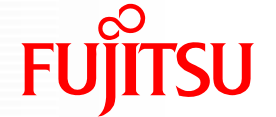




# **SFF-8470 (CX4) / Copper Concepts for 802.3ba**

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# Contributors



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# Contributors



## Supporters:

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- **Gourgen Oganessyan –Quellan**
- **Herb Van Deusen –WL Gore**
- **Mike Savage –Cinch**
- **Tom Dineen, Dineen Consulting**

# 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

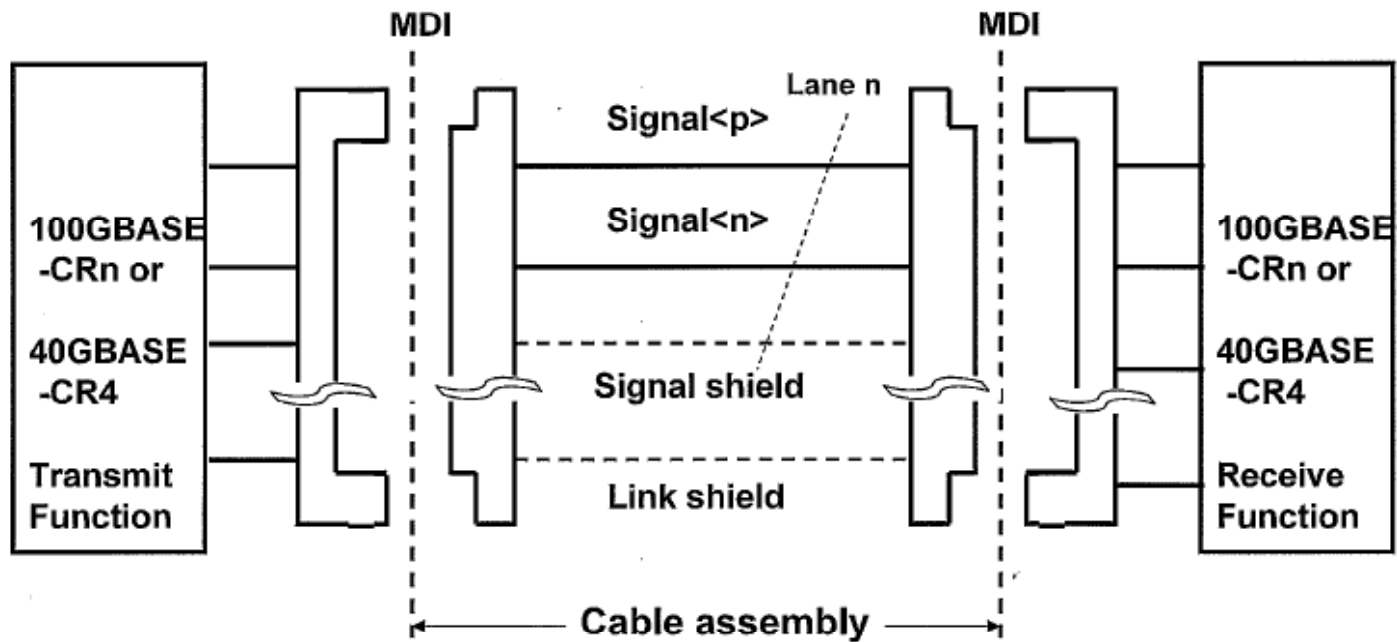
# Presentation Objectives



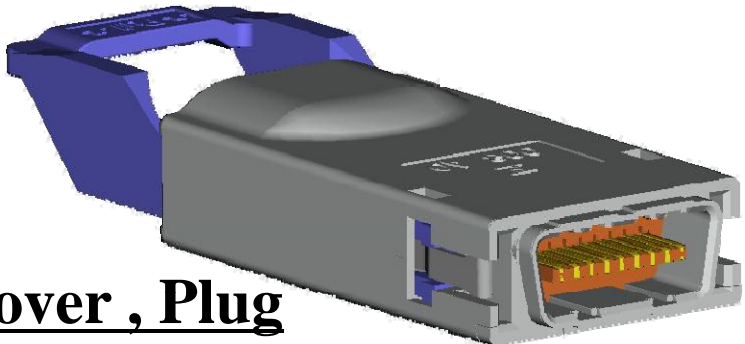
This presentation will provide information regarding:

- 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.

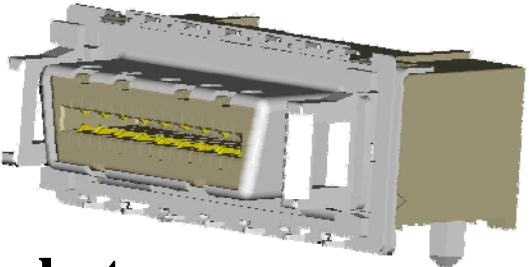
# IEEE 802.3ba Link Model



# SFF-8470 / CX4 Connector Structure

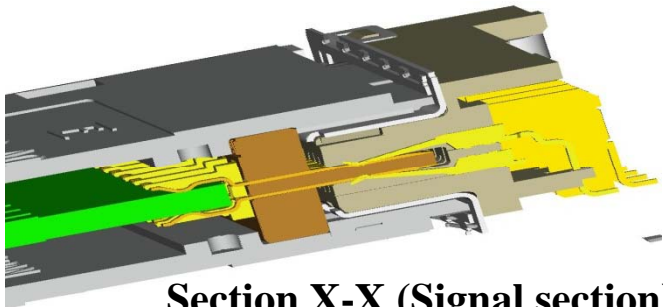
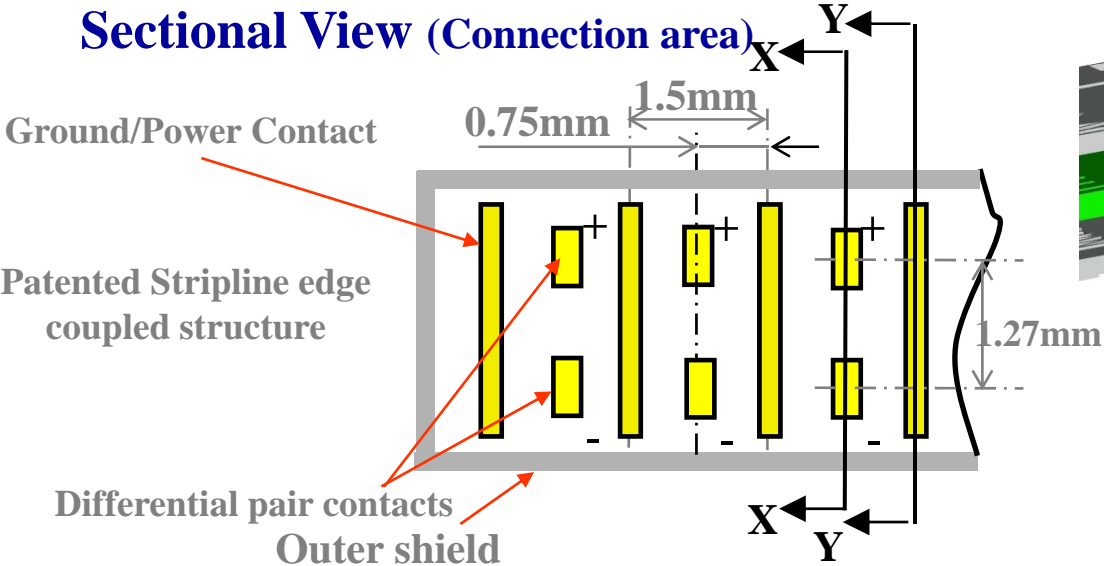


