# QSFP-DD Test Adapter

User Manual

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# Introduction

This user's guide documents the QSFP-DD Legacy Plug, QSFP-DD Plug, QSFP-DD RX Plug, QSFP-DD TX Plug and QSFP-DD Receptacle Test Adapters.

Model Numbers (QSFPDD-TPAK-HCB-LGCY-P, QSFPDD-TPAK-HCB-DD-P, QSFPDD-TPAK-HCB-RX-P, QSFPDD-TPAK-HCB-TX-P and QSFPDD-TPAHK-MCB-R). The two test adapter types, shown in Figures 1 and 2, test QSFP-DD interface cables, hosts, and modules to the requirements of the QSFP-DD MSA and IEEE 802.3cd Standards.

The QSFP-DD HCB (Plug) and QSFP-DD MCB (Receptacle) test adapter assemblies allow easy access, via 2.92mm (K-Style) connections, to measure or inject data signals.

**NOTE: To avoid damaging the cables, use the handling techniques described in the Care and Handling section before making any connections or configuring a test setup.**

**Always use a static-safe workstation when performing tests, as explained in the "Electrostatic Discharge Information" section.**

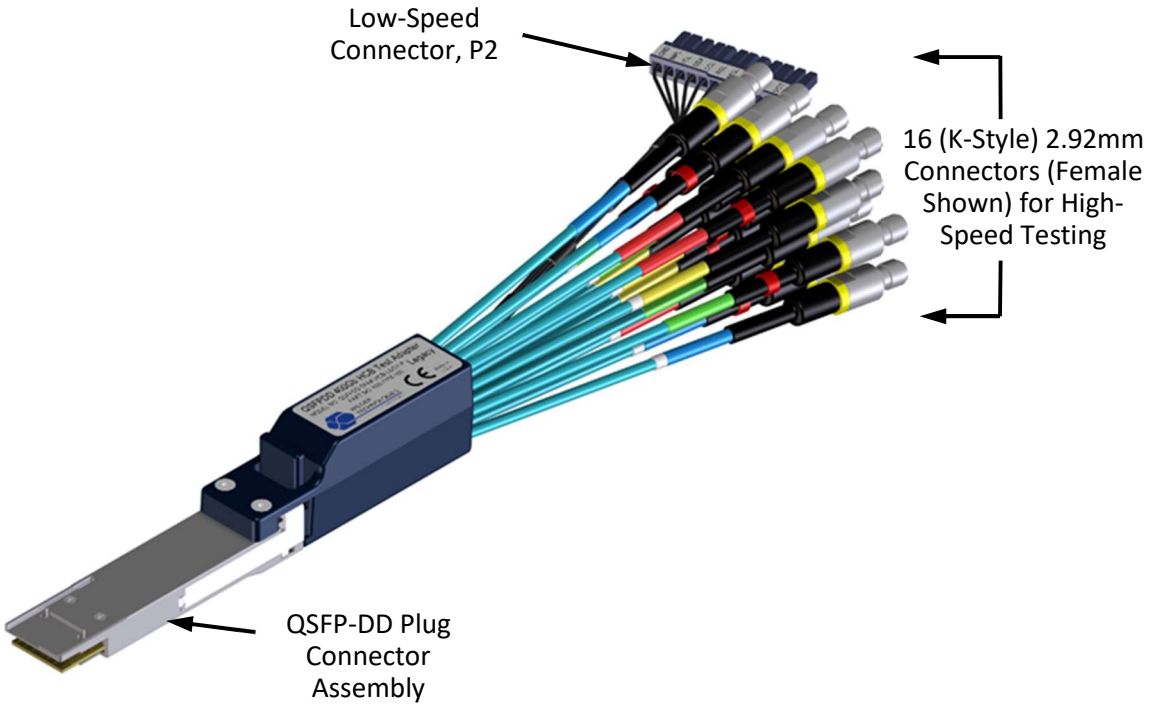



Figure 1. The QSFP-DD HCB (Plug) Test Adapter (Note: The coaxial cables are configuration dependent and may be terminated with different connectors and have different color-coding than what is shown.)

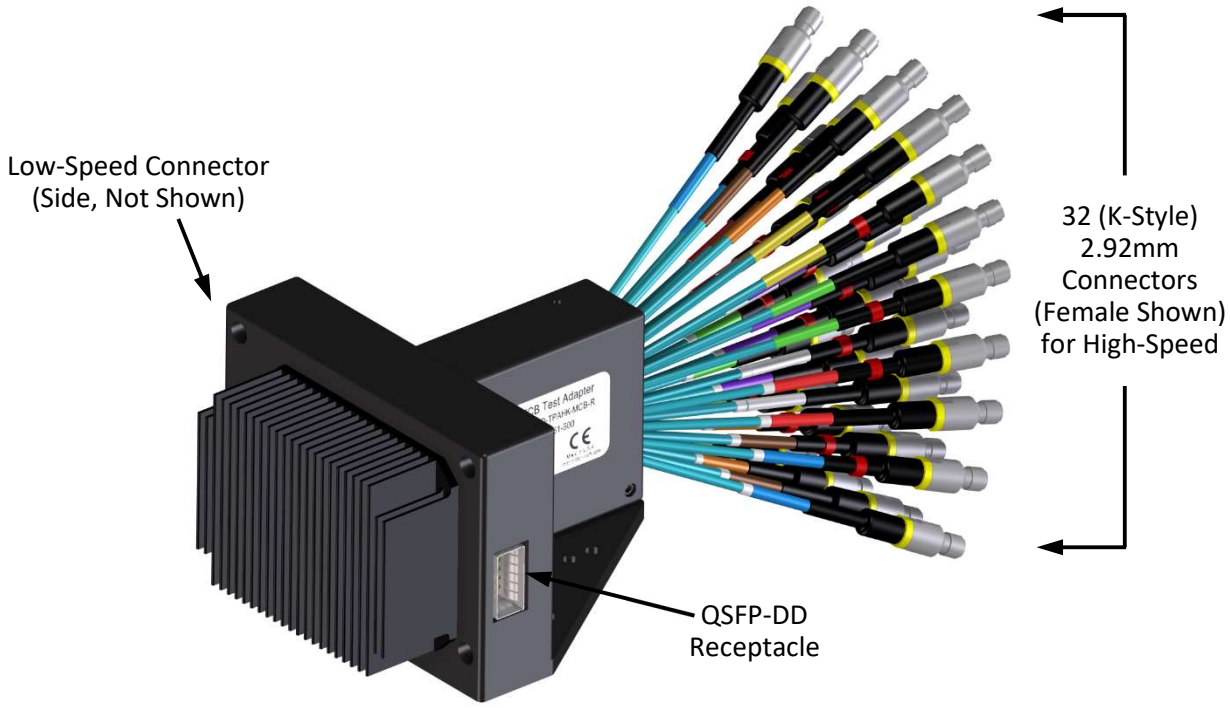



Figure 2. The QSFP-DD MCB (Receptacle) Test Adapter (Note: The coaxial cables are configuration dependent and may be terminated with different connectors than what is shown.)

**NOTE: The metal shell of both the plug (QSFP-DD HCB) and receptacle (QSFP-DD MCB) connectors tie high-speed ground to chassis ground.**

The low-speed 12-position receptacle and plug connectors are keyed and latching (Molex part number 43645-1200 for the plug TPA and 43650-1204 for the receptacle TPA). The mating connector housings and contact pins for 26-30awg wire are Molex part number 43640-1201 for the 12-position housing and 43031-0011 for the plug contacts used with the plug TPA, and Molex part number 43645-1200 for the 12-position housing and 43030-0011 for the receptacle contacts used with the receptacle TPA. Replacement parts can be purchased through Molex distributors.

**NOTE: The receiver 2.92mm (K-Style) connections for QSFP-DD are normally AC coupled. The QSFP-DD plug and receptacle TPAs do NOT have internal DC Blocks. This allows for parametric testing through the TPAs. Normal testing may require DC Blocks (May be optionally ordered from Wilder Technologies). Refer to the Electrical Specifications section of this document for DC Block performance parameters.**

# Product Inspection

Upon receiving QSFP-DD Test Adapters from Wilder Technologies, perform the following product inspection:

- Inspect the outer shipping container, foam-lined instrument case, and product for damage. Retain the outer cardboard shipping container until the contents of the shipment have been inspected for completeness and the product has been checked mechanically and electrically. Use the foam-lined instrument-case for secure storage of the Wilder Technologies QSFP-DD Test Adapter when not in use.

- Locate the shipping list and verify that all items ordered were received.

- In the unlikely event that the product is defective or incomplete, the “Limited Warranty” section discusses how to contact Wilder Technologies for technical assistance and/or how to package the product for return.

# The QSFP-DD Test Adapter Care and Handling Precautions

The QSFP-DD Test Adapters requires careful handling to avoid damage. Improper handling techniques, or using too small a cable bend radius, can damage the coaxial cable connections within the adapter housing or the cables themselves. This can occur at any point along the cable. To achieve optimum performance and to prolong the QSFP-DD TPA's life, observe the following handling precautions:

- **CAUTION 1: Avoid Torque Forces** (Twisting)
  While individual coaxial cables within the test adapter have some rotational freedom, twisting the QSFP-DD TPA as a unit, with one end held stationary, may damage or severely degrade performance. Adherence to Caution 5 (below) helps to avoid twisting.

- **CAUTION 2: Avoid Sharp Cable Bends**
  Never bend coaxial cables into a radius of 26 mm (1-inch) or less. Never bend cables greater than 90°. Single or multiple cable bends must be kept within this limit. Bending the QSFP-DD TPA cables less than a 26mm (1-Inch) radius will permanently damage or severely degrade test adapter performance.

- **CAUTION 3: Avoid Cable Tension** (Pull Forces)
  Never apply tension (pull forces) to an individual coaxial cable that is greater than 2.3 kg (5 lbs.). To avoid applying tension, always place accessories and equipment on a surface that allows adjustment to eliminate tension on the QSFP-DD TPA and cables. Use adjustable elevation stands or apparatus to accurately place and support the QSFP-DD TPA.

- **CAUTION 4: Connect the QSFP-DD Test Adapter First**
  To prevent twisting, bending, or applying tension to the coaxial cables when connecting a QSFP-DD TPA, always attach the QSFP-DD TPA to the device under test (DUT) or cable under test before attaching any 2.92mm (K-Style) connectors. Carefully align the QSFP-DD connectors and then gently push the connectors together until fully seated.

  If the QSFP-DD TPA must be turned or twisted to make connection to the DUT, avoid using the QSFP-DD TPA housing alone to make this occur. Try to distribute the torque forces along the length of the test setup and cabling. If this is not possible, it is recommended to first loosen or disconnect the 2.92mm (K-Style) connections at the QSFP-DD TPA, make the connection to the DUT and then re-tighten or attach the test equipment leads.

  **NOTE: Only grip the test adapter housing when inserting or extracting the QSFP-DD TPA to or from the DUT. Pulling directly on the QSFP-DD TPA cables or using them to insert the QSFP-DD TPA may cause damage.**

- **CAUTION 5: Carefully Make High-Speed (2.92mm, K-Style) Connections**
  To connect the QSFP-DD TPA 2.92mm (K-Style) connectors, follow these steps:

  1. Hold the cable stationary by grasping the cable at the black heat-shrink section near the High-Speed connector.

  2. Insert the mating High-Speed connector barrel and hand-tighten the free-spinning 2.92mm connector (K-Style) nut onto the connector while avoiding pulling, bending, or twisting the QSFP-DD TPA coaxial cable.

3. The QSFP-DD TPA 2.92mm connectors (K-Style) have flats that accept an open-end 1/4-inch or 5/16-inch wrench, depending on configuration. When attaching instrument cables to the QSFP-DD TPA, it is recommended that the QSFP-DD TPA high-speed connectors be mechanically held and the test leads be tightened to the equipment manufacturer's torque recommendations, normally 5 in-lbs., using an open-end torque wrench.

   If the test set-up requires repositioning, first loosen or disconnect the 2.92mm (K-Style) connections to avoid twisting, bending, or tension.

**NOTE: A drop in signal amplitude by half or 6dB during the testing of a channel may indicate that a cable has been mechanically pulled free of coaxial cable connections internal to the assembly. This could be determined by checking if the cable has any lateral play relative to the TPA. This would only occur when the TPA has exceeded the pull force as specified within the mechanical specification. If the cable cannot be re-seated, the test adapter will need to be sent back to the factory for service.**

- **CAUTION 6: Independently Support Instrument Cables or Accessories**
  Excessive weight from instrument cables and/or accessories connected to the QSFP-DD TPA can cause damage or affect the test adapter performance. Be sure to provide appropriate means to support and stabilize all test set-up components.

- **CAUTION 7: ESD Sensitivity**
  The QSFP-DD test adapters are passive components and are not in themselves sensitive to electrostatic discharge. However, when an active DUT is installed, that device becomes susceptible to ESD. Observe proper ESD precautions, further discussed later in this document.

# General Test Adapter, Cable, and Connector

Observing simple precautions can ensure accurate and reliable measurements.

## Handling and Storage

Before each use of the QSFP-DD TPA, ensure that all connectors are clean. Handle all cables carefully and store the QSFP-DD TPA in the foam-lined instrument case when not in use, if possible. Do not set connectors contact end down. Install the high-speed connector protective end caps when the QSFP-DD TPA is not in use.

## Visual Inspection

Be sure to inspect all cables carefully before making a connection. Inspect all cables for metal particles, scratches, deformed threads, dents, or bent, broken, or misaligned center conductors. Do not use damaged cables.

## Cleaning

If necessary, clean the connectors using low-pressure (less than 60 PSI) compressed air or nitrogen with an effective oil-vapor filter and condensation trap. Clean the cable threads, if necessary, using a lint-free swab or cleaning cloth moistened with isopropyl alcohol. Always completely dry a connector before use. Do not use abrasives to clean the connectors. Re-inspect connectors, making sure no particles or residue remains.

## Making Connections

Before making any connections, review the “Care and Handling Precautions” section. Follow these guidelines when making connections:

- Align cables carefully
- Make preliminary connection lightly
- To tighten, turn connector nut only
- Do not apply bending force to cable
- Do not over-tighten preliminary connections
- Do not twist or screw-in cables
- Use an appropriately sized torque wrench, and do not tighten past the “break” point of the torque wrench (normally 5-inch pounds)

# Electrostatic Discharge Information

Protection against electrostatic discharge (ESD) is essential while connecting, inspecting, or cleaning the QSFP-DD TPA test adapter and connectors attached to a static-sensitive circuit (such as those found in test sets).

Electrostatic discharge can damage or destroy electronic components. Be sure to perform all work on electronic assemblies at a static-safe workstation, using two types of ESD protection:

- Conductive table-mat and wrist-strap combination
- Conductive floor-mat and heel-strap combination

When used together, both types provide a significant level of ESD protection. Used alone, the table-mat and wrist-strap combination provide adequate ESD protection. To ensure user safety, the static-safe accessories must provide at least 1 MΩ of isolation from ground. Acceptable ESD accessories may be purchased from a local supplier.

