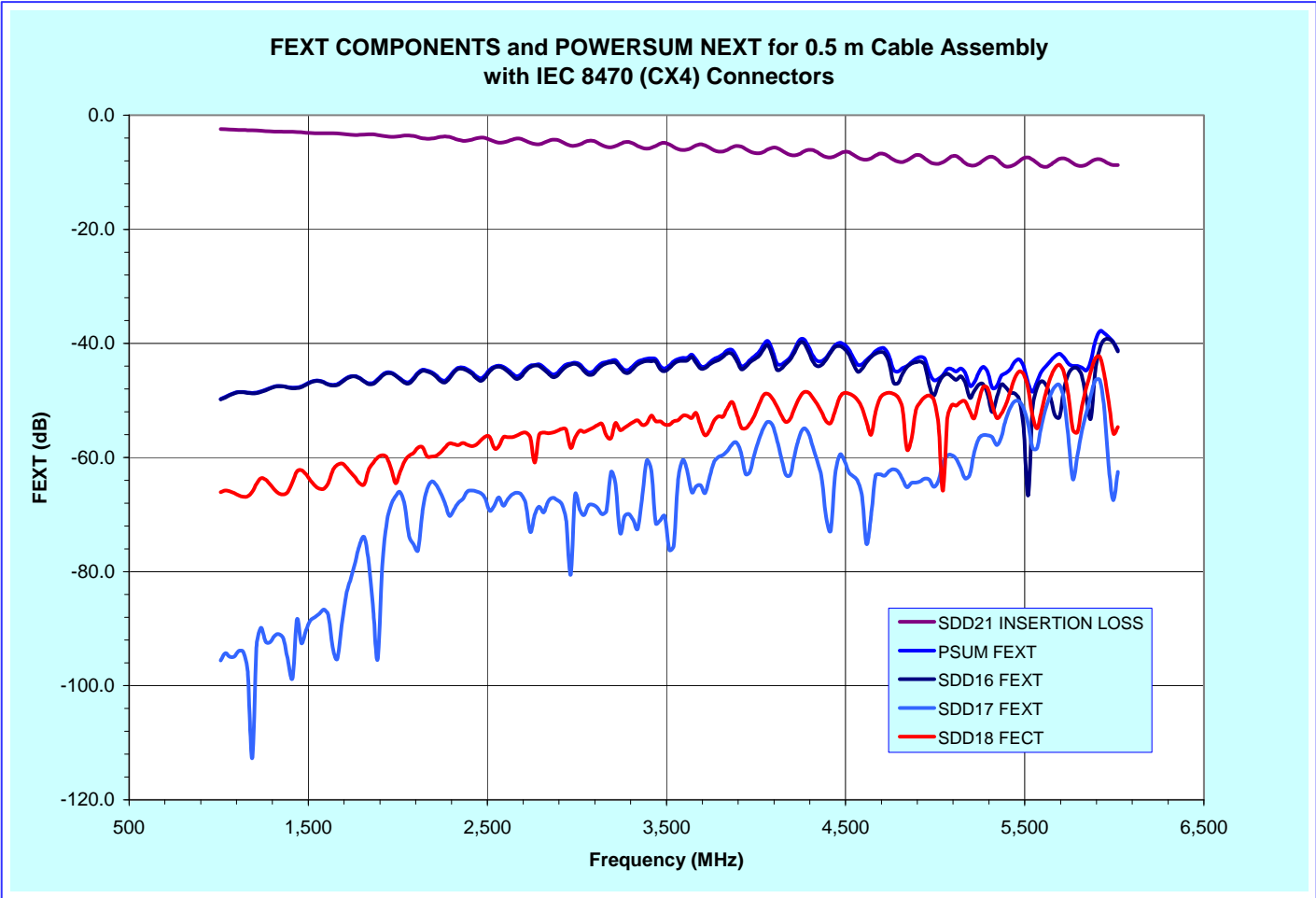
SFF-8470 Insertion Loss and Crosstalk Parameters: 10 meter FEXT, PSFEXT