**Cover, Plug**

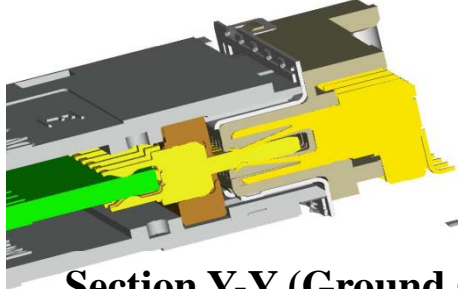


**Socket**

**Sectional View (Connection area)**



**Section X-X (Signal section)**

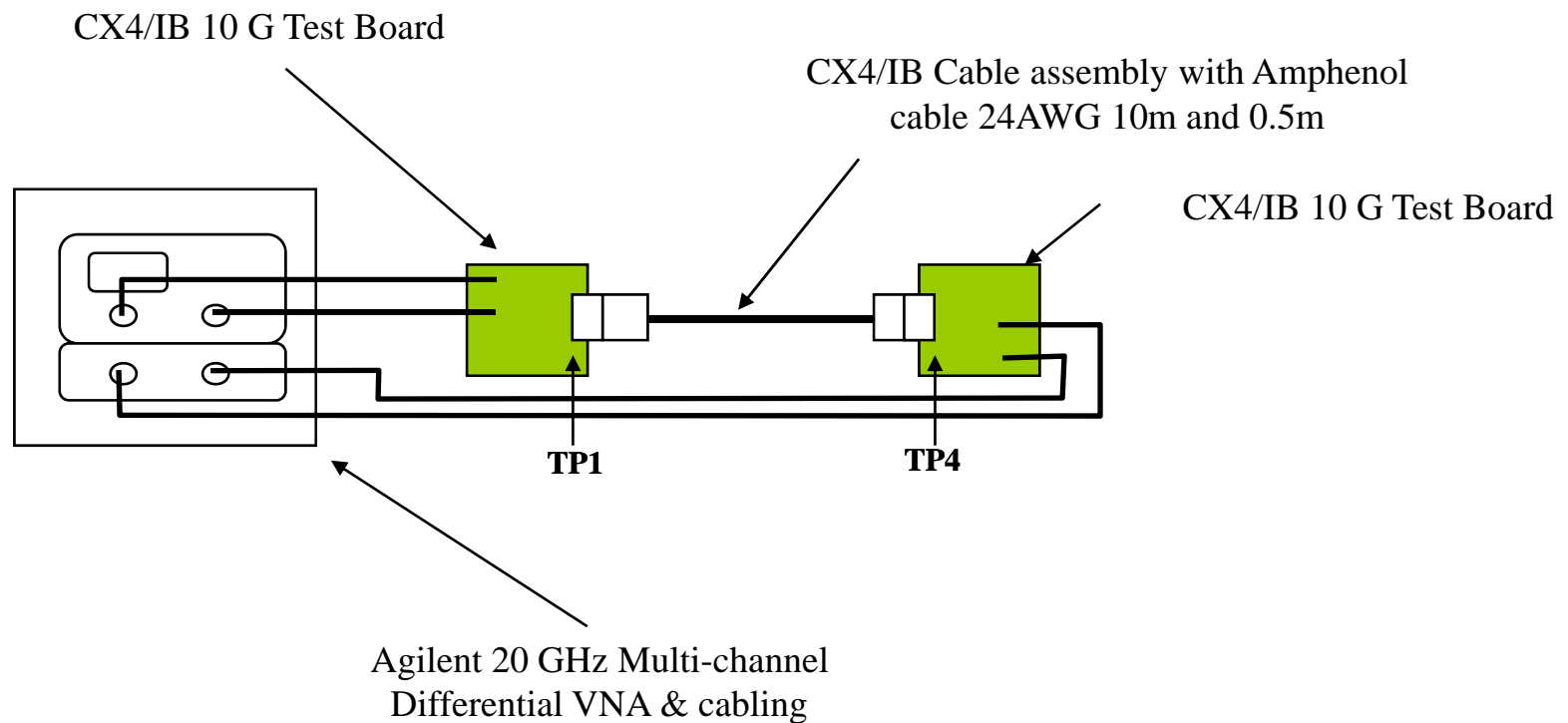


**Section Y-Y (Ground section)**

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

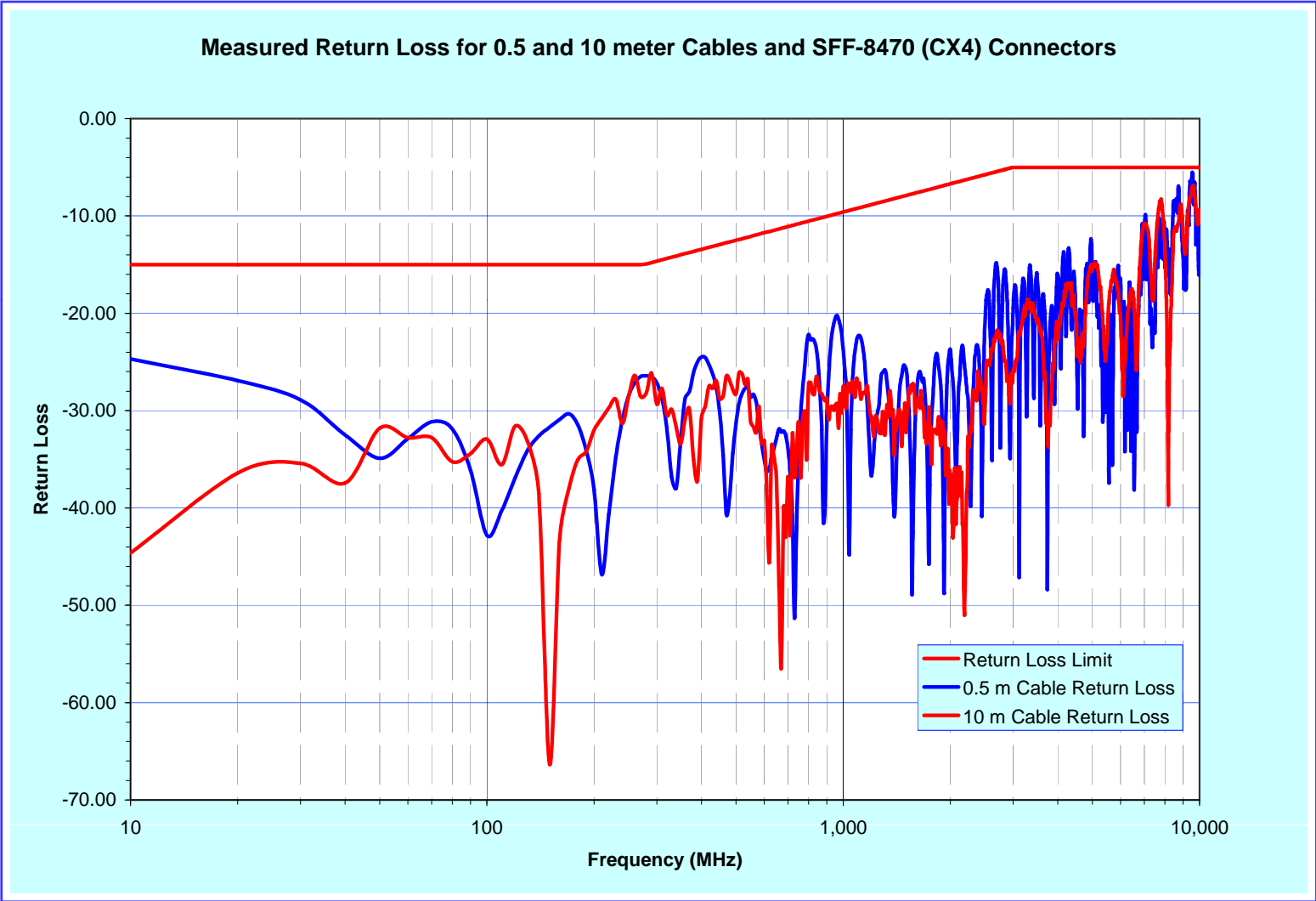