**WARNING: These techniques for a static-safe workstation should not be used when working on circuitry with a voltage potential greater than 500 volts.**

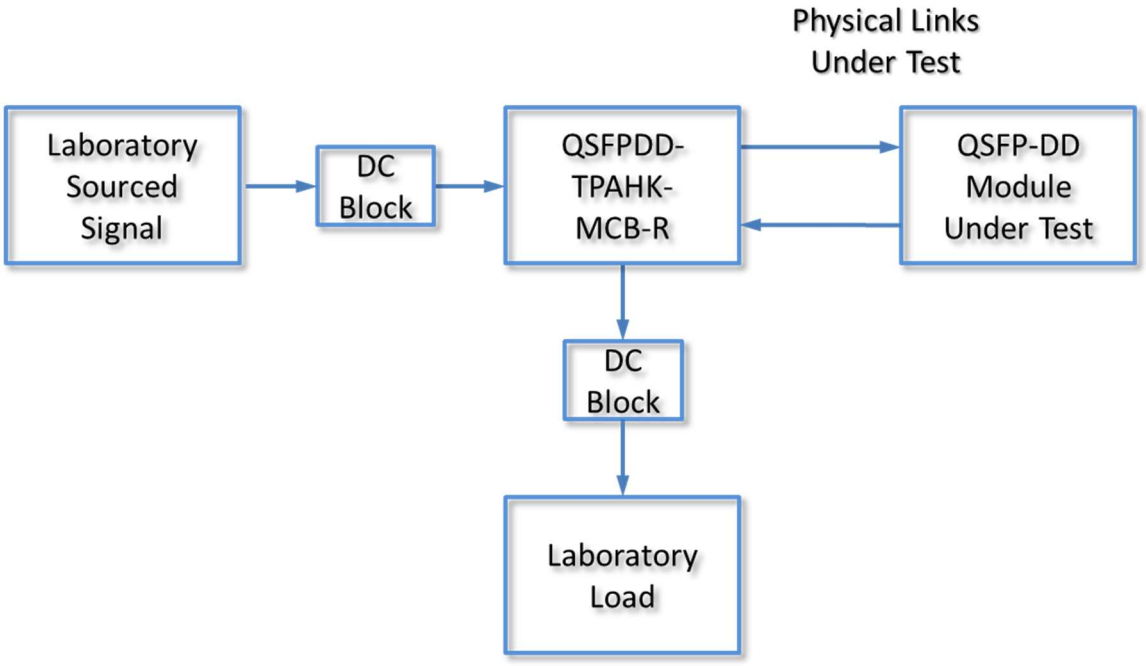
# User Model

The QSFP-DD TPAs are capable of performing to the requirements of both IEEE and SFF specifications, limited only by the specifications, environmental, care and handling of this document.

In the case where the laboratory source or load is not used in the test, it must be replaced with RF terminations on each unused signal. (NOTE: DC Blocks and RF terminators are optionally offered by Wilder Technologies.)

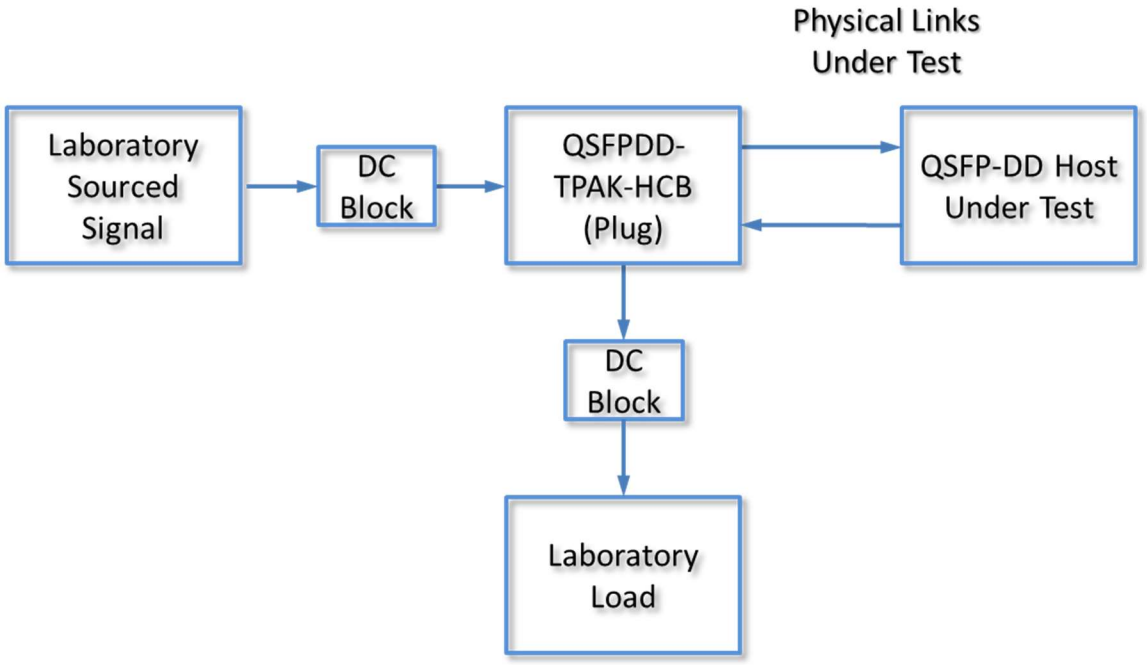
The following examples are suggestions for possible testing setups.

In this first example, a QSFPDD TPAHK-MCB-R is used to test a QSFP-DD Module:

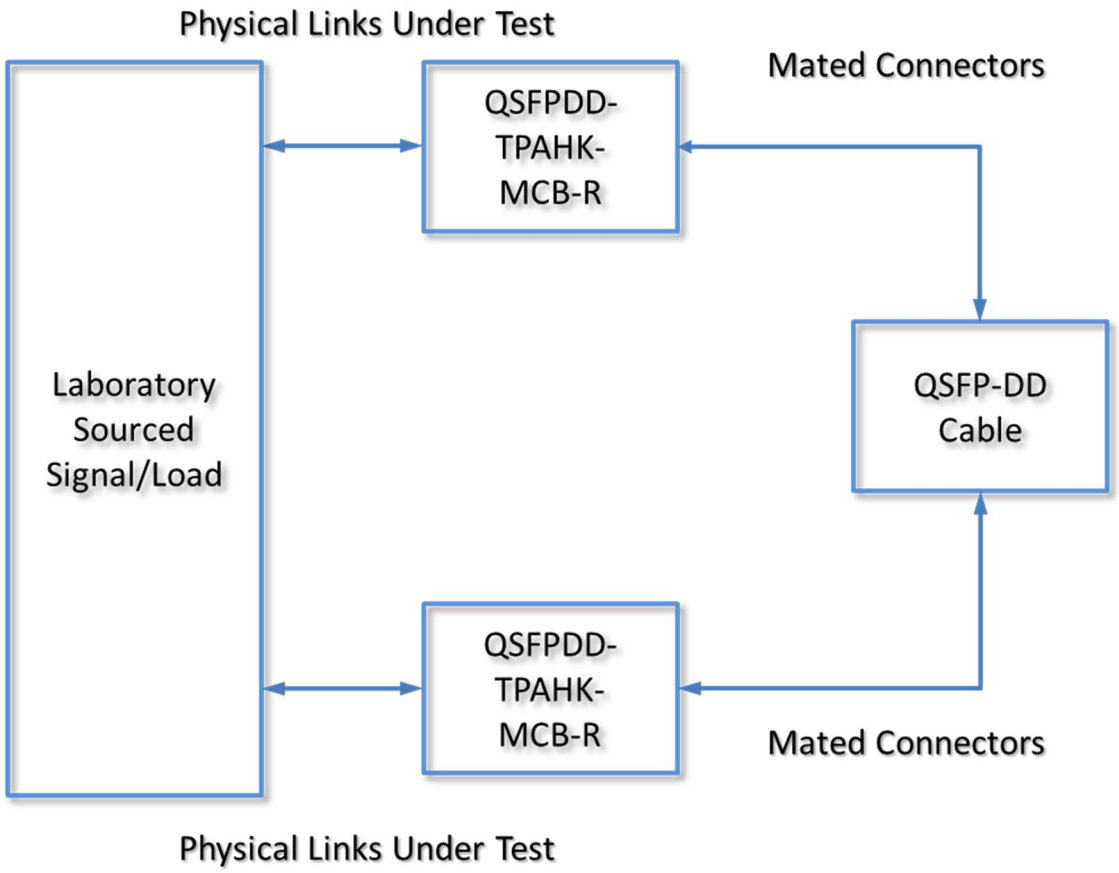


The second example shows a QSFPDD-TPAK-HCB (Plug) is used to test a host:

In the case where the laboratory source or load is not used in the test, it must be replaced with RF terminations on each unused signal. (NOTE: DC Blocks and RF terminators are optionally offered by Wilder Technologies.)



The third example shows two QSFPDD-TPAHK-MCB-R's used for testing a QSFP-DD cable:



# Calibration Through De-Embedding

The QSFP-DD Test Adapters are fully passive components. Therefore, calibration compensating for the losses must occur within the test instrumentation that drives the QSFP-DD Receivers or looks at the response of the QSFP-DD Transmitters.

The QSFP-DD TPA's have Touchstone S4P files for de-embedding the electrical length and losses within the TPA up to the QSFP-DD connector interface pads. (Contact Wilder Technologies, support@wilder-tech.com, to obtain a copy of the S4P files.) The Touchstone S4P files enable the test engineer to compensate for the last four of the following six repeatable, systematic errors that occur when moving the reference plane:

- Signal leakage effects: *Directivity errors*
- Signal leakage effects: *Crosstalk errors*
- Reflection effects: *Source Impedance Mismatching errors*
- Reflection effects: *Load Impedance Mismatching errors*
- Bandwidth effects: *Receiver Transmission in Test Equipment errors*
- Bandwidth effects: *Receiver Reflection-tracking in Test Equipment errors*

These errors are corrected on each port. Refer to the Instrument Manual for instructions on the instrument's specific de-embedding process.

**NOTE: The reference plane is the boundary, both physically and electrically, between the calibrated and uncalibrated portions of the circuit. Everything outside the reference plane is considered part of the DUT. Any instrument that does not use calibration or de-embedding of the test fixture defines the DUT as the total of externally connected components. If the de-embedding file is not used, all of the QSFP-DD TPA and associated coaxial cables, as well as cables connecting the TPA assembly to the test instrument, would be a part of the DUT.**

Non-repeatable errors, such as drift or random errors, can be reduced but not corrected. Drift errors aggregate over time or with environmental changes such as temperature shift. To eliminate drift errors, perform an instrumentation-level calibration.

A random error cannot be corrected through calibration since the error occurred randomly. Random errors are typically associated with either test instrument noise or test repeatability problems. Reduce test instrument noise by increasing source power, lowering the IF bandwidth, or averaging results over multiple sweeps. Reduce test repeatability problems through the use of a torque wrench or, again, by averaging over multiple sweeps.

# Mechanical and Environmental Specifications

**NOTE: All specifications in this manual are subject to change.**

**Table 1. General Specifications**

| ITEM | DESCRIPTION |
|---|---|
| Usage Environment | Controlled indoor environment |
| Plug Test Adapter Length (w/standard cables) | 263.00 mm +/- 2 mm (10.35 inches +/- .08 inches) (Characteristic) |
| Receptacle Test Adapter Length (w/standard cables, end to end) | 236.22 mm +/- 2 mm (9.30 inches +/- .08 inches) (Characteristic) |
| Receptacle Test Adapter Housing Dimensions | 125.98 x 106.43 x 74.68 (4.96 x 4.19 x 2.94 inches) (L, W, H) |
| Operating Temperature | 0°C to +55°C (32°F to +131°F) (Characteristic) |
| Storage Temperature | -40°C to +70°C (-40°F to +158°F) (Characteristic) |

**QSFPDD-TPAK-HCB (Plug)**

Each of the four configurations of Plug-Type QSFPDD-TPAK-HCB test adapters (Legacy, DD, Rx and Tx) provide sixteen 2.92mm (K-Style) connectors (four lanes of primary differential signals). Labels clearly mark each cable or connector. The following figure refers to the pin-description tables for the QSFPDD-TPAK-HCB (Plug) test adapters.

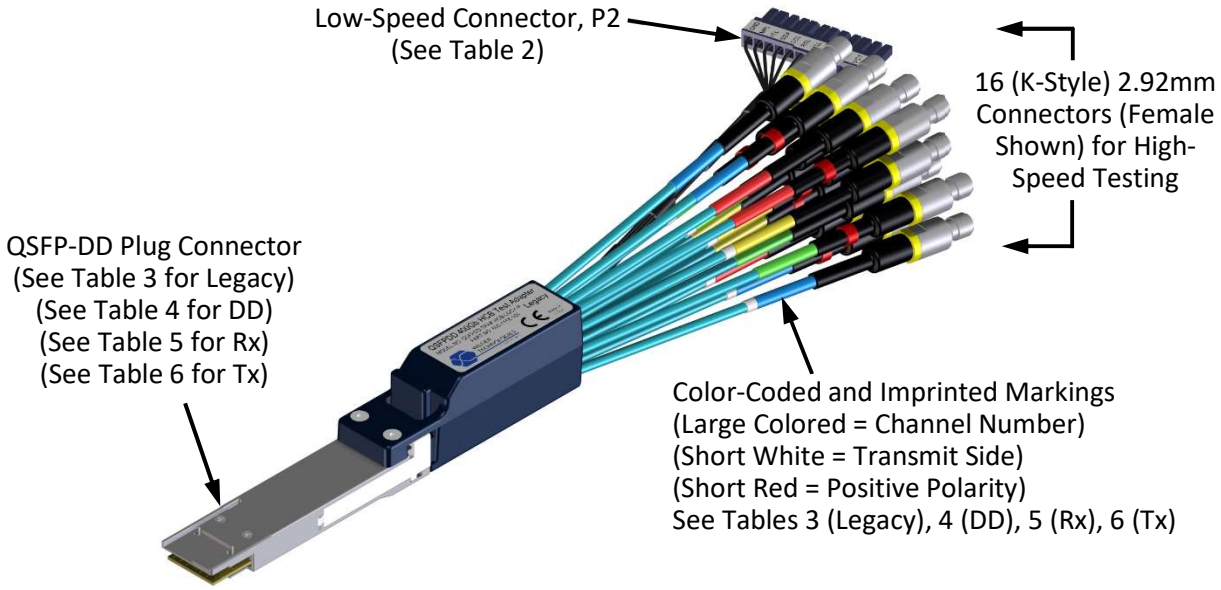


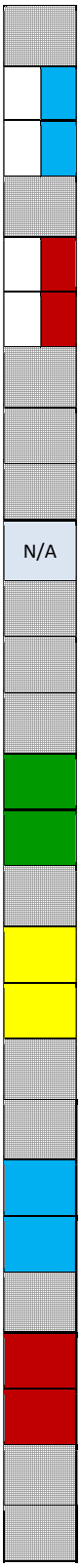

**Figure 3. Cable Connectors (QSFPDD-TPAK-HCB shown). (Note: The coaxial cables are configuration dependent and may be terminated with different connectors and have different color-coding than what is shown.)**