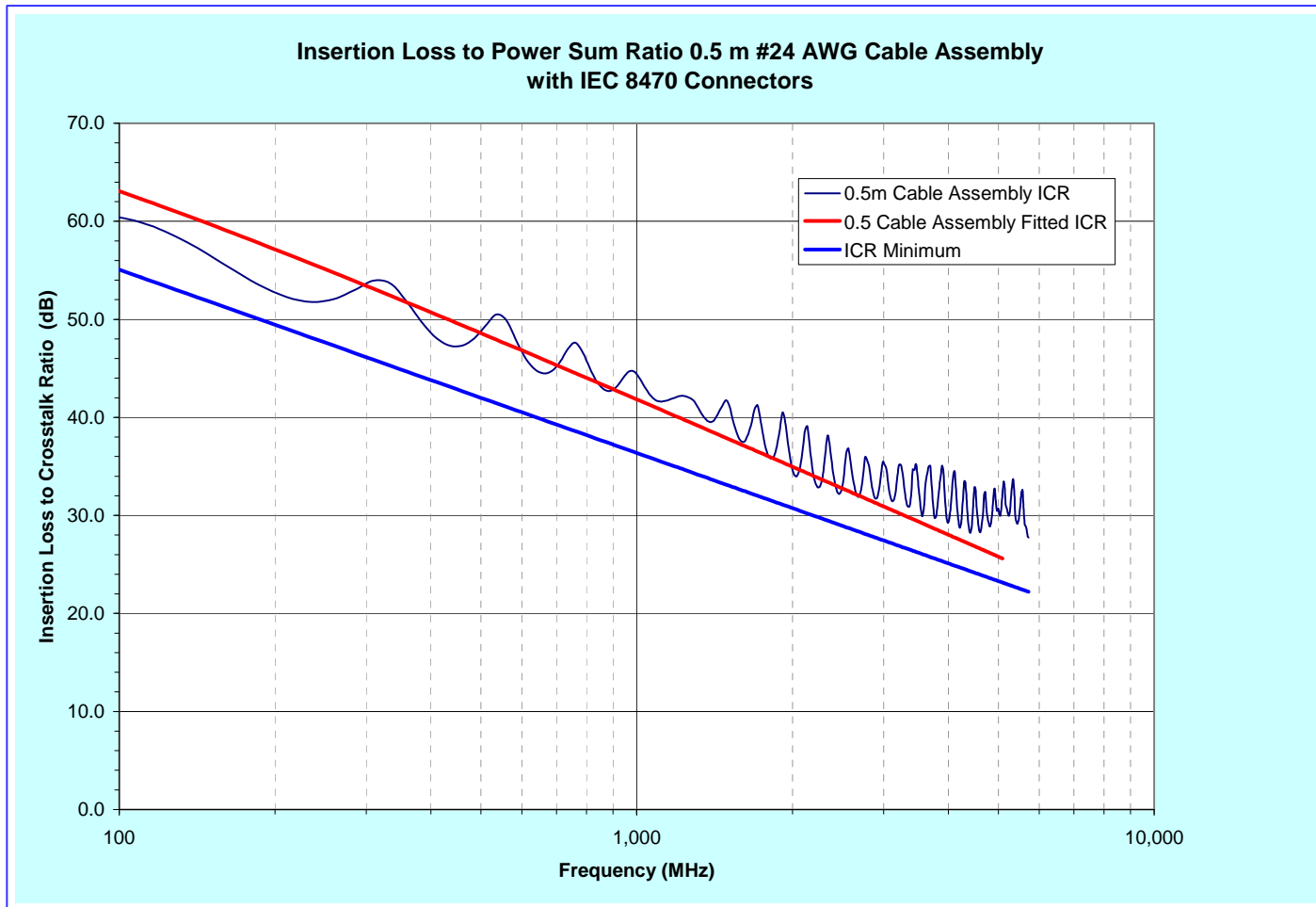
SFF-8470 Insertion Loss and Crosstalk Parameters: 0.5 meter NEXT, PSNEXT