## Return Loss $RL(f)$ Measurement

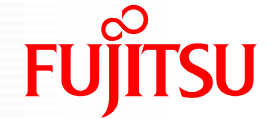




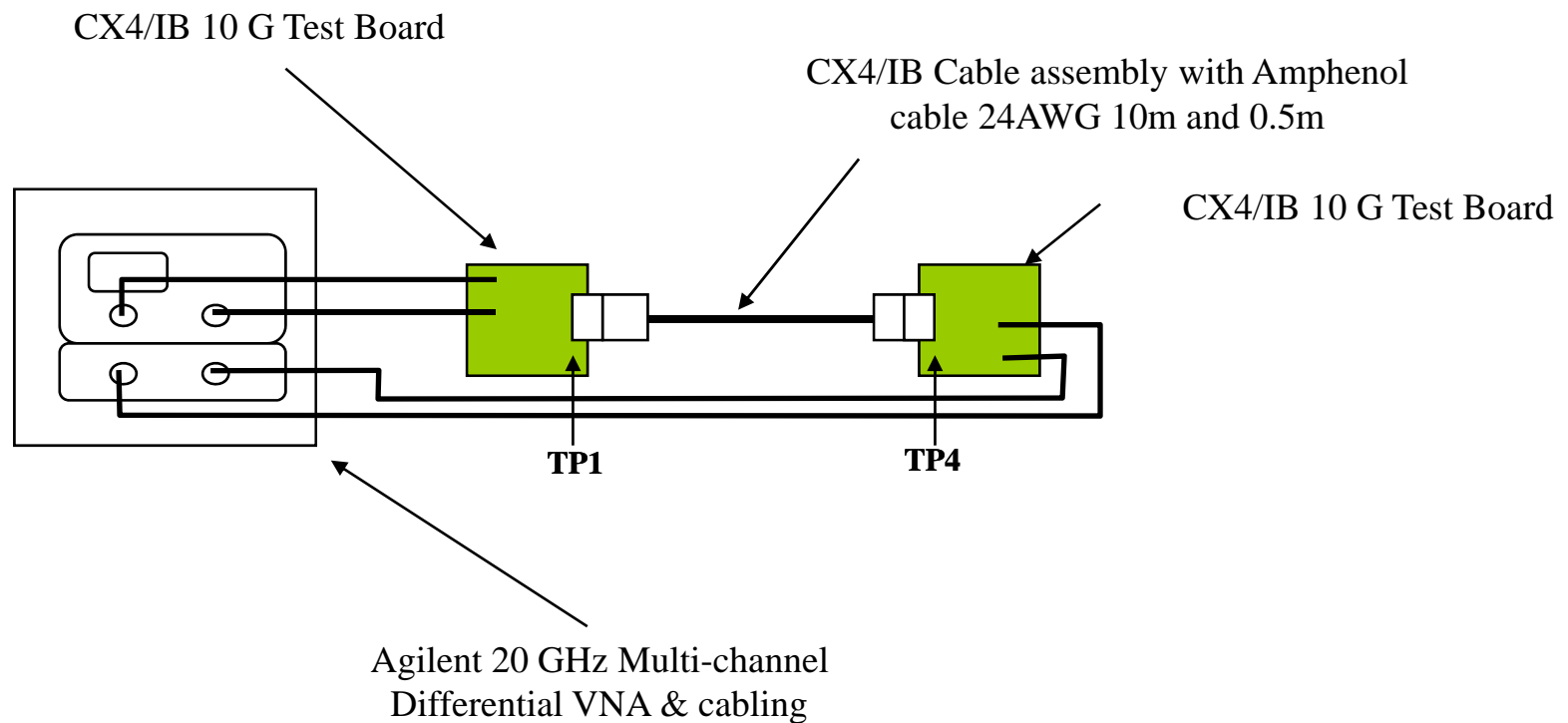
# SFF-8470 (CX4) + 10 and 0.5 meter SkewClear EXD Cable Channel Return Loss Compliance



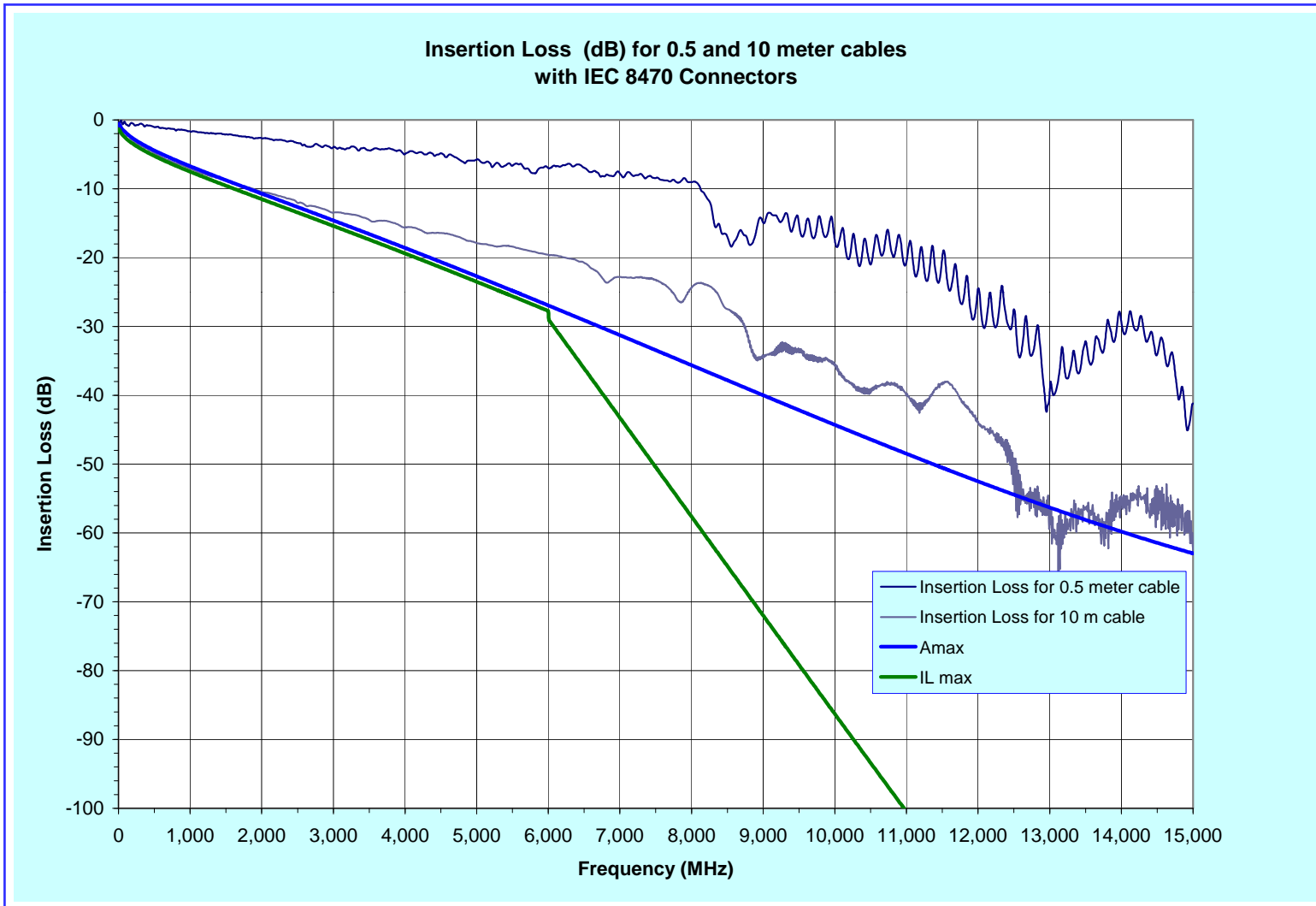
# Connector and Cable assembly 24AWG 10m and 0.5m Frequency Domain Measurement Set-up