**Table 2. QSFPDD-TPAK-HCB (Plug) 12-Position Cable Connector (Low-Speed).**
**(NOTE: Connections are common to Legacy, DD, Rx and Tx configurations)**

| LABEL | PIN NO. | COLOR ID FOR HCB | DESCRIPTION |
|---|---|---|---|
| GND | Pin 1 | Black | Signal (RF Ground) and Supply (Power) Common |
| MPL | Pin 2 | Black | Module Present |
| ITL | Pin 3 | Black | Interrupt |
| SDA | Pin 4 | Black | SDA, $I^2C$ Data for DDC |
| SCL | Pin 5 | Black | SCL, $I^2C$ Clock for DDC |
| RSL | Pin 6 | Black | Module Reset |
| MSL | Pin 7 | Black | Module Select |
| LPM | Pin 8 | Black | Low Power Mode |
| VCC | Pin 9 | Not Present/Connected | Vcc1 module power supply (+3.3V) |
| VCR | Pin 10 | Not Present/Connected | VccR, module receiver power supply (+3.3V) |
| VCT | Pin 11 | Not Present/Connected | VccT, module transmitter power supply (+3.3V) |
| GND | Pin 12 | Black | Signal (RF Ground) and Supply (Power) Common |

**Table 3. QSFPDD-TPAK-HCB-LGCY-P (Legacy Plug) Pin Assignments**

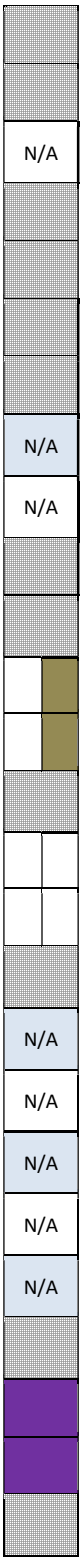
| Pin Description | Connector Pin Number | Destination (HCB) | Color ID for Data Line Polarity | Color Identification (HCB) |
|---|---|---|---|---|
| Ground | 1 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx2n | 2 | Tx2- | Black | White/Blue |
| Tx2p | 3 | Tx2+ | Red | White/Blue |
| Ground | 4 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx4n | 5 | Tx4- | Black | White/Red |
| Tx4p | 6 | Tx4+ | Red | White/Red |
| Ground | 7 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| MSL | 8 | P2 Pin 7 | N/A | Black Insulation |
| RSL | 9 | P2 Pin 6 | N/A | Black Insulation |
| VccR | 10 | Not Present/Connected | N/A | Not Present/Connected |
| SCL | 11 | P2 Pin 5 | N/A | Black Insulation |
| SDA | 12 | P2 Pin 4 | N/A | Black Insulation |
| Ground | 13 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx3p | 14 | Rx3+ | Red | Green |
| Rx3n | 15 | Rx3- | Black | Green |
| Ground | 16 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx1p | 17 | Rx1+ | Red | Yellow |
| Rx1n | 18 | Rx1- | Black | Yellow |
| Ground | 19 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Ground | 20 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx2n | 21 | Rx2- | Black | Blue |
| Rx2p | 22 | Rx2+ | Red | Blue |
| Ground | 23 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx4n | 24 | Rx4- | Black | Red |
| Rx4p | 25 | Rx4+ | Red | Red |
| Ground | 26 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| MPL | 27 | P2 Pin 2 | N/A | Black Insulation |



| | | | | | |
|---|---|---|---|---|---|
| ITL | 28 | P2 Pin 3 | N/A | Black Insulation | |
| VccT | 29 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc1 | 30 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| LPM | 31 | P2 Pin 8 | N/A | Black Insulation | |
| Ground | 32 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx3p | 33 | Tx3+ | Red | White/Green | |
| Tx3n | 34 | Tx3- | Black | White/Green | |
| Ground | 35 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx1p | 36 | Tx1+ | Red | White/Yellow | |
| Tx1n | 37 | Tx1- | Black | White/Yellow | |
| Ground | 38 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |

**Table 4. QSFPDD-TPAK-HCB-DD-P (DD Plug) Pin Assignments**

| Pin Description | Connector Pin Number | Destination (HCB) | Color ID for Data Line Polarity | Color Identification (HCB) |
|---|---|---|---|---|
| MSL | 8 | P2 Pin 7 | N/A | Black Insulation |
| RSL | 9 | P2 Pin 6 | N/A | Black Insulation |
| VccR | 10 | Not Present/Connected | N/A | Not Present/Connected |
| SCL | 11 | P2 Pin 5 | N/A | Black Insulation |
| SDA | 12 | P2 Pin 4 | N/A | Black Insulation |
| MPL | 27 | P2 Pin 2 | N/A | Black Insulation |
| ITL | 28 | P2 Pin 3 | N/A | Black Insulation |
| VccT | 29 | Not Present/Connected | N/A | Not Present/Connected |
| Vcc1 | 30 | Not Present/Connected | N/A | Not Present/Connected |
| LPM | 31 | P2 Pin 8 | N/A | Black Insulation |
| Ground | 39 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx6n | 40 | Tx6- | Black | White/Brown |
| Tx6p | 41 | Tx6+ | Red | White/Brown |
| Ground | 42 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx8n | 43 | Tx8- | Black | White/White |
| Tx8p | 44 | Tx8+ | Red | White/White |
| Ground | 45 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Reserved | 46 | Not Present/Connected | N/A | Not Present/Connected |
| VS1 | 47 | Not Present/Connected | N/A | Not Present/Connected |
| VccRx1 | 48 | Not Present/Connected | N/A | Not Present/Connected |
| VS2 | 49 | Not Present/Connected | N/A | Not Present/Connected |
| VS3 | 50 | Not Present/Connected | N/A | Not Present/Connected |
| Ground | 51 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx7p | 52 | Rx7+ | Red | Violet |
| Rx7n | 53 | Rx7- | Black | Violet |
| Ground | 54 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |



| | | | | | |
|---|---|---|---|---|---|
| Rx5p | 55 | Rx5+ | Red | Orange | |
| Rx5n | 56 | Rx5- | Black | Orange | |
| Ground | 57 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Ground | 58 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx6n | 59 | Rx6- | Black | Brown | |
| Rx6p | 60 | Rx6+ | Red | Brown | |
| Ground | 61 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx8n | 62 | Rx8- | Black | White | |
| Rx8p | 63 | Rx8+ | Red | White | |
| Ground | 64 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| NC | 65 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Reserved | 66 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VccTx1 | 67 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc2 | 68 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| ePPS | 69 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Ground | 70 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx7p | 71 | Tx7+ | Red | White/Violet | |
| Tx7n | 72 | Tx7- | Black | White/Violet | |
| Ground | 73 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx5p | 74 | Tx5+ | Red | White/Orange | |
| Tx5n | 75 | Tx5- | Black | White/Orange | |
| Ground | 76 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |

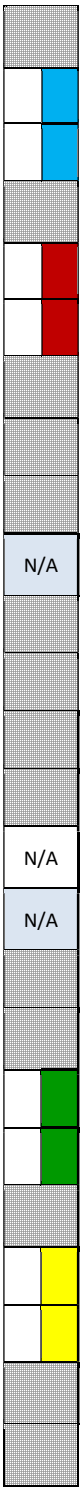
**Table 5. QSFPDD-TPAK-HCB-RX-P (Rx Plug) Pin Assignments**

| Pin Description | Connector Pin Number | Destination (HCB) | Color ID for Data Line Polarity | Color Identification (HCB) | |
|---|---|---|---|---|---|
| MSL | 8 | P2 Pin 7 | N/A | Black Insulation | |
| RSL | 9 | P2 Pin 6 | N/A | Black Insulation | |
| VccR | 10 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| SCL | 11 | P2 Pin 5 | N/A | Black Insulation | |
| SDA | 12 | P2 Pin 4 | N/A | Black Insulation | |
| Ground | 13 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx3p | 14 | Rx3+ | Red | Green | |
| Rx3n | 15 | Rx3- | Black | Green | |
| Ground | 16 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx1p | 17 | Rx1+ | Red | Yellow | |
| Rx1n | 18 | Rx1- | Black | Yellow | |
| Ground | 19 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Ground | 20 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx2n | 21 | Rx2- | Black | Blue | |
| Rx2p | 22 | Rx2+ | Red | Blue | |
| Ground | 23 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx4n | 24 | Rx4- | Black | Red | |
| Rx4p | 25 | Rx4+ | Red | Red | |
| Ground | 26 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| MPL | 27 | P2 Pin 2 | N/A | Black Insulation | |
| ITL | 28 | P2 Pin 3 | N/A | Black Insulation | |
| VccT | 29 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc1 | 30 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| LPM | 31 | P2 Pin 8 | N/A | Black Insulation | |
| Reserved | 46 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS1 | 47 | Not Present/Connected | N/A | Not Present/Connected | N/A |

| | | | | | |
|---|---|---|---|---|---|
| VccRx1 | 48 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS2 | 49 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS3 | 50 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Ground | 51 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx7p | 52 | Rx7+ | Red | Violet | |
| Rx7n | 53 | Rx7- | Black | Violet | |
| Ground | 54 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx5p | 55 | Rx5+ | Red | Orange | |
| Rx5n | 56 | Rx5- | Black | Orange | |
| Ground | 57 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Ground | 58 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx6n | 59 | Rx6- | Black | Brown | |
| Rx6p | 60 | Rx6+ | Red | Brown | |
| Ground | 61 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx8n | 62 | Rx8- | Black | White | |
| Rx8p | 63 | Rx8+ | Red | White | |
| Ground | 64 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| NC | 65 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Reserved | 66 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VccTx1 | 67 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc2 | 68 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| ePPS | 69 | Not Present/Connected | N/A | Not Present/Connected | N/A |

**Table 6. QSFPDD-TPAK-HCB-TX-P (Tx Plug) Pin Assignments**

| Pin Description | Connector Pin Number | Destination (HCB) | Color ID for Data Line Polarity | Color Identification (HCB) |
|---|---|---|---|---|
| Ground | 1 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx2n | 2 | Tx2- | Black | White/Blue |
| Tx2p | 3 | Tx2+ | Red | White/Blue |
| Ground | 4 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx4n | 5 | Tx4- | Black | White/Red |
| Tx4p | 6 | Tx4+ | Red | White/Red |
| Ground | 7 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| MSL | 8 | P2 Pin 7 | N/A | Black Insulation |
| RSL | 9 | P2 Pin 6 | N/A | Black Insulation |
| VccR | 10 | Not Present/Connected | N/A | Not Present/Connected |
| SCL | 11 | P2 Pin 5 | N/A | Black Insulation |
| SDA | 12 | P2 Pin 4 | N/A | Black Insulation |
| MPL | 27 | P2 Pin 2 | N/A | Black Insulation |
| ITL | 28 | P2 Pin 3 | N/A | Black Insulation |
| VccT | 29 | Not Present/Connected | N/A | Not Present/Connected |
| Vcc1 | 30 | Not Present/Connected | N/A | Not Present/Connected |
| LPM | 31 | P2 Pin 8 | N/A | Black Insulation |
| Ground | 32 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx3p | 33 | Tx3+ | Red | White/Green |
| Tx3n | 34 | Tx3- | Black | White/Green |
| Ground | 35 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx1p | 36 | Tx1+ | Red | White/Yellow |
| Tx1n | 37 | Tx1- | Black | White/Yellow |
| Ground | 38 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Ground | 39 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |



| | | | | | |
|---|---|---|---|---|---|
| Tx6n | 40 | Tx6- | Black | White/Brown | |
| Tx6p | 41 | Tx6+ | Red | White/Brown | |
| Ground | 42 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx8n | 43 | Tx8- | Black | White/White | |
| Tx8p | 44 | Tx8+ | Red | White/White | |
| Ground | 45 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Reserved | 46 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS1 | 47 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VccRx1 | 48 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS2 | 49 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS3 | 50 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| NC | 65 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Reserved | 66 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VccTx1 | 67 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc2 | 68 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| ePPS | 69 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Ground | 70 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx7p | 71 | Tx7+ | Red | White/Violet | |
| Tx7n | 72 | Tx7- | Black | White/Violet | |
| Ground | 73 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx5p | 74 | Tx5+ | Red | White/Orange | |
| Tx5n | 75 | Tx5- | Black | White/Orange | |
| Ground | 76 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |

**QSFPDD-TPAHK-MCB-R (Receptacle) Cable Pinout**

The QSFPDD-TPAHK-MCB-R test adapter (Legacy, DD, Rx and Tx) provides thirty-two 2.92mm (K-Style) connectors (four lanes of primary differential signals) to access all QSFP-DD high-speed signals (Legacy, DD, Rx and Tx). Labels clearly mark each cable or connector. The following figure refers to the pin-description tables for the QSFPDD-TPAHK-MCB-R (Receptacle) test adapter.

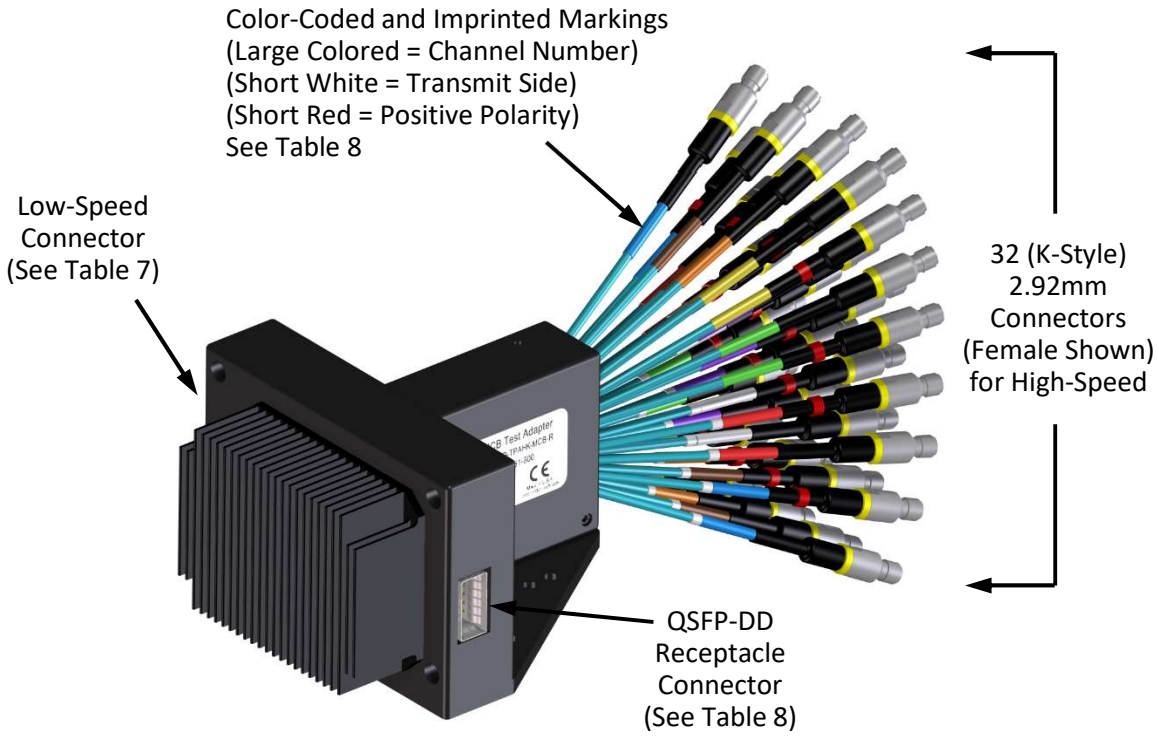


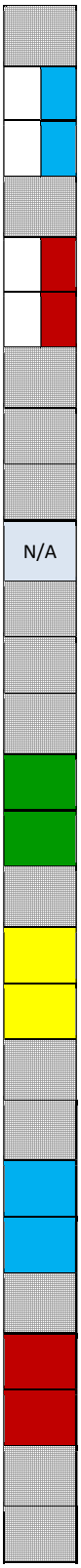

Figure 4. Cable Connectors (QSFPDD-TPAHK-MCB-R shown). (Note: The coaxial cables are configuration dependent and may be terminated with different connectors than what is shown.)