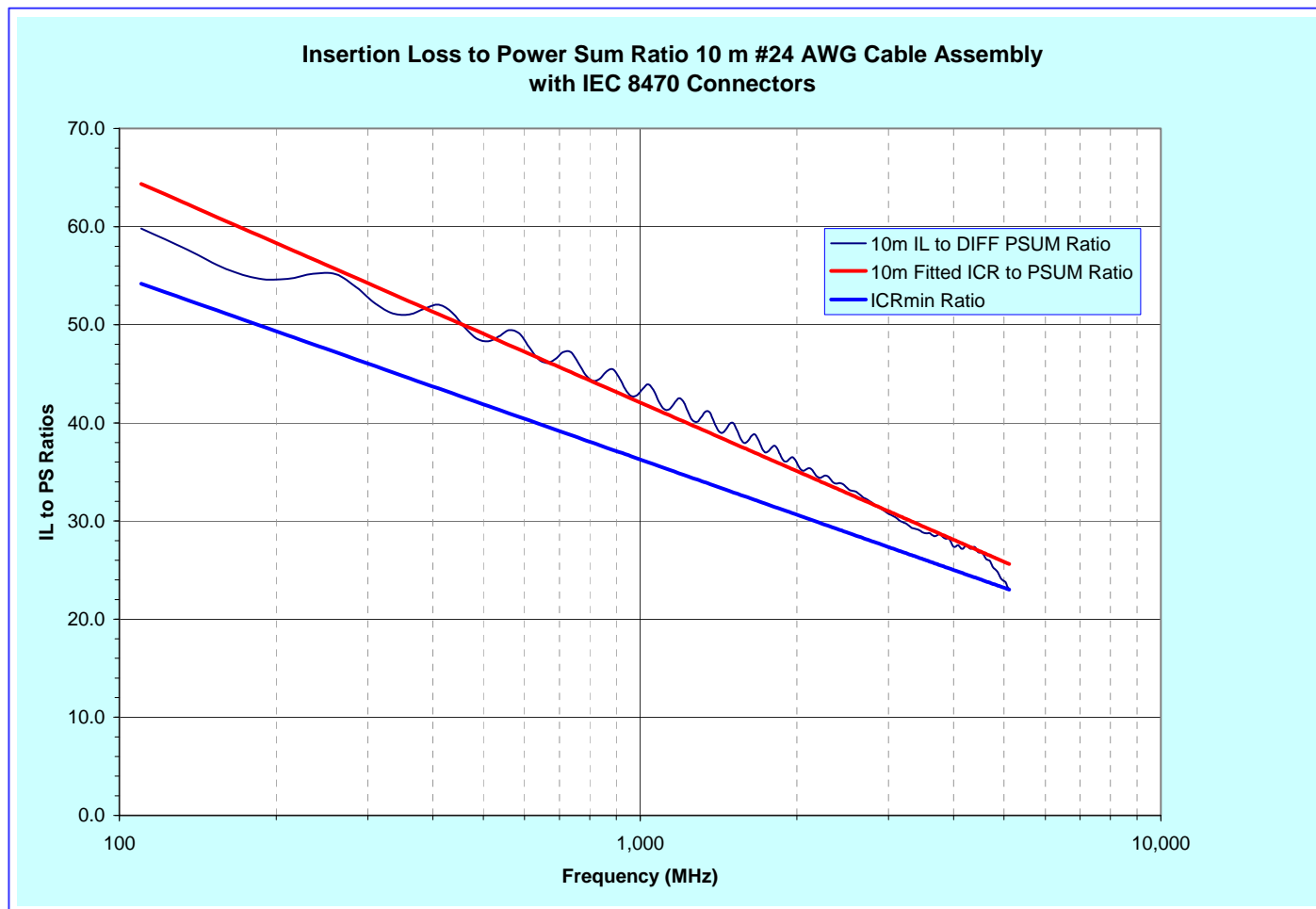
SFF-8470 Insertion Loss and Crosstalk Parameters: 0.5 meter FEXT, PSFEXT