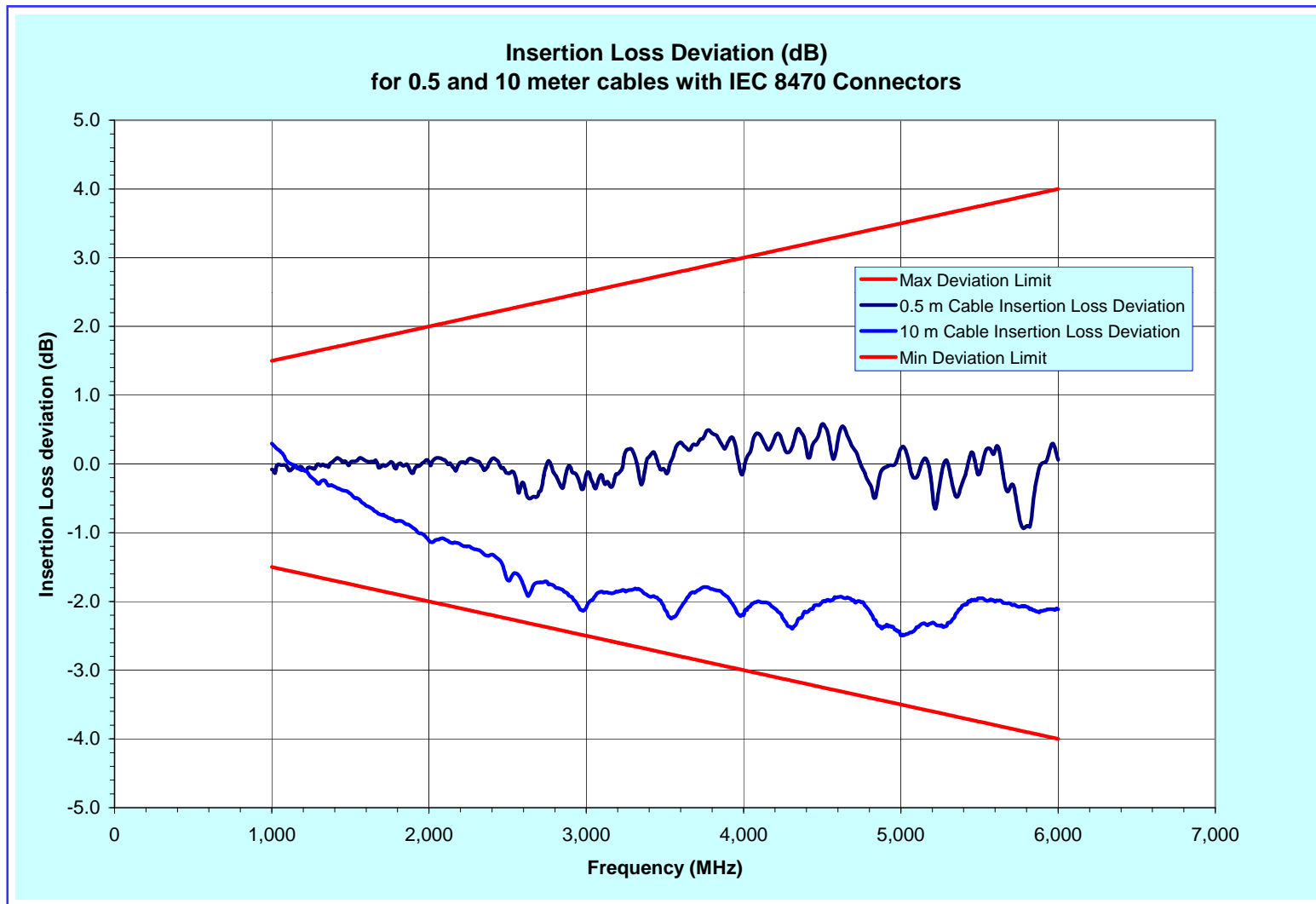
## Insertion Loss $IL(f)$ Measurement Set-up



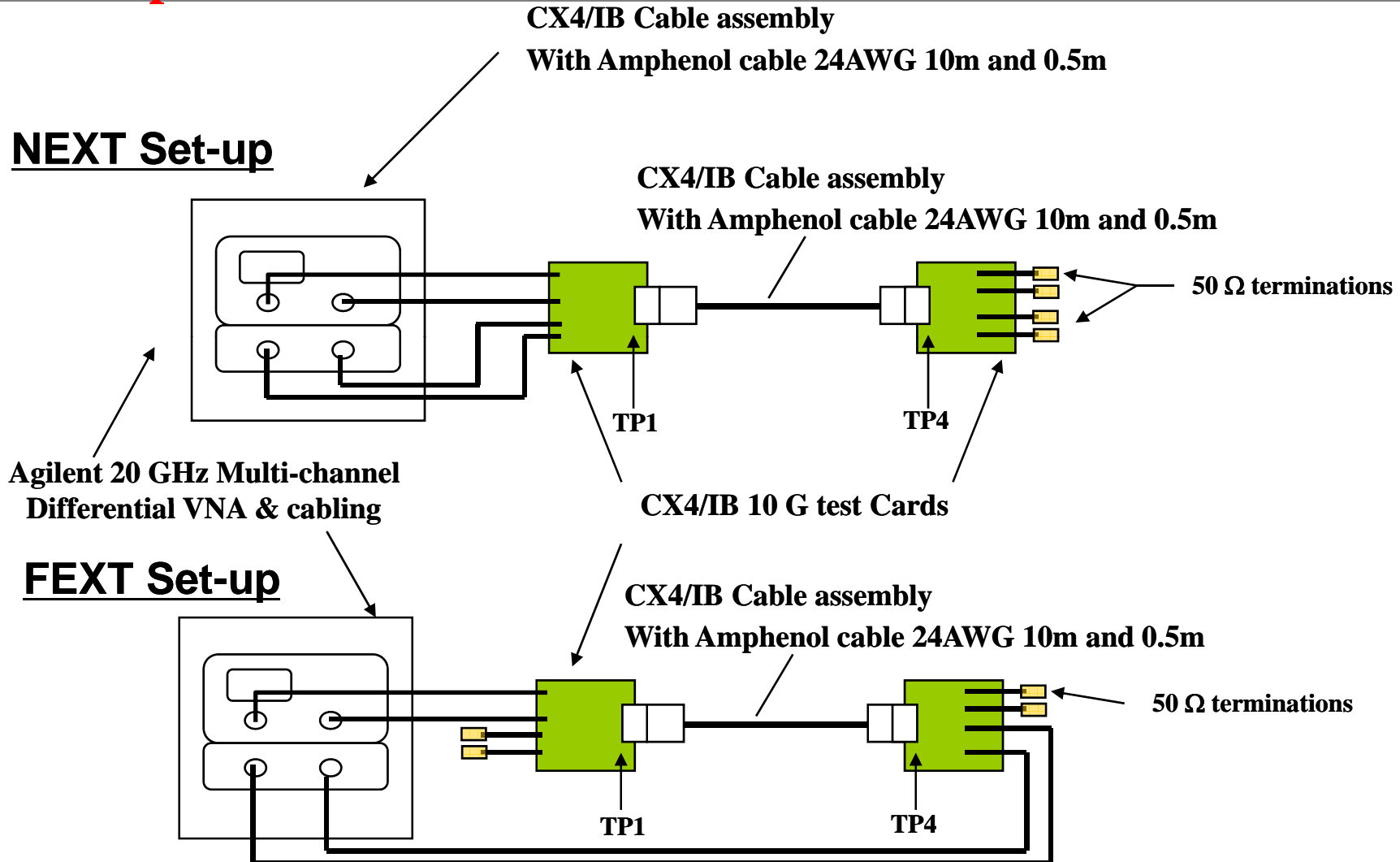
# SFF-8470 (CX4) + 10 and 0.5 meter SkewClear EXD Cable Channel Insertion Loss Compliance