**Table 7. QSFPDD-TPAHK-MCB-R 12-Position Fixture-Mounted Connector (Low-Speed)**

| LABEL | PIN NO. | DESCRIPTION |
|---|---|---|
| GND | Pin 1 | Signal (RF Ground) and Supply (Power) Common |
| MPL | Pin 2 | Module Present |
| ITL | Pin 3 | Interrupt |
| SDA | Pin 4 | SDA, $I^2C$ Data for DDC |
| SCL | Pin 5 | SCL, $I^2C$ Clock for DDC |
| RSL | Pin 6 | Module Reset |
| MSL | Pin 7 | Module Select |
| LPM | Pin 8 | Low Power Mode |
| VCC | Pin 9 | Vcc1 module power supply (+3.3V) |
| VCR | Pin 10 | VccR, module receiver power supply (+3.3V) |
| VCT | Pin 11 | VccT, module transmitter power supply (+3.3V) |
| GND | Pin 12 | Signal (RF Ground) and Supply (Power) Common |

**Table 8. QSFPDD-TPAHK-MCB-R (Receptacle) Pin Assignments**

| Pin Description | Connector Pin Number | Destination (HCB) | Color ID for Data Line Polarity | Color Identification (HCB) |
|---|---|---|---|---|
| Ground | 1 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx2n | 2 | Tx2- | Black | White/Blue |
| Tx2p | 3 | Tx2+ | Red | White/Blue |
| Ground | 4 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Tx4n | 5 | Tx4- | Black | White/Red |
| Tx4p | 6 | Tx4+ | Red | White/Red |
| Ground | 7 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| MSL | 8 | P2 Pin 7 | N/A | Black Insulation |
| RSL | 9 | P2 Pin 6 | N/A | Black Insulation |
| VccR | 10 | Not Present/Connected | N/A | Not Present/Connected |
| SCL | 11 | P2 Pin 5 | N/A | Black Insulation |
| SDA | 12 | P2 Pin 4 | N/A | Black Insulation |
| Ground | 13 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx3p | 14 | Rx3+ | Red | Green |
| Rx3n | 15 | Rx3- | Black | Green |
| Ground | 16 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx1p | 17 | Rx1+ | Red | Yellow |
| Rx1n | 18 | Rx1- | Black | Yellow |
| Ground | 19 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Ground | 20 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx2n | 21 | Rx2- | Black | Blue |
| Rx2p | 22 | Rx2+ | Red | Blue |
| Ground | 23 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| Rx4n | 24 | Rx4- | Black | Red |
| Rx4p | 25 | Rx4+ | Red | Red |
| Ground | 26 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation |
| MPL | 27 | P2 Pin 2 | N/A | Black Insulation |



| | | | | | |
|---|---|---|---|---|---|
| ITL | 28 | P2 Pin 3 | N/A | Black Insulation | |
| VccT | 29 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc1 | 30 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| LPM | 31 | P2 Pin 8 | N/A | Black Insulation | |
| Ground | 32 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx3p | 33 | Tx3+ | Red | White/Green | |
| Tx3n | 34 | Tx3- | Black | White/Green | |
| Ground | 35 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx1p | 36 | Tx1+ | Red | White/Yellow | |
| Tx1n | 37 | Tx1- | Black | White/Yellow | |
| Ground | 38 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Ground | 39 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx6n | 40 | Tx6- | Black | White/Brown | |
| Tx6p | 41 | Tx6+ | Red | White/Brown | |
| Ground | 42 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx8n | 43 | Tx8- | Black | White/White | |
| Tx8p | 44 | Tx8+ | Red | White/White | |
| Ground | 45 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Reserved | 46 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS1 | 47 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VccRx1 | 48 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS2 | 49 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VS3 | 50 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Ground | 51 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx7p | 52 | Rx7+ | Red | Violet | |
| Rx7n | 53 | Rx7- | Black | Violet | |
| Ground | 54 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |

| | | | | | |
|---|---|---|---|---|---|
| Rx5p | 55 | Rx5+ | Red | Orange | |
| Rx5n | 56 | Rx5- | Black | Orange | |
| Ground | 57 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Ground | 58 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx6n | 59 | Rx6- | Black | Brown | |
| Rx6p | 60 | Rx6+ | Red | Brown | |
| Ground | 61 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Rx8n | 62 | Rx8- | Black | White | |
| Rx8p | 63 | Rx8+ | Red | White | |
| Ground | 64 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| NC | 65 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Reserved | 66 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| VccTx1 | 67 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Vcc2 | 68 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| ePPS | 69 | Not Present/Connected | N/A | Not Present/Connected | N/A |
| Ground | 70 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx7p | 71 | Tx7+ | Red | White/Violet | |
| Tx7n | 72 | Tx7- | Black | White/Violet | |
| Ground | 73 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |
| Tx5p | 74 | Tx5+ | Red | White/Orange | |
| Tx5n | 75 | Tx5- | Black | White/Orange | |
| Ground | 76 | Coax Shield and P2 Pin 1, 12 | N/A | Black Insulation | |

# Electrical Specifications

**NOTE: All specifications in this manual are subject to change.**

**Table 9. Electrical Specifications (Optional External DC Block) as Supplied by Wilder Technologies**

| SPECIFICATION | MIN | TYP | MAX | NOTES |
|---|---|---|---|---|
| Insertion Loss (dB),<br>at 100 kHz - 12.4 GHz<br>at 12.4 - 26.5 GHz | | <br>0.50<br>0.75 | | |
| VSWR, 7kHz TO 26.5 GHz | | | 1.35 | |
| Upper -3dB Bandwidth (GHz) | 26.5 | | | |
| Lower -3dB Bandwidth (kHz) | | | 7 | |
| Voltage | | 100 Volts Max. | | |
| In-Line Capacitance (µF) | | 0.474 | | |
| Impedance (Ohms) | | 50 | | |

**Table 10. Electrical Specifications (Optional RF Termination) as Supplied by Wilder Technologies**

| SPECIFICATION | MIN | TYP | MAX | NOTES |
|---|---|---|---|---|
| VSWR,<br>DC to 4 GHz<br>4 to 12.4 GHz<br>12.4 to 18 GHz | | | <br>1.05<br>1.15<br>1.20 | |
| Frequency Range (GHz) | DC | | 18 | |
| Power Dissipation (Watts) | | | 2 | Power derates linearly from 100% ≤ 25°C to 10% @ 125°C |
| Impedance (Ohms) | | 50 | | |

**NOTE: At the time of this document release, higher-performing DC Blocks and RF Terminators are unavailable but are being specified and sourced. Contact support@wilder-tech.com for status and availability.**

# QSFP-DD Mated HCBs/MCB Performance Plots

**NOTE: All specifications in this manual are subject to change.**

**Table 11. Fixtures Measured**

| DESCRIPTION | SUPPORT FEATURE | WILDER PART NUMBER | COAX CABLE CONFIGURATION |
|---|---|---|---|
| QSFPDD-TPAHK-MCB-R (Receptacle) | Power Sinking | 600-1161-600 | 2.92mm 6” Female (K-Style) |
| QSFPDD TPAK-HCB-LGCY-P (Plug) | Legacy | 600-1158-000 | 2.92mm 6” Female (K-Style) |
| QSFPDD TPAK-HCB-DD-P (Plug) | DD | 600-1158-025 | 2.92mm 6” Female (K-Style) |
| QSFPDD TPAK-HCB-RX-P (Plug) | Rx | 600-1158-050 | 2.92mm 6” Female (K-Style) |
| QSFPDD TPAK-HCB-TX-P (Plug) | Tx | 600-1158-075 | 2.92mm 6” Female (K-Style) |

## Measurements Plotted and Post Processed to:

IEEE 802.3cd Section 136B.1.1 Mated Test Fixtures (references IEEE 802.3bj section 92.11.3 Mated Test Fixtures)

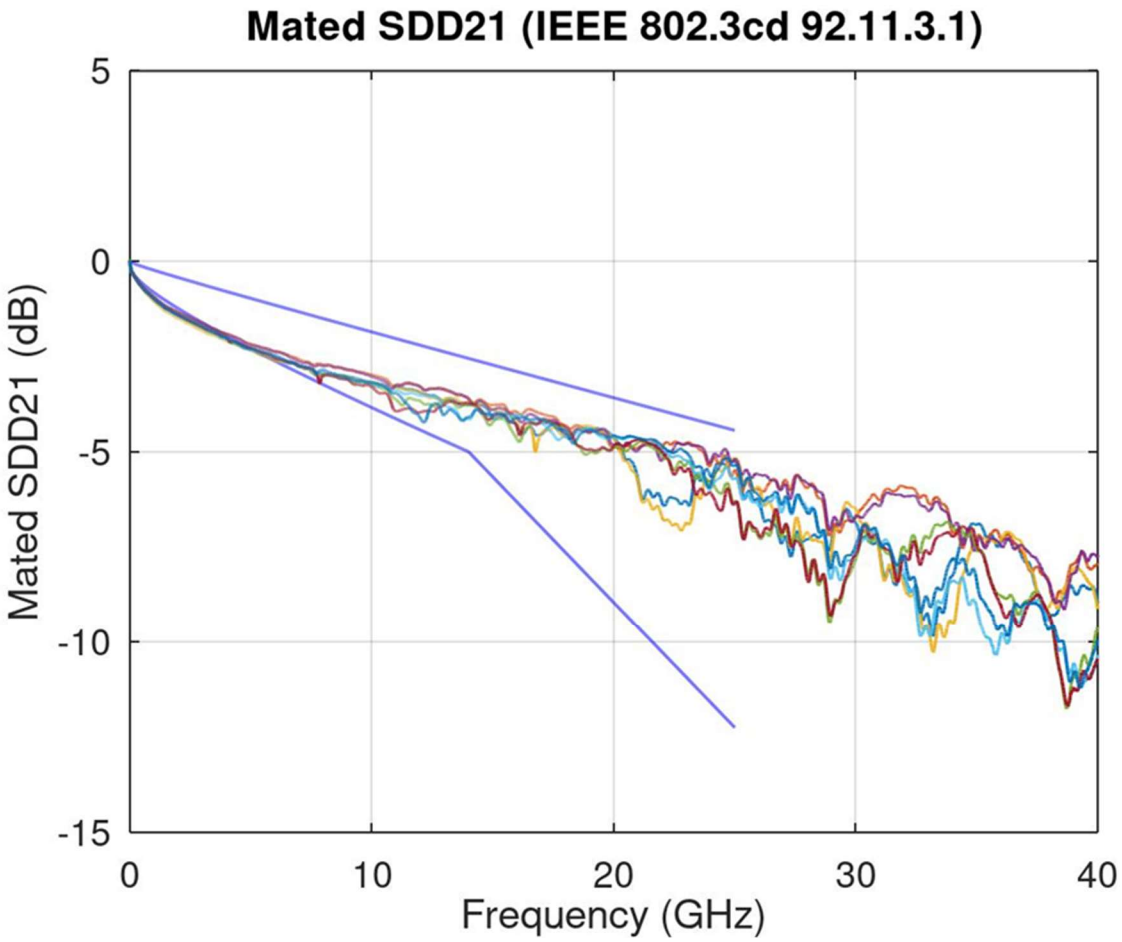



Figure 5. QSFP-DD HCB (TX) Insertion Loss

The insertion loss reflects the typical coaxial fixture loss profile where at the low frequencies the loss is at or slightly below the maximum loss limit then slopes to near the minimum loss limit at higher frequencies.