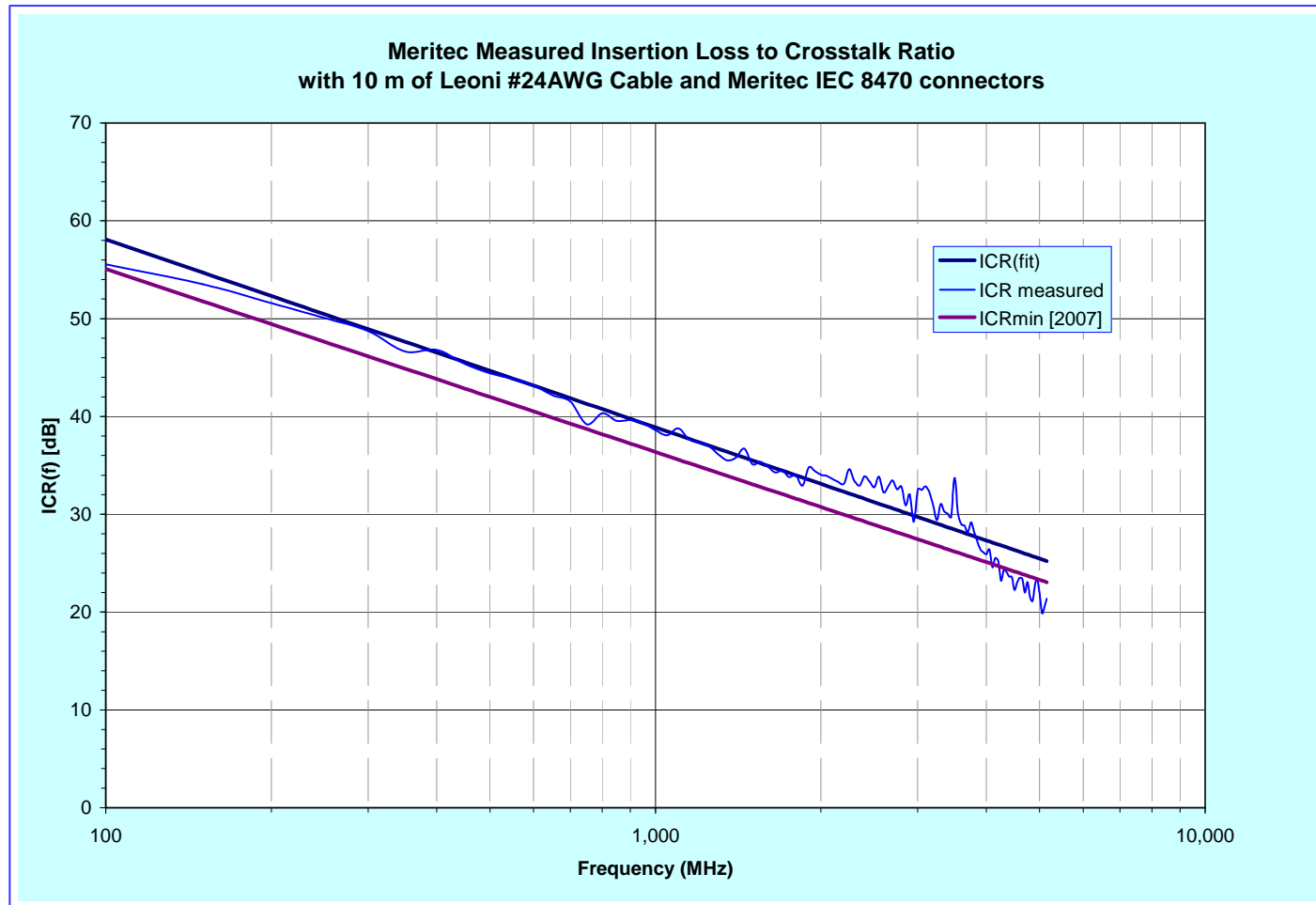
CX4/IB Insertion Loss to Crosstalk Ratio – 0.5 m FUJITSU