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



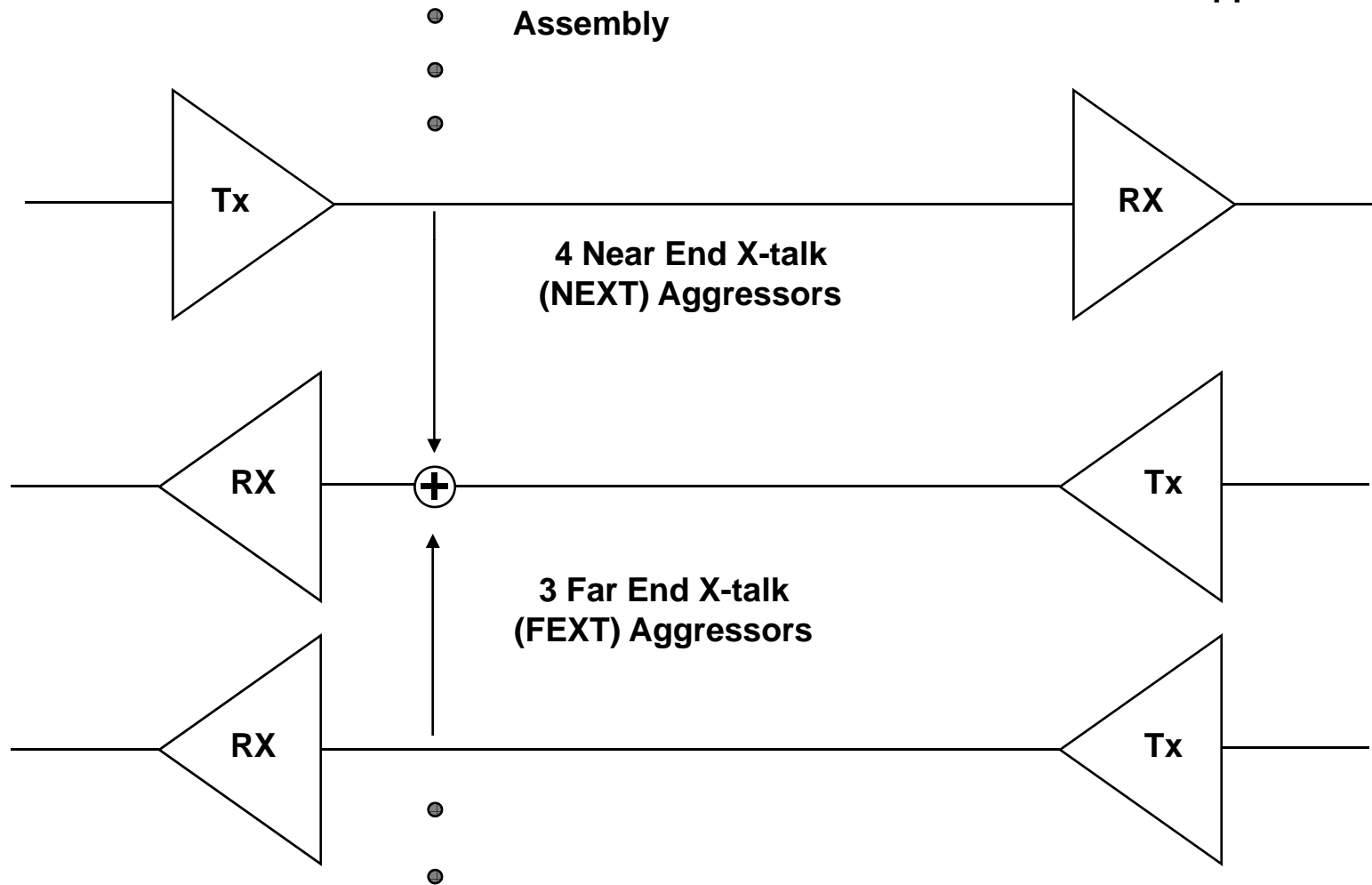
# SFF-8470 (CX4 CN) NEXT/FEXT Measurement Set-ups



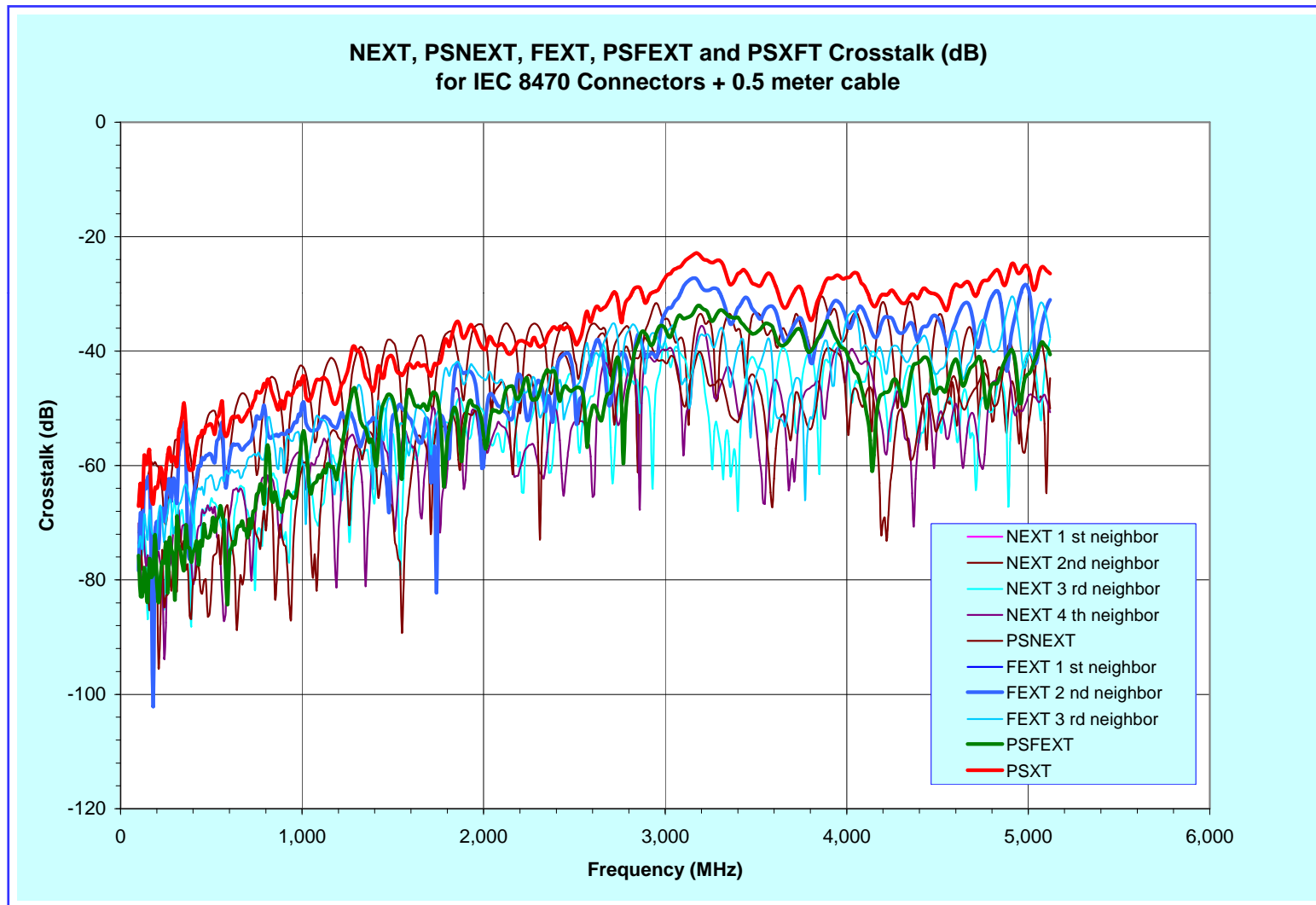
# 802.3 CX4 Channel Insertion Loss to Crosstalk Ratio