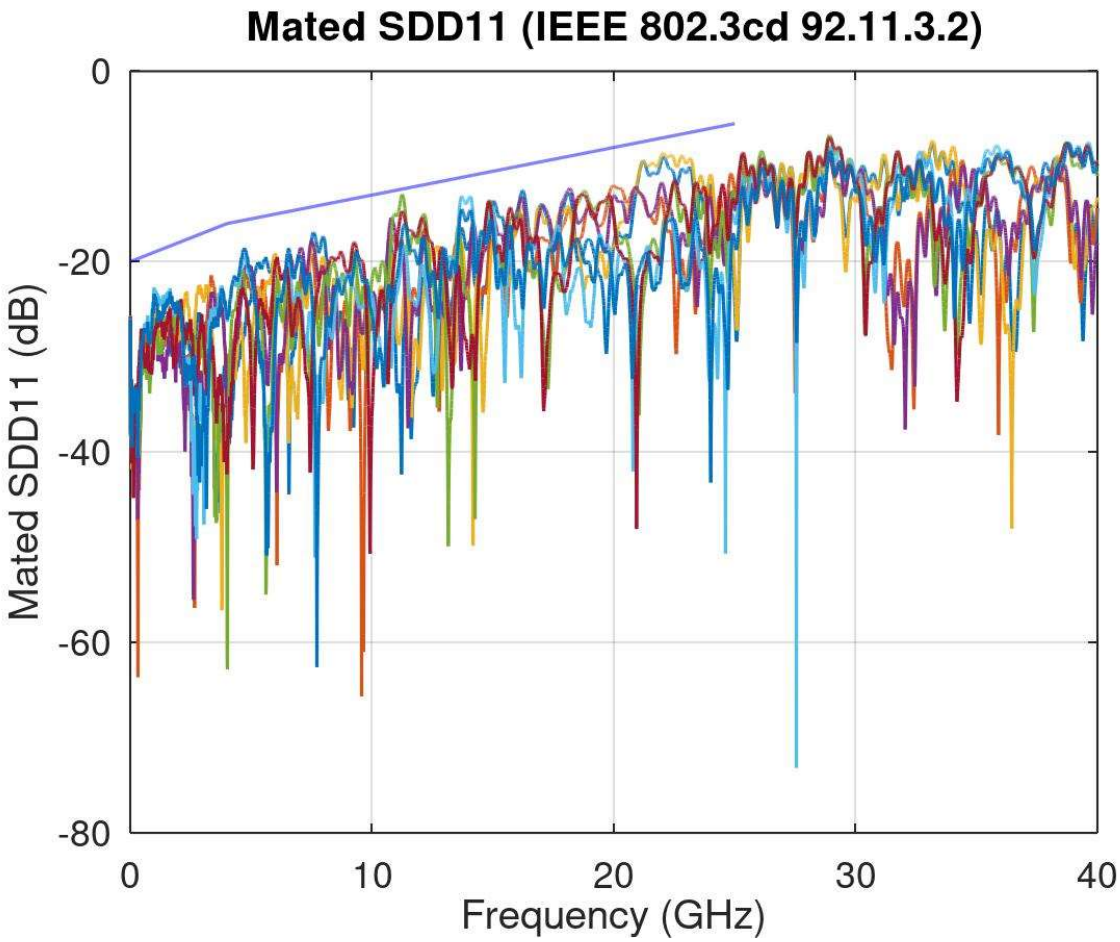



Figure 6. QSFP-DD HCB (TX) Return Loss

Meets IEEE 802.3cd Specification

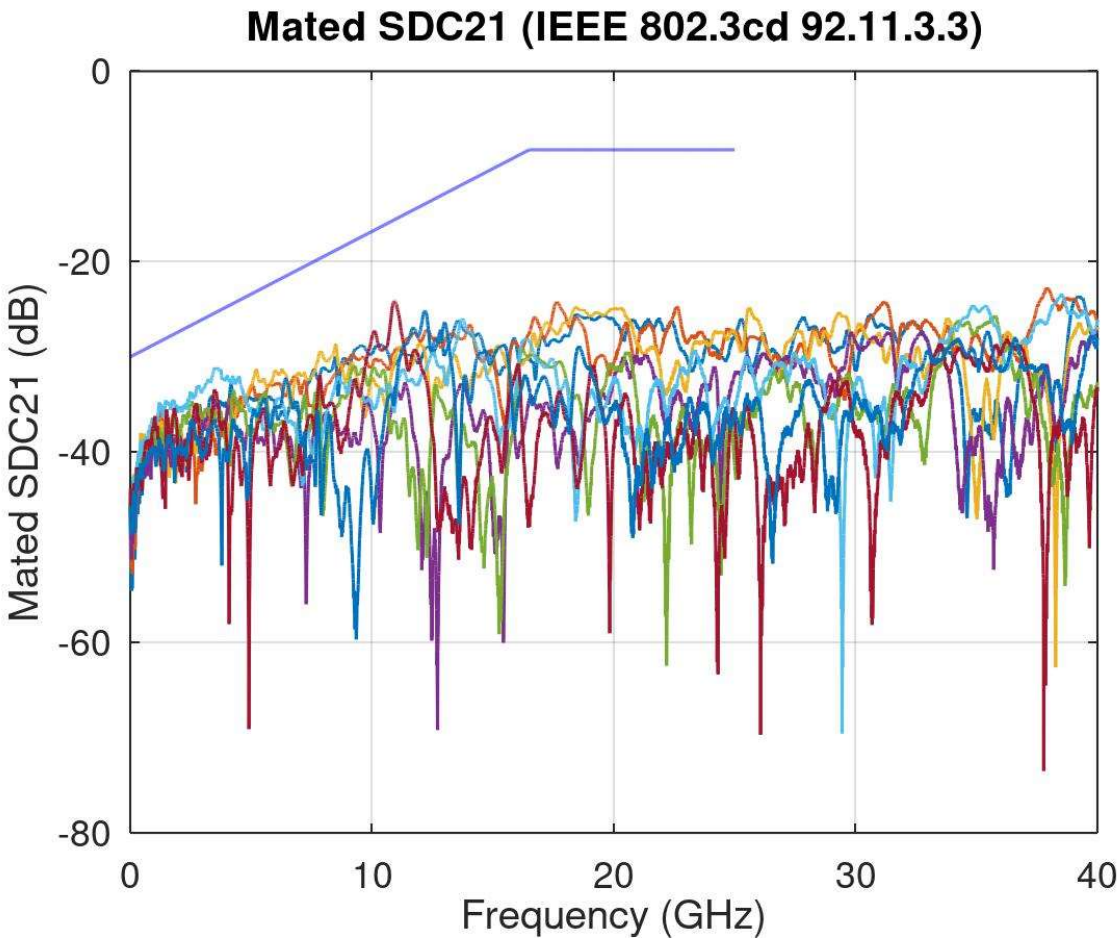



Figure 7. QSFP-DD HCB (TX) Mated Common Mode Conversion Insertion Loss

Meets IEEE 802.3cd Specification

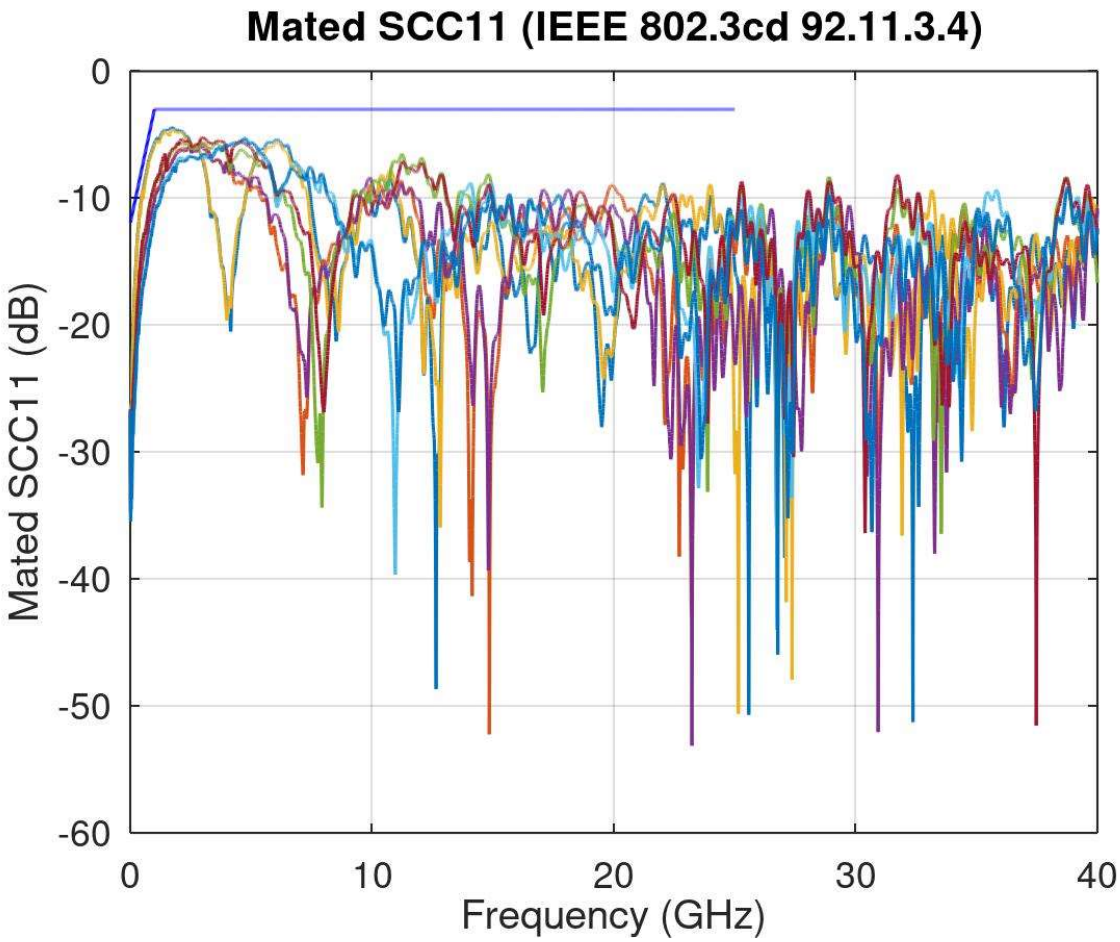



Figure 8. QSFP-DD HCB (TX) Mated Common Mode Return Loss

Meets IEEE 802.3cd Specification

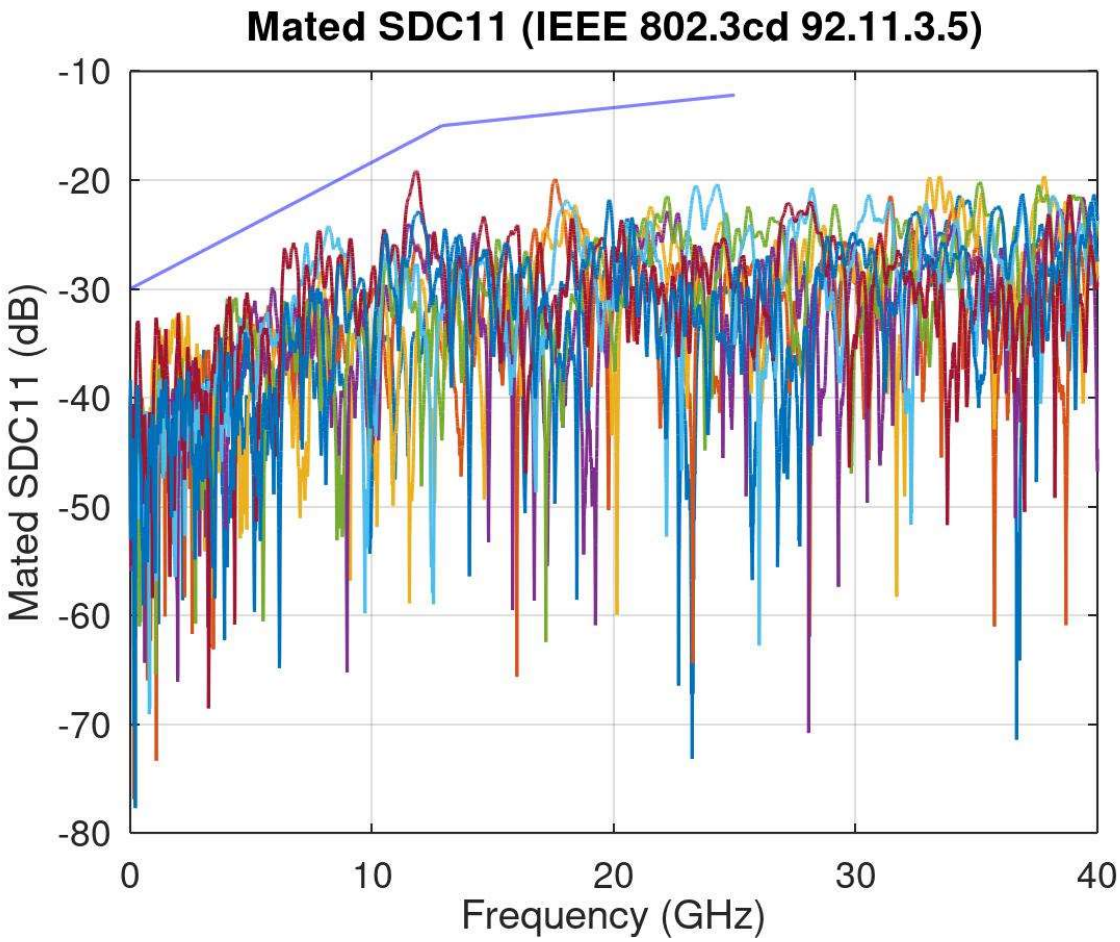



Figure 9. QSFP-DD HCB (TX) Mated Common-Mode Conversion Return Loss

Meets IEEE 802.3cd Specification

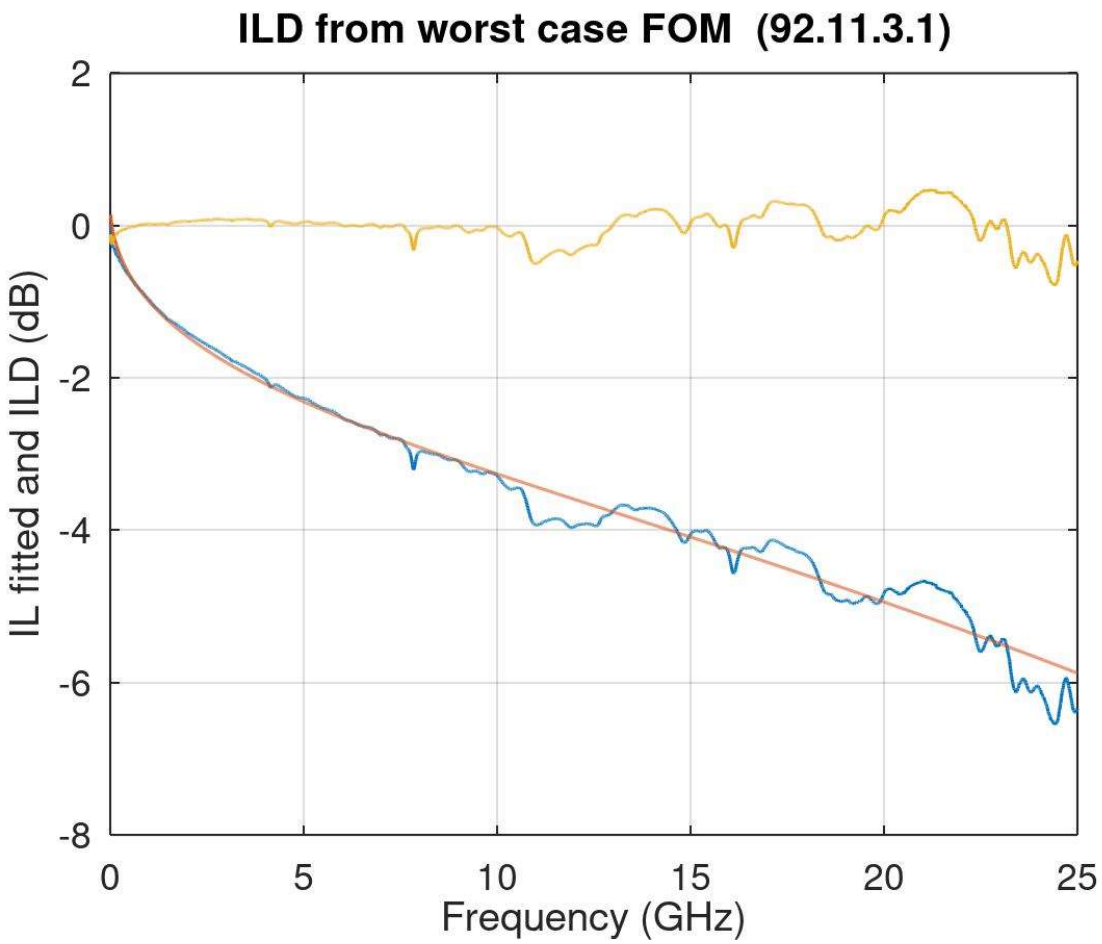



Figure 10. QSFP-DD HCB (TX) Mated ILD (Worst Case)

FOM (Figure of Merit) < .13 dB
IEEE 802.3cd 136B.1.1.1
IEEE 802.3bj 92.11.3.1

Tx1 FOM ILD = 0.051 dB
Tx2 FOM ILD = 0.029 dB
Tx3 FOM ILD = 0.059 dB
Tx4 FOM ILD = 0.039 dB
Tx5 FOM ILD = 0.049 dB
Tx6 FOM ILD = 0.041 dB
Tx7 FOM ILD = 0.085 dB
Tx8 FOM ILD = 0.068 dB