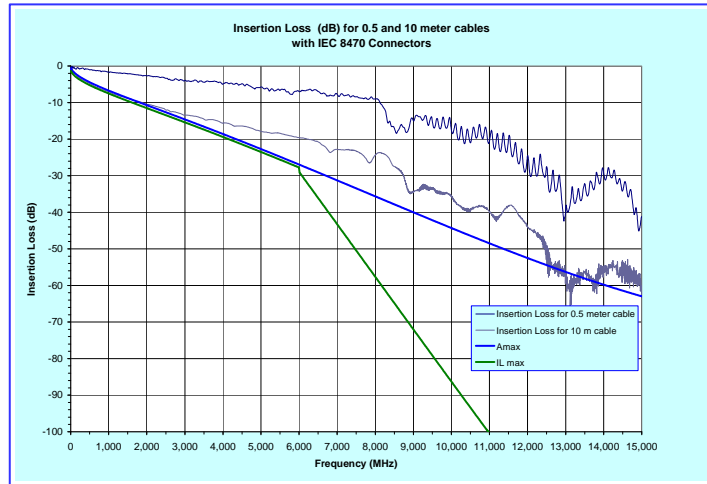
CX4/IB Insertion Loss to Crosstalk Ratio – 10 m



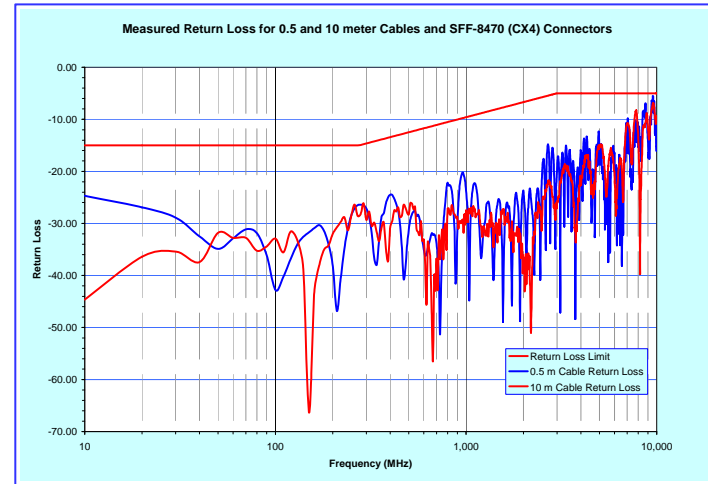
CX4/IB Insertion Loss to Crosstalk Ratio – 10 m FUJITSU