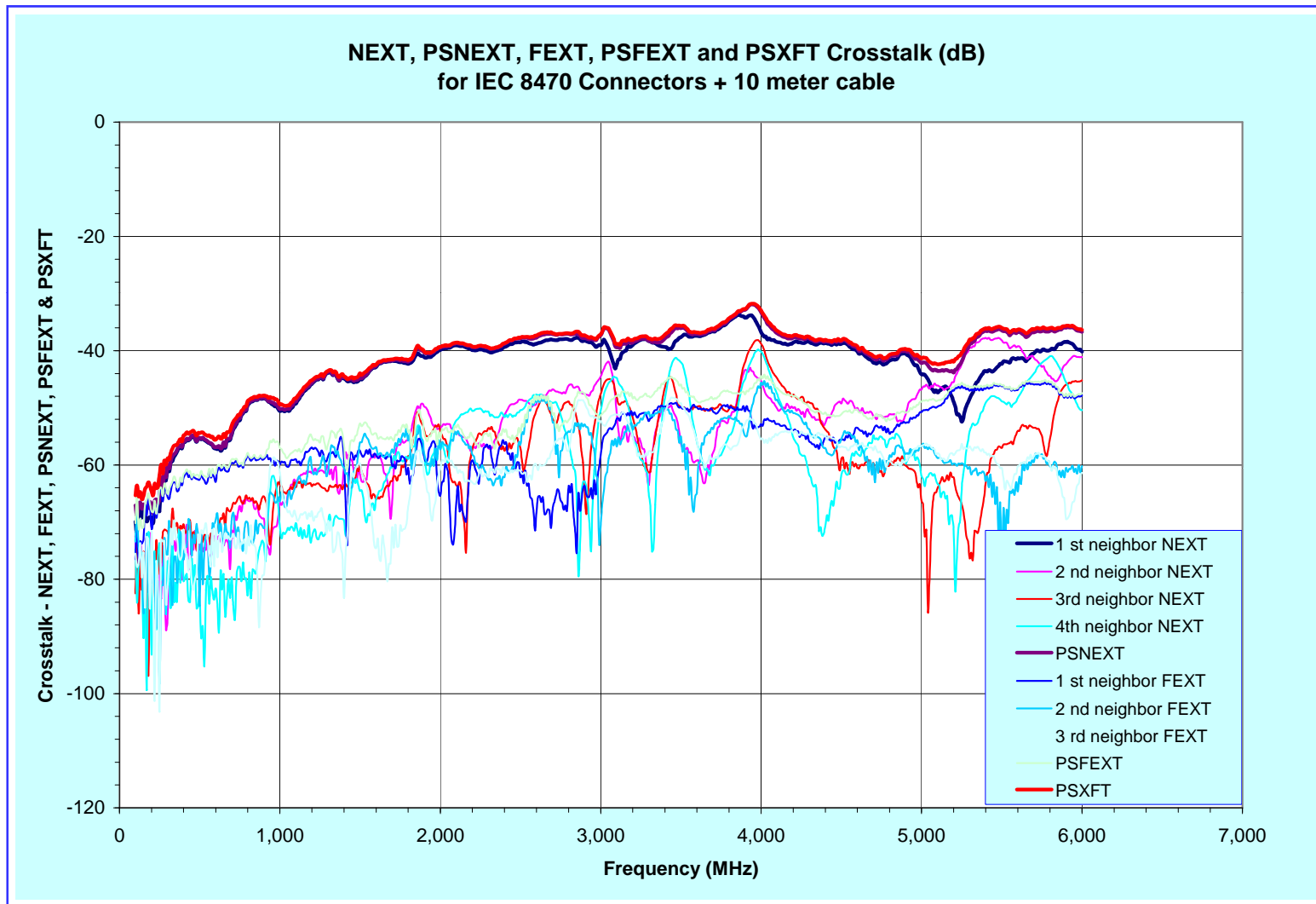
Insertion Loss to Crosstalk Ratio computed from S-Parameter Insertion Loss and Crosstalk Components of the 10 and 0.5 meter CX4 SkewClear EXD Copper Cable Assembly