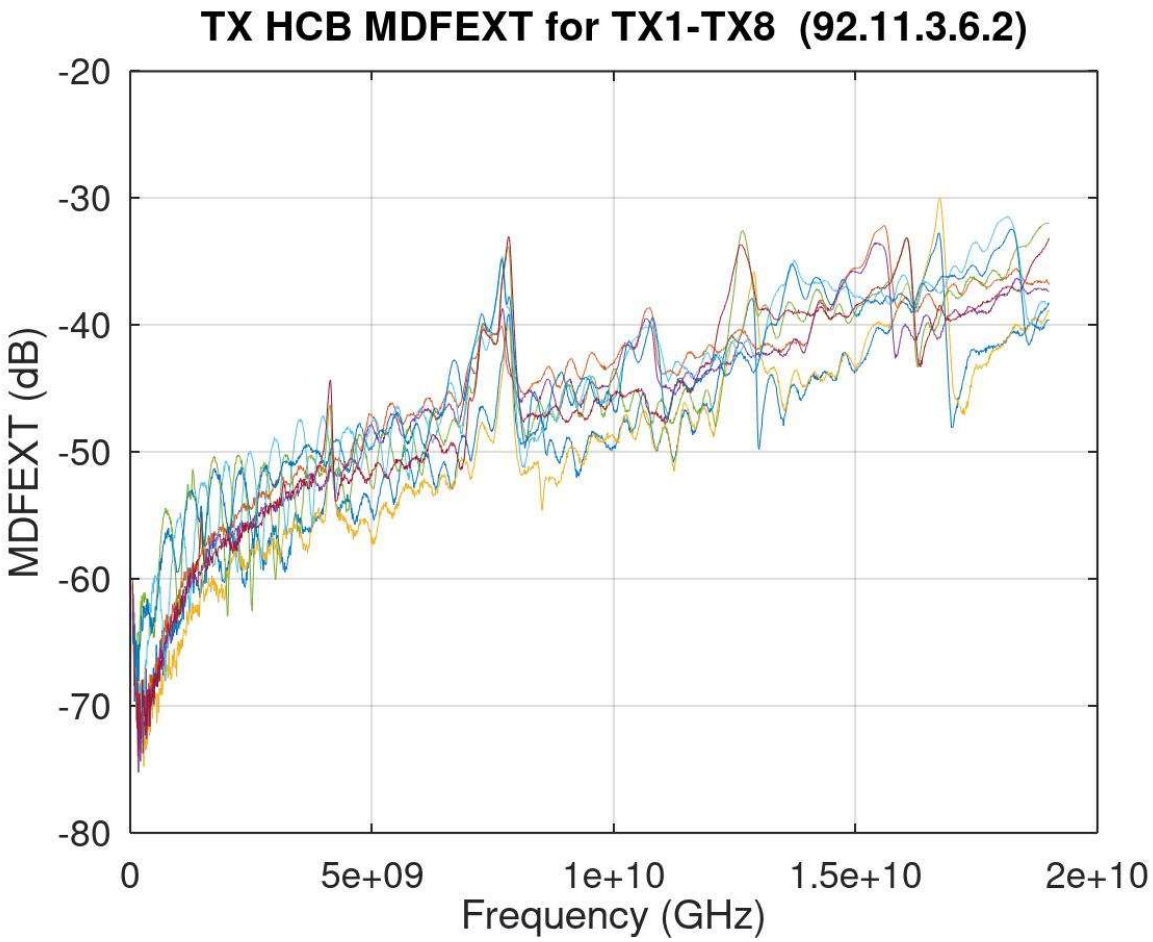



Figure 11. QSFP-DD HCB (TX) Mated MDFEXT dB

ICN FEXT = 4.2 mV
IEEE 802.3cd 136B.1.1.6

Tx1 ICN = 2.33 mV
Tx2 ICN = 3.62 mV
Tx3 ICN = 2.34 mV
Tx4 ICN = 3.28 mV
Tx5 ICN = 3.61 mV
Tx6 ICN = 3.77 mV
Tx7 ICN = 3.56 mV
Tx8 ICN = 3.65 mV

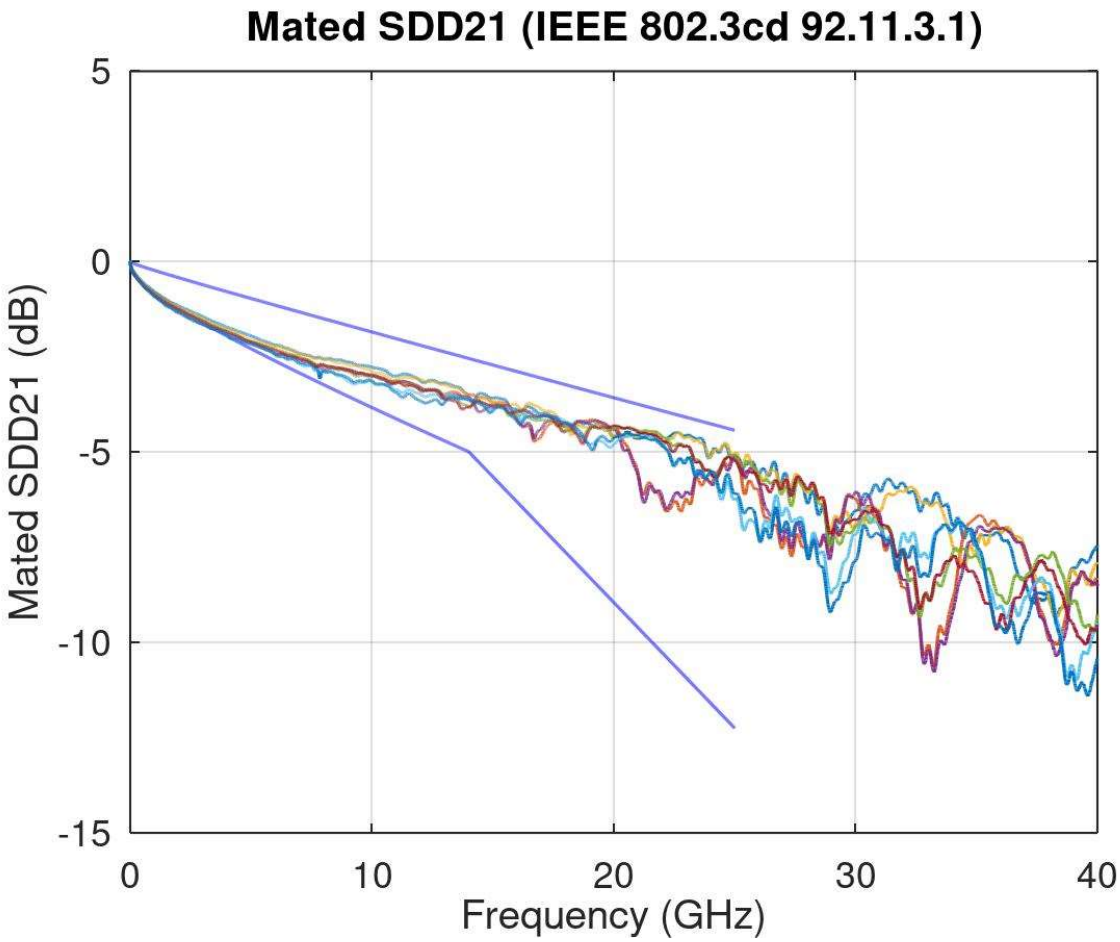



Figure 12. QSFP-DD HCB (RX) Insertion Loss

The insertion loss reflects the typical coaxial fixture loss profile where at the low frequencies the loss is at or slightly below the maximum loss limit then slopes to near the minimum loss limit at higher frequencies.