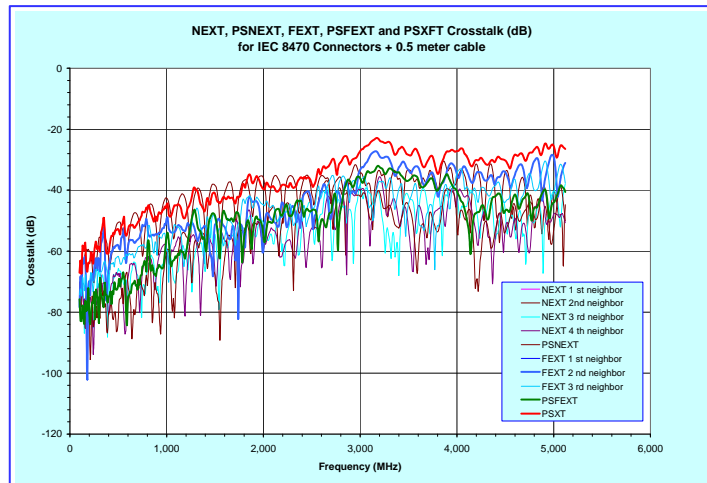
Channel Model Componentss



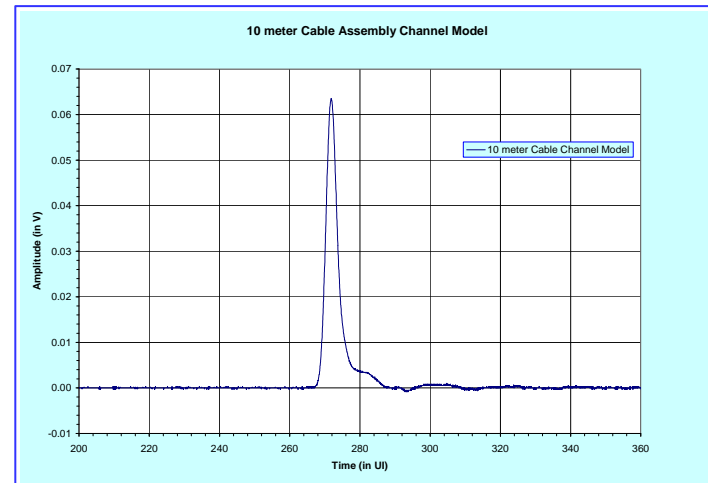
Insertion Loss



Return Loss

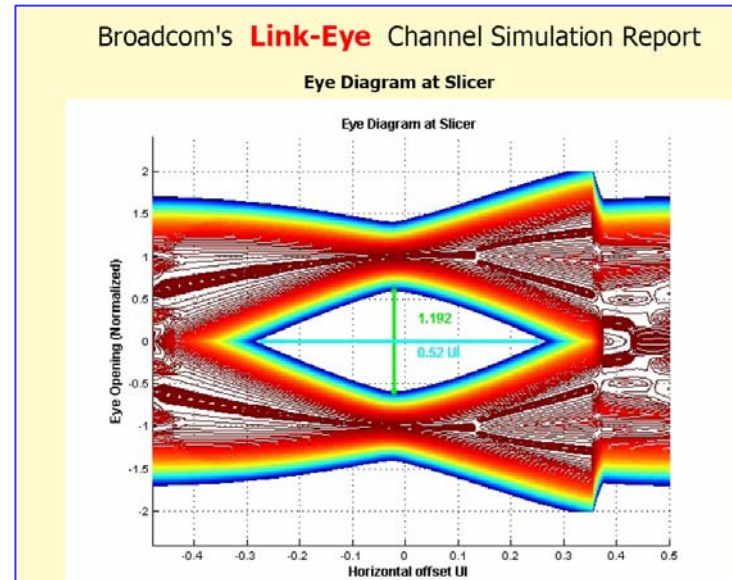
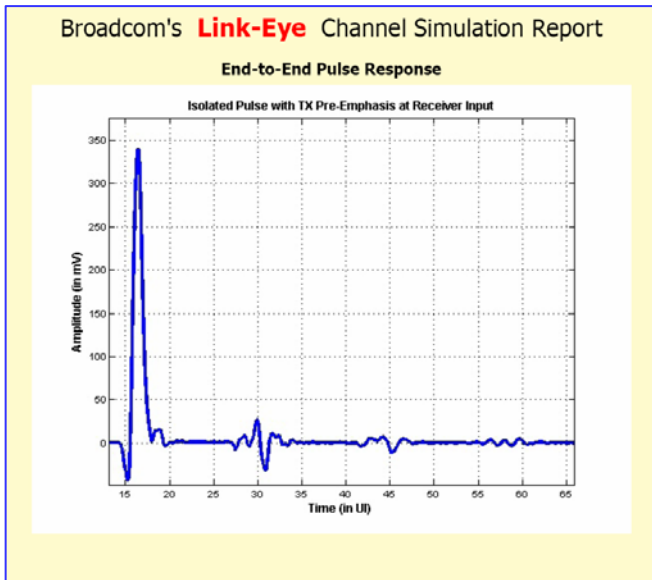


Crosstalk



Channel Model

Simulation Resultss



Results Courtesy: Vivek Talang, Broadcom

Summary of SFF-8470 (CX4) Measurement Results for IEEE 802.3ba Compliance



- The measurements and analyses of the SFF-8470 (CX4) connector and attached 10 and 0.5 meter cable assembly show the following compliance to the current IEEE802.3ap requirements:
 - The measured Return Loss meets the 802.3ap Return Loss limits.
 - The measured Insertion Loss satisfies the maximum attenuation limit. The fitted data are lower than the 802.3ap maximum attenuation limit.
 - The measured ICR satisfies the 802.3ap minimum limit for 0.5 meter and 10 meter with low crosstalk connector.
 - The current SFF-8470 based cable assemblies will meet the requirements of 802.3ap.

Summary



- The data suggests that SFF-8470 (CX4) cable connector with 0.5 thru 10 meters of twinaxial cable be considered for 40GBASE-CR4 cable assembly.