# SFF-8470 Insertion Loss and Crosstalk Parameters: 0.5 meter NEXT, FEXT, PSNEXT, PSFEXT and PSXT(f)

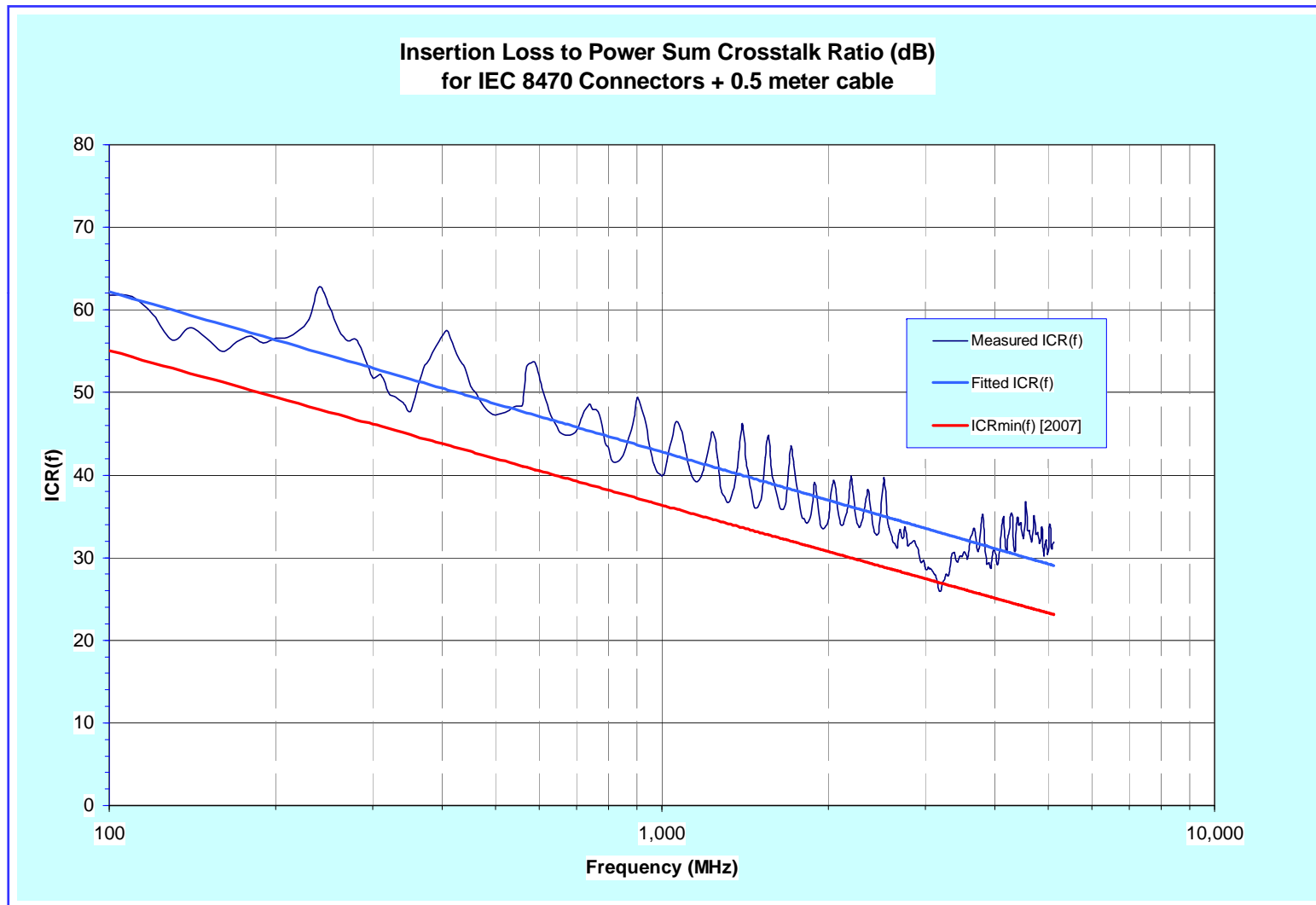


# SFF-8470 Insertion Loss and Crosstalk Parameters: 10 meter NEXT, FEXT, PSNEXT, PSFEXT and PSXT(f)

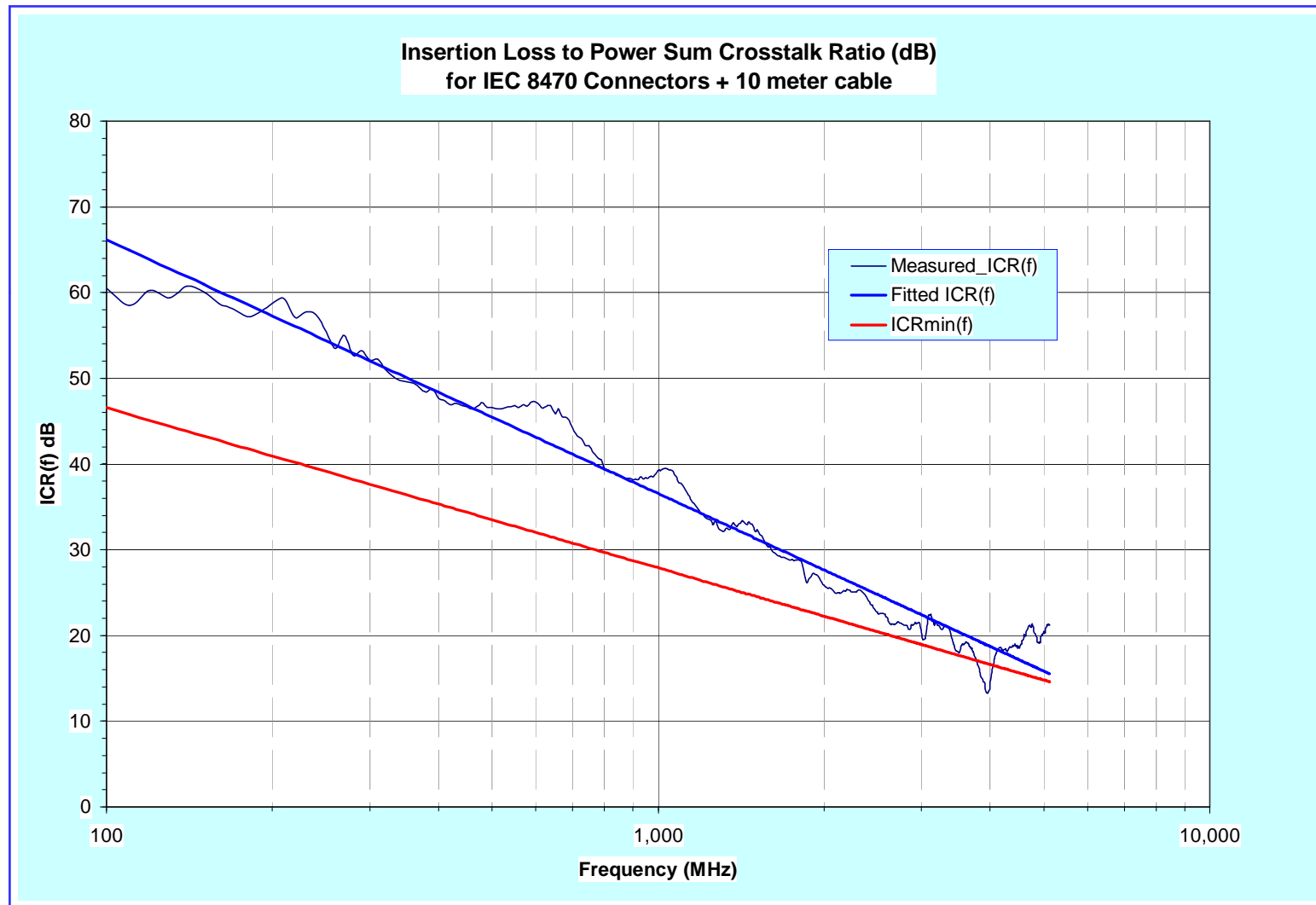




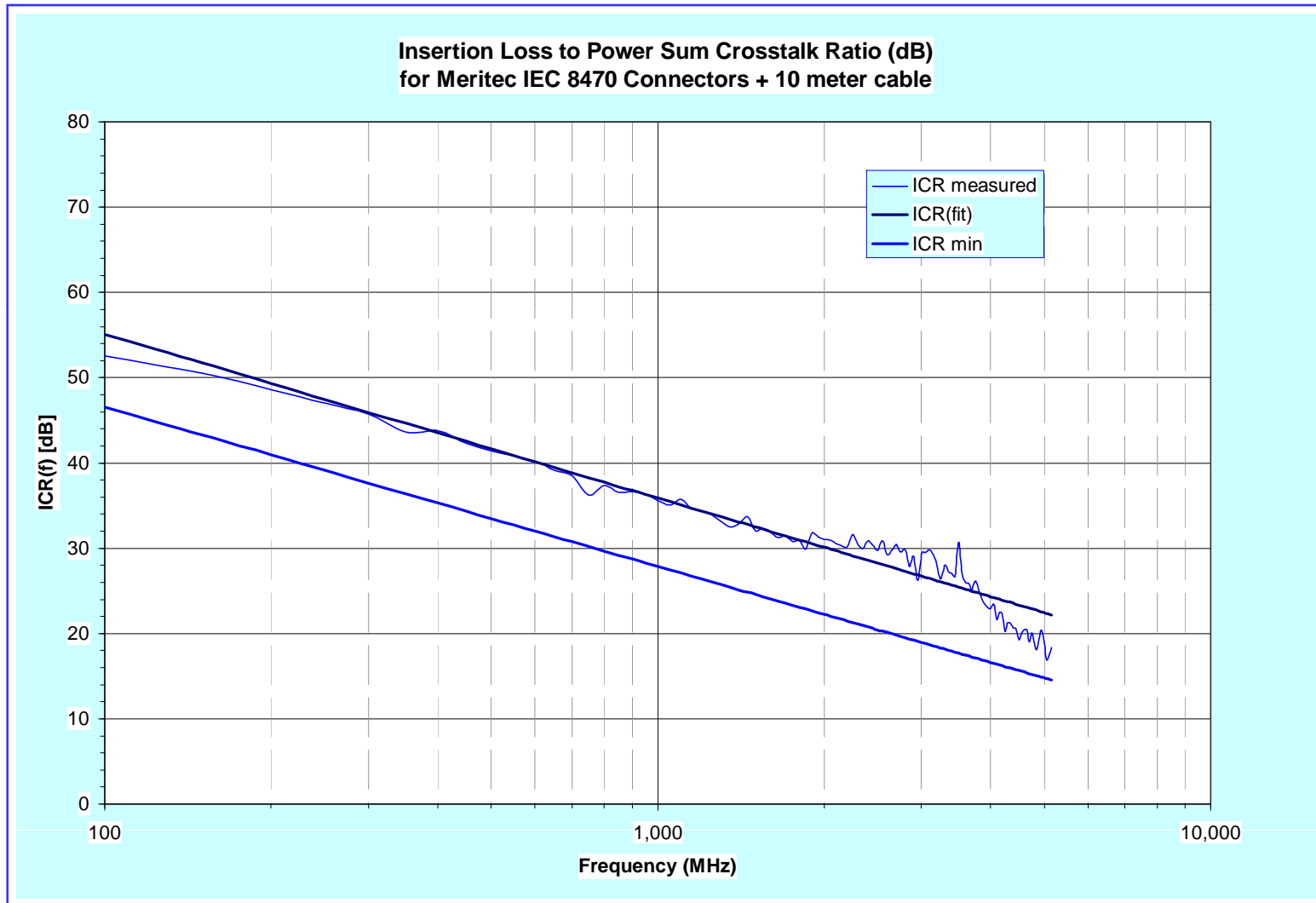
# CX4/IB Insertion Loss to Crosstalk Ratio – 0.5 m FUJITSU