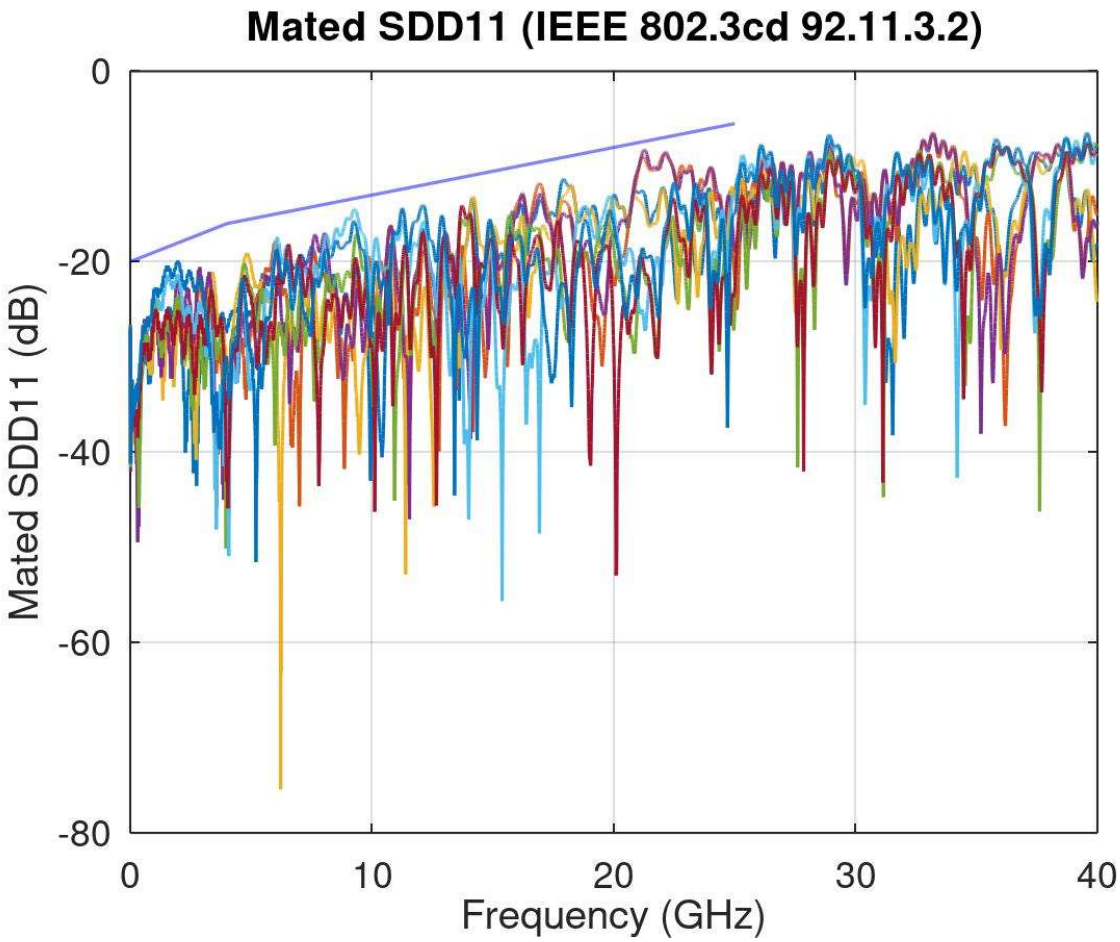



Figure 13. QSFP-DD HCB (RX) Return Loss

Meets IEEE 802.3cd Specification

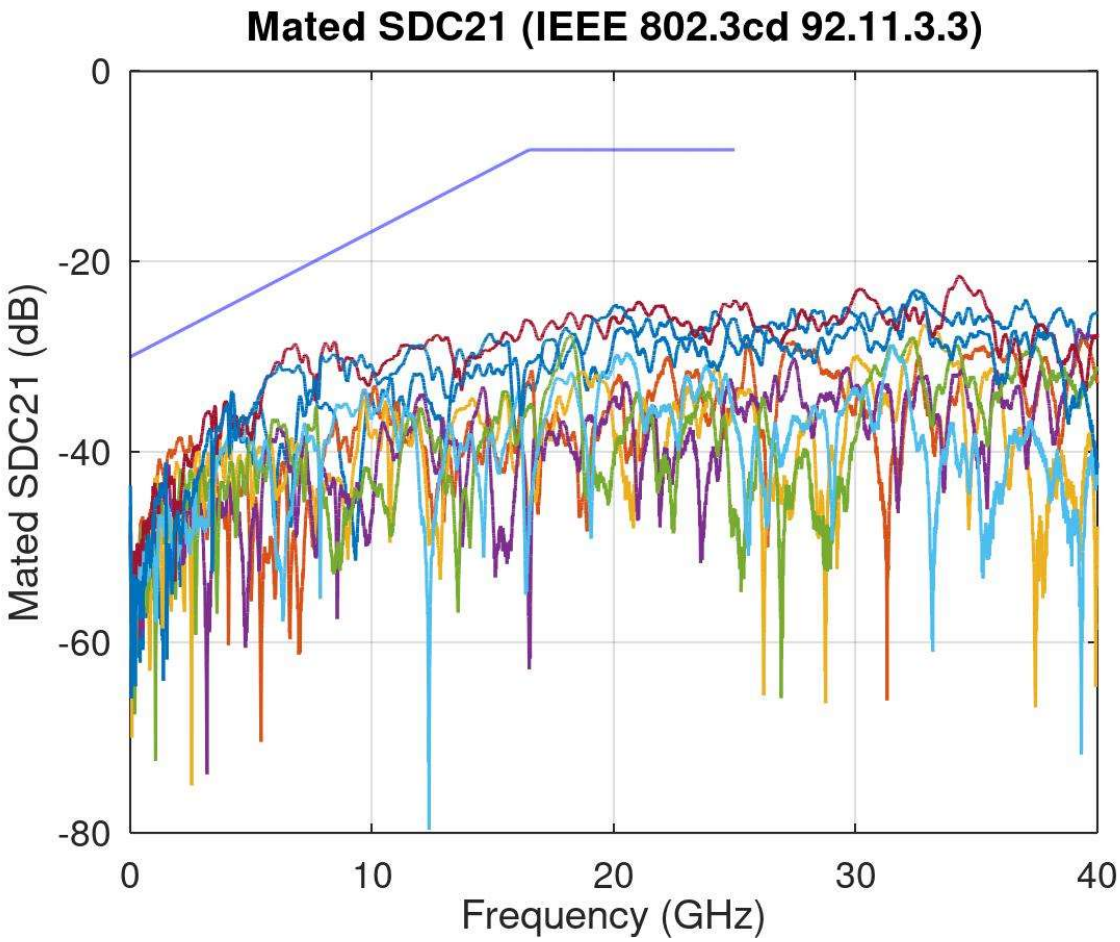



Figure 14. QSFP-DD HCB (RX) Mated Common Mode Conversion Insertion Loss

Meets IEEE 802.3cd Specification

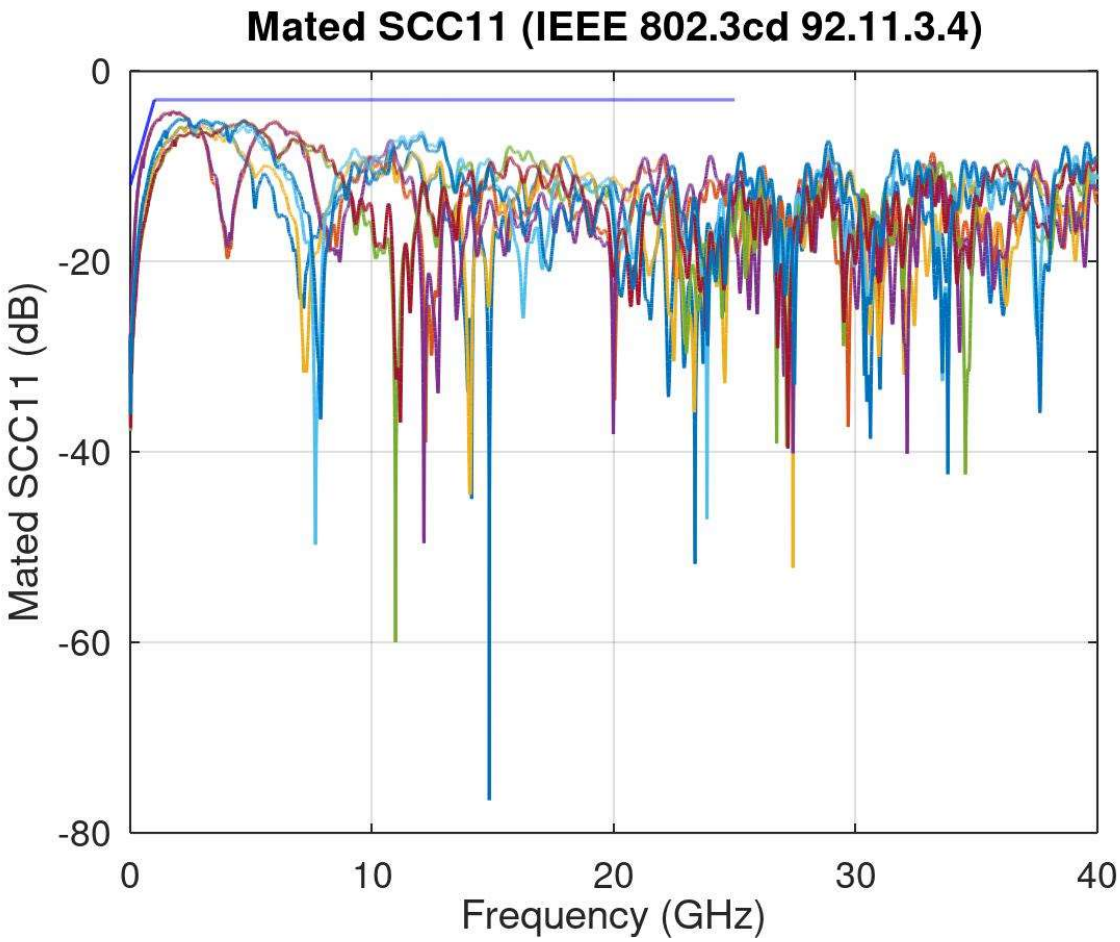



Figure 15. QSFP-DD HCB (RX) Mated Common Mode Return Loss

Meets IEEE 802.3cd Specification

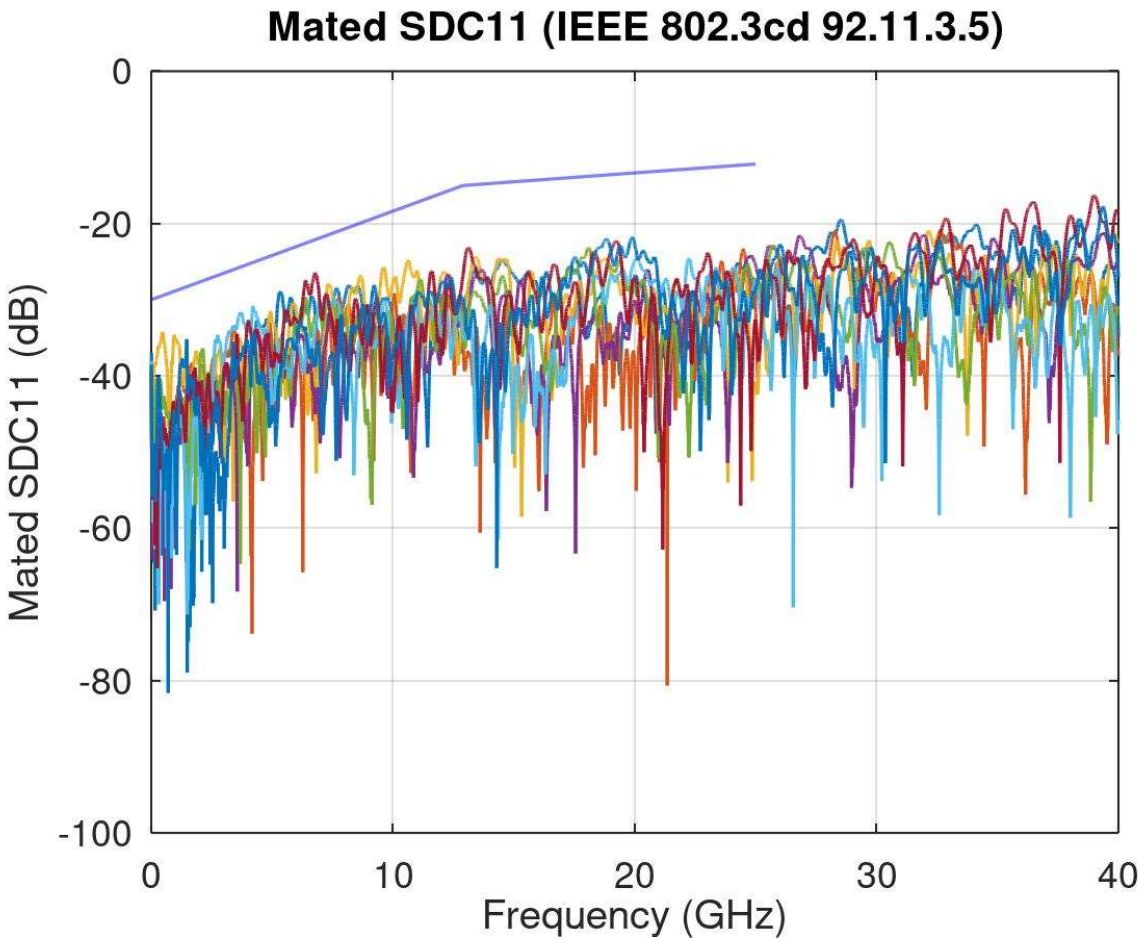



Figure 16. QSFP-DD HCB (RX) Mated Common-Mode Conversion Return Loss

Meets IEEE 802.3cd Specification

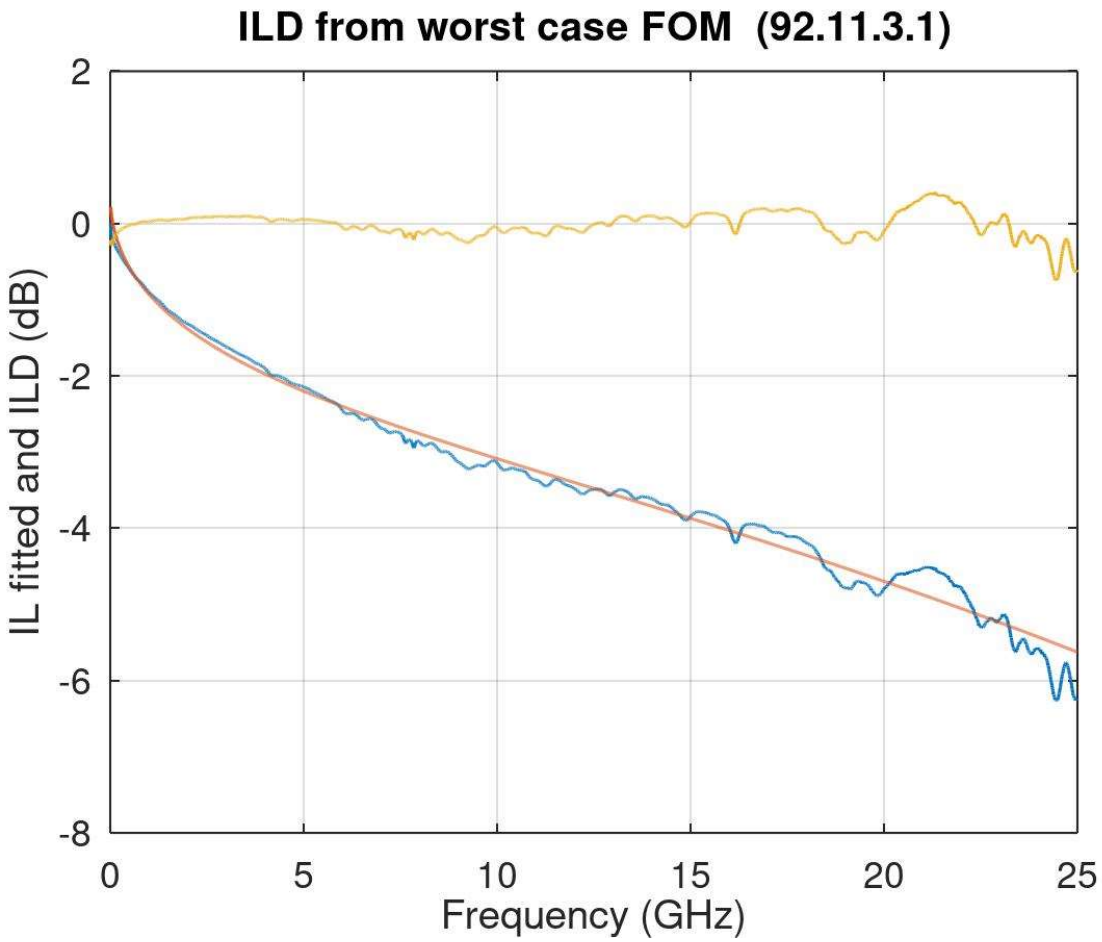



Figure 17. QSFP-DD HCB (TX) Mated MDFEXT dB

FOM (Figure of Merit) < .13 dB
IEEE 802.3cd 136B.1.1.1
IEEE 802.3bj 92.11.3.1

Tx1 FOM ILD = 0.039 dB
Tx2 FOM ILD = 0.059 dB
Tx3 FOM ILD = 0.036 dB
Tx4 FOM ILD = 0.054 dB
Tx5 FOM ILD = 0.028 dB
Tx6 FOM ILD = 0.063 dB
Tx7 FOM ILD = 0.034 dB
Tx8 FOM ILD = 0.055 dB

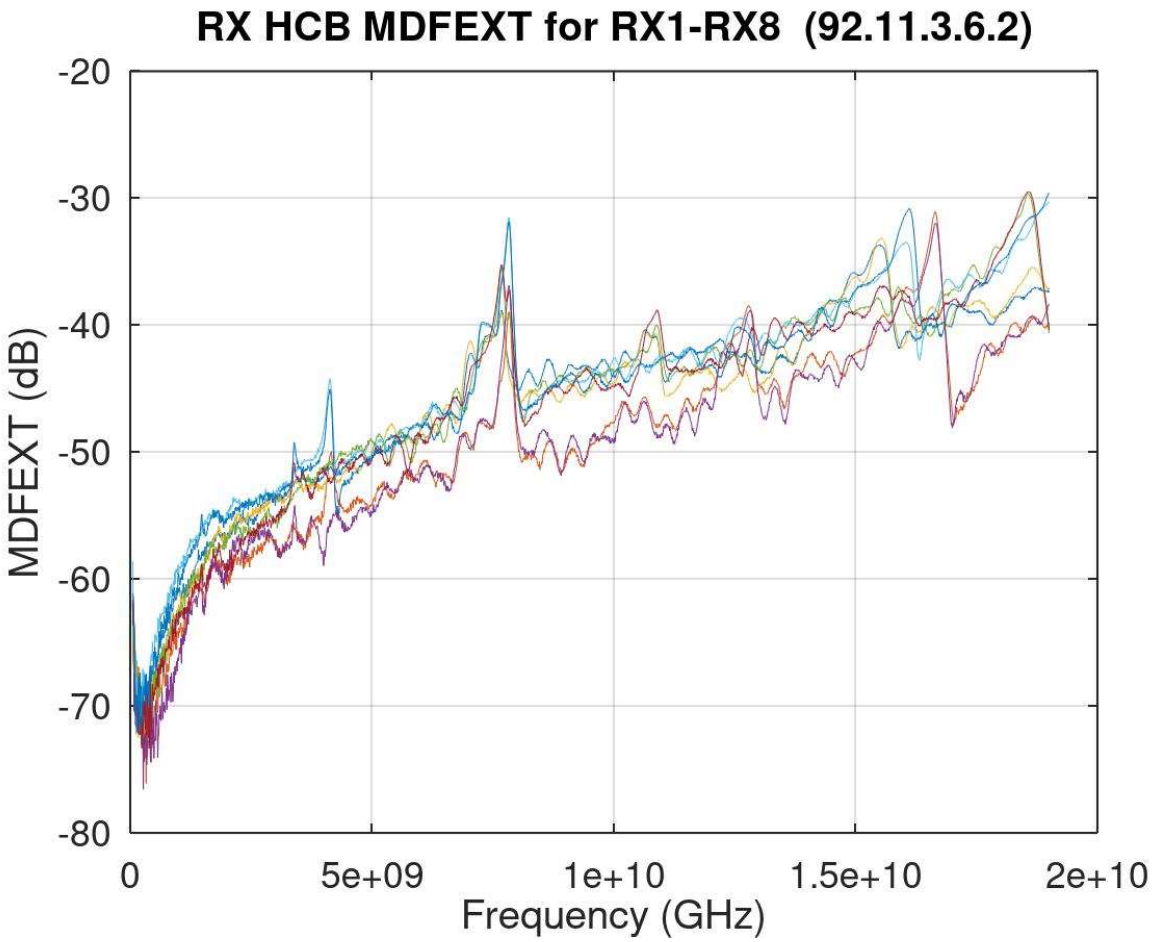



Figure 18. QSFP-DD HCB (RX) Mated MDFEXT dB

ICN FEXT = 4.2 mV
IEEE 802.3cd 136B.1.1.6

Rx1 ICN = 3.30 mV
Rx2 ICN = 2.42 mV
Rx3 ICN = 3.17 mV
Rx4 ICN = 2.36 mV
Rx5 ICN = 3.42 mV
Rx6 ICN = 3.80 mV
Rx7 ICN = 3.41 mV
Rx8 ICN = 3.77 mV

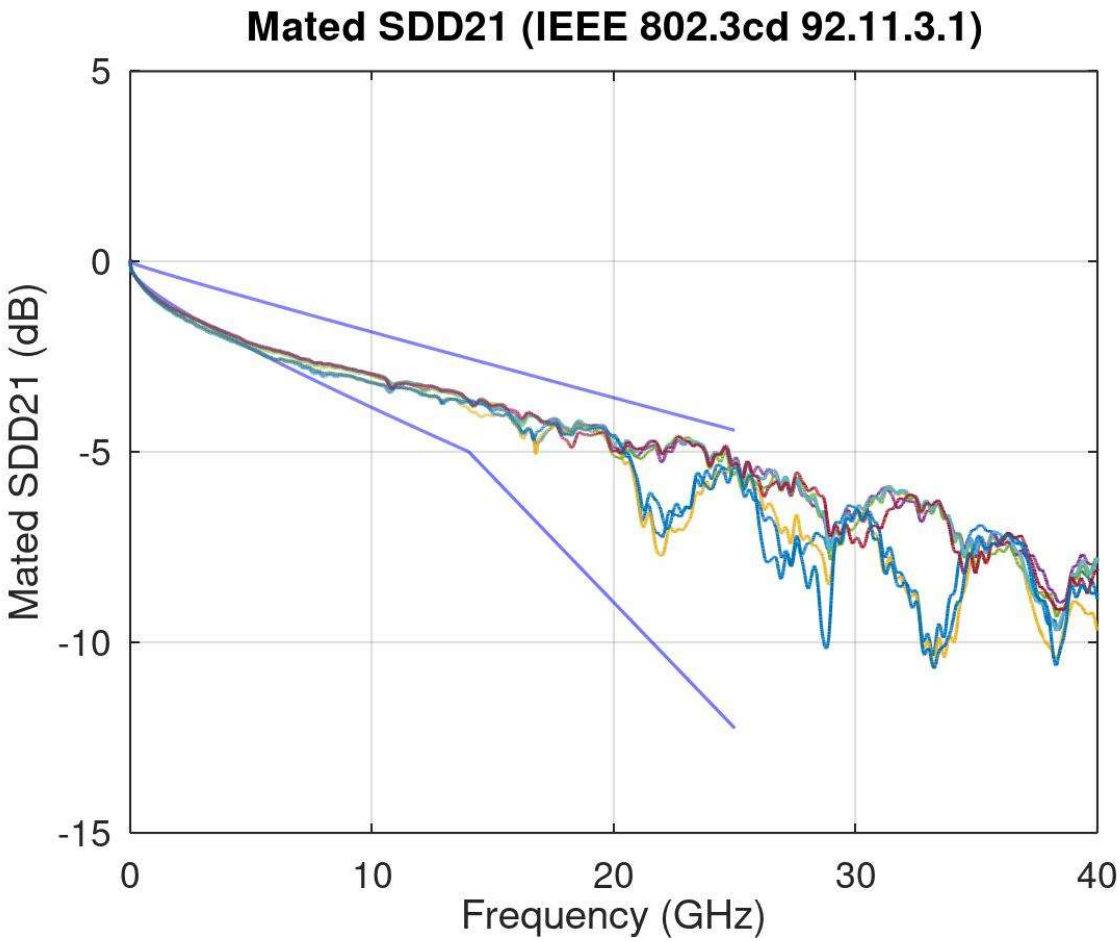



Figure 19. QSFP-DD HCB (LGCY) Insertion Loss

The insertion loss reflects the typical coaxial fixture loss profile where at the low frequencies the loss is at or slightly below the maximum loss limit then slopes to near the minimum loss limit.

The QSFP-DD Legacy channels are showing more resonances at the higher frequencies. The board impedance is low by 5% to 6% on some of the Legacy channels.

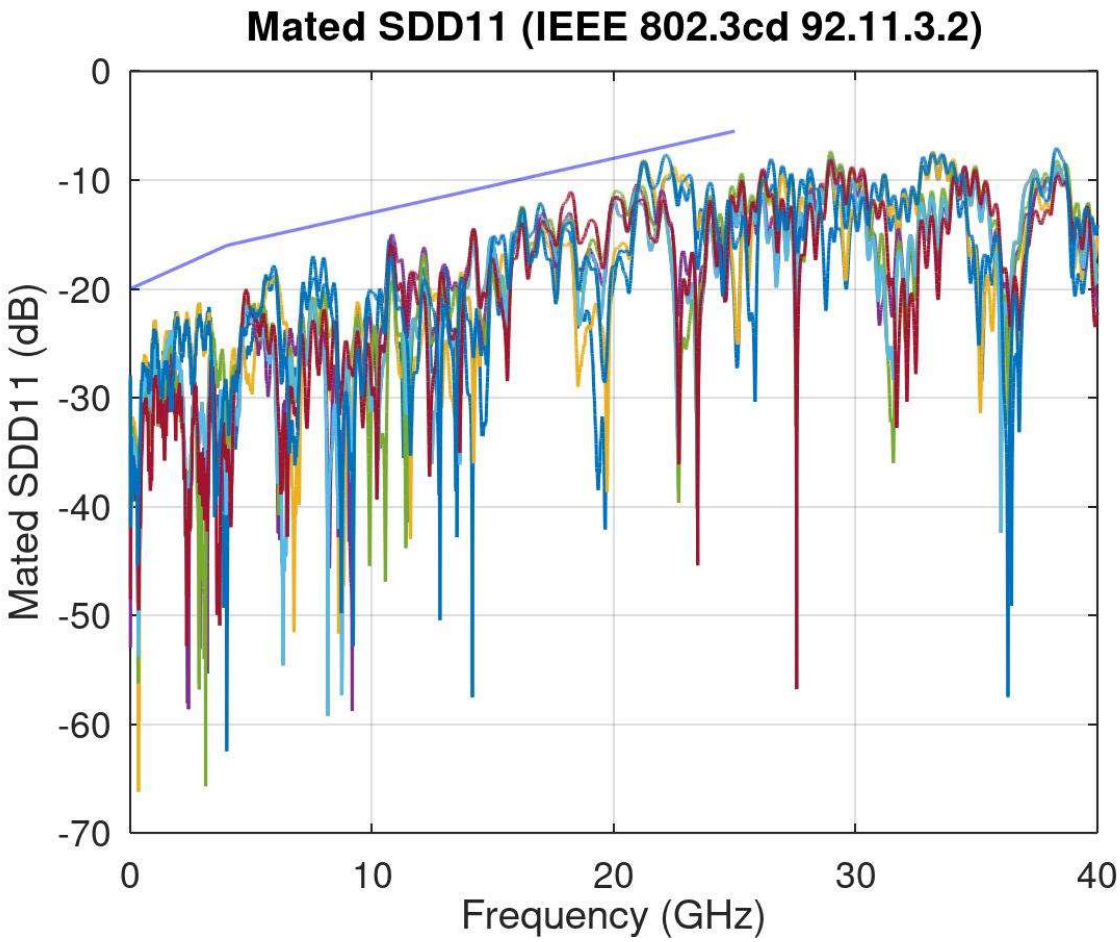



Figure 20. QSFP-DD HCB (LGCY) Return Loss

Meets IEEE 802.3cd Specification

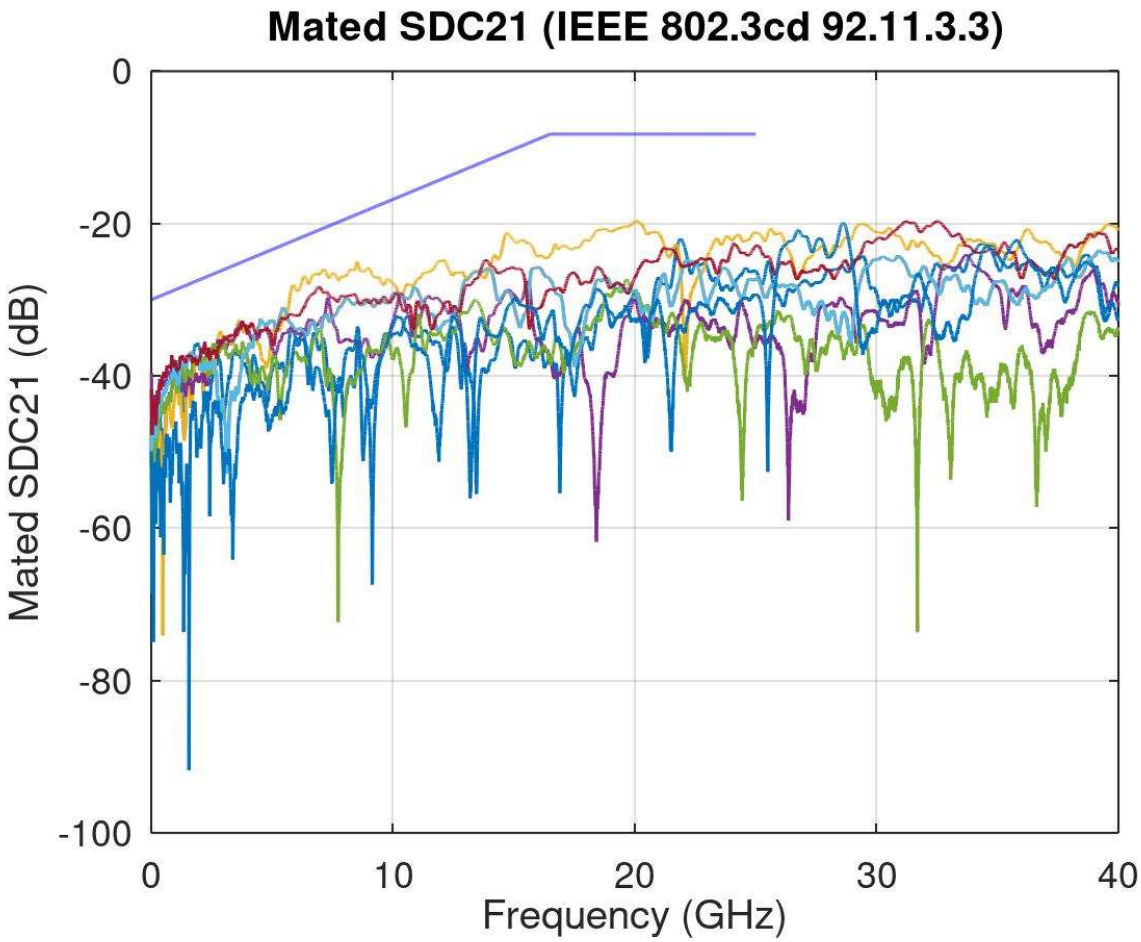



Figure 21. QSFP-DD HCB (LGCY) Mated Common Mode Conversion Insertion Loss

Meets IEEE 802.3cd Specification

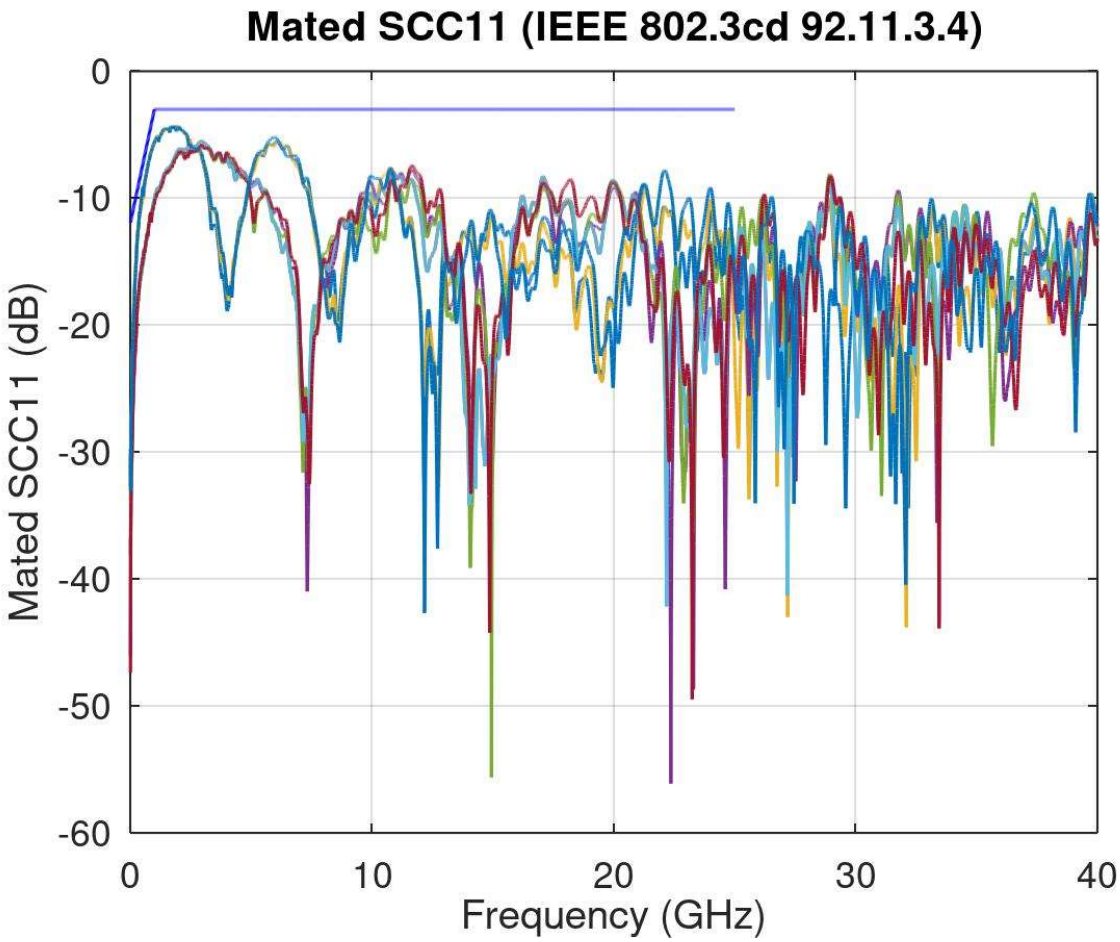



Figure 22. QSFP-DD HCB (LGCY) Mated Common Mode Return Loss

Meets IEEE 802.3cd Specification

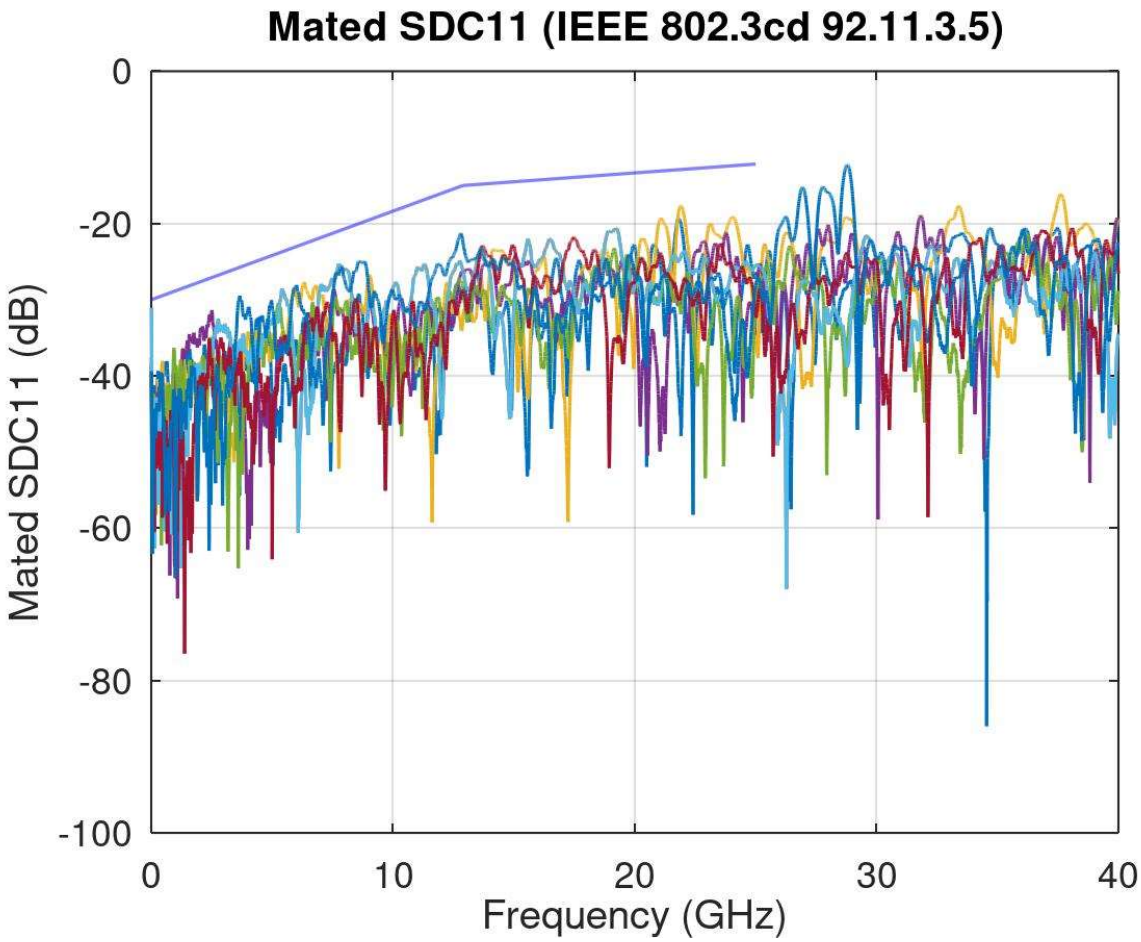



Figure 23. QSFP-DD HCB (LGCY) Mated Common-Mode Conversion Return Loss

Meets IEEE 802.3cd Specification