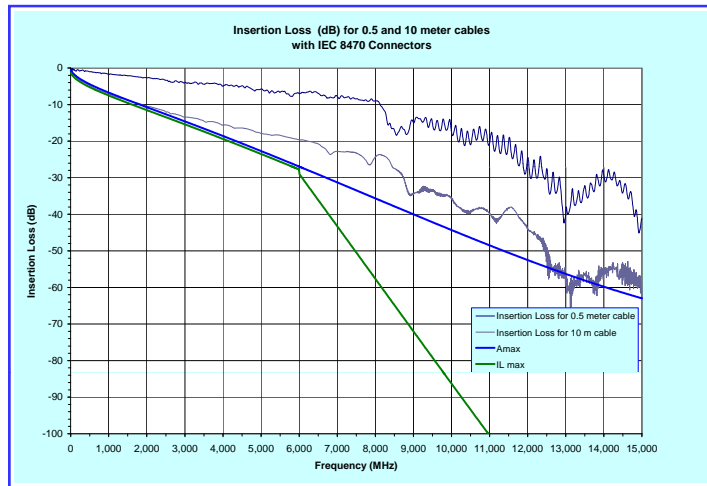
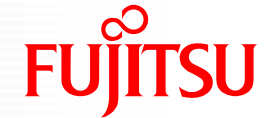
# CX4/IB Insertion Loss to Crosstalk Ratio – 10 m



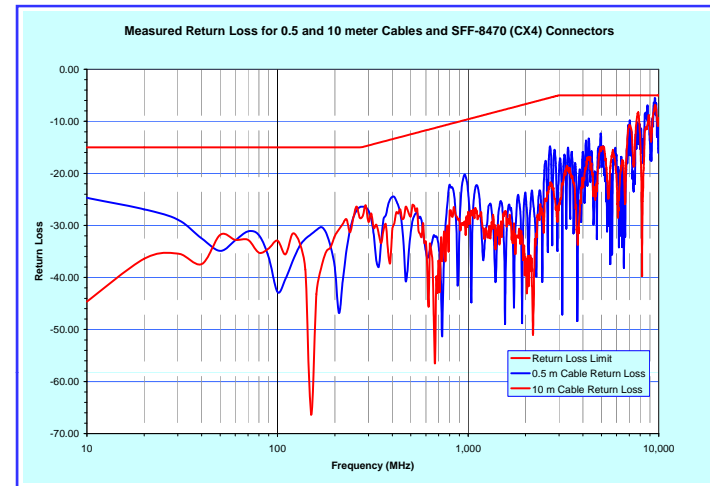
# CX4/IB Insertion Loss to Crosstalk Ratio – 10 m



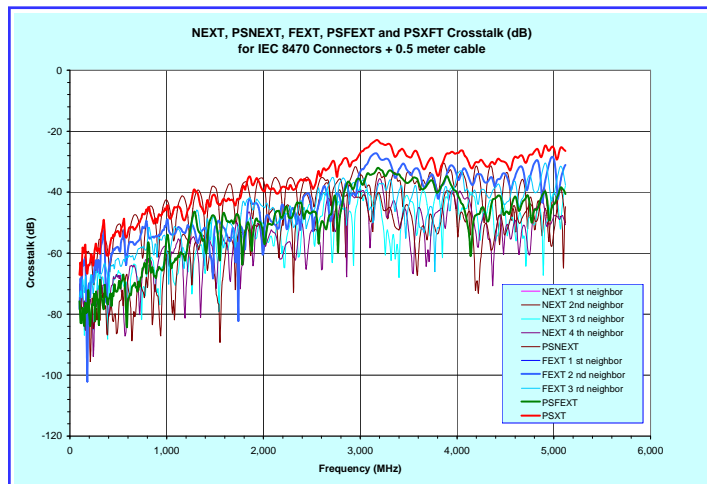
# Channel Model Componentss



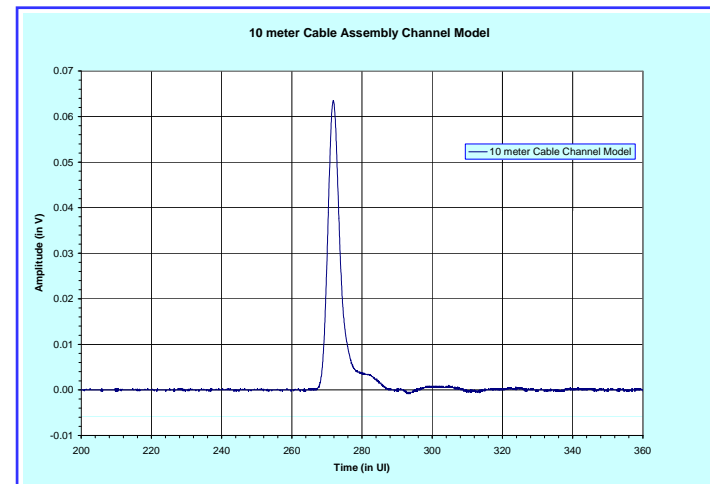
Insertion Loss



Return Loss

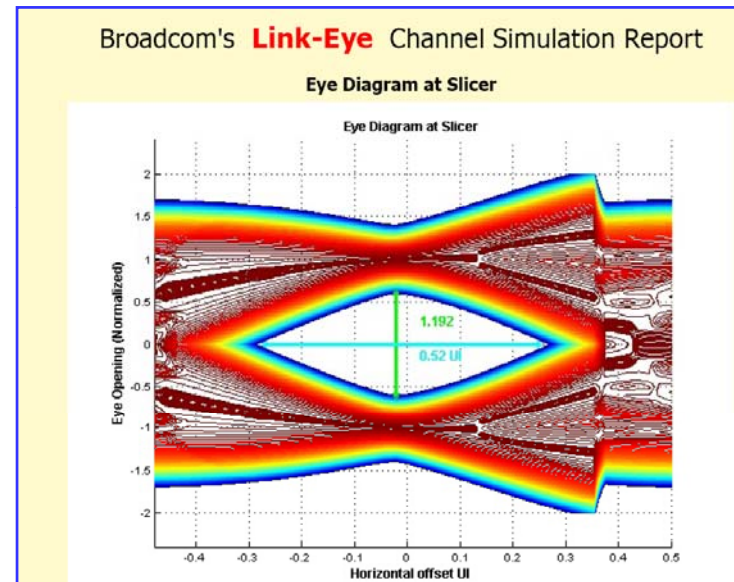
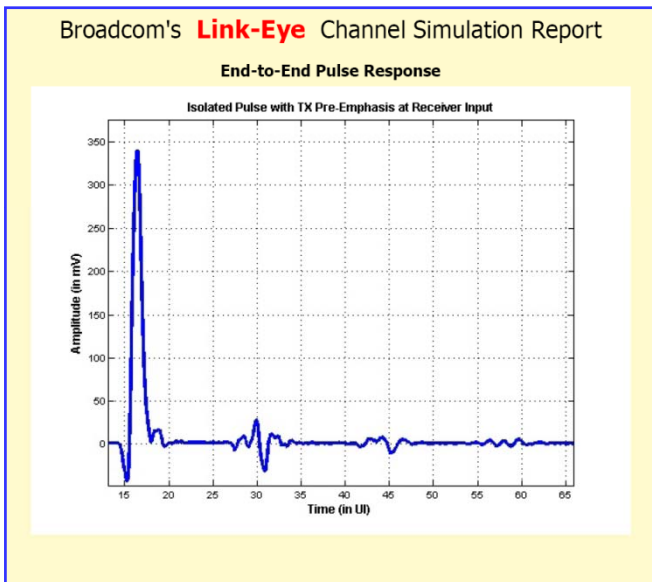


Crosstalk



Channel Model

# Simulation Resultss



Results Courtesy: Vivek Talang, Broadcom

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



- The measurements analyses of the SFF-8470 (CX4) connector and attached 10 and 0.5 meter cable assembly show the following compliance:
  - 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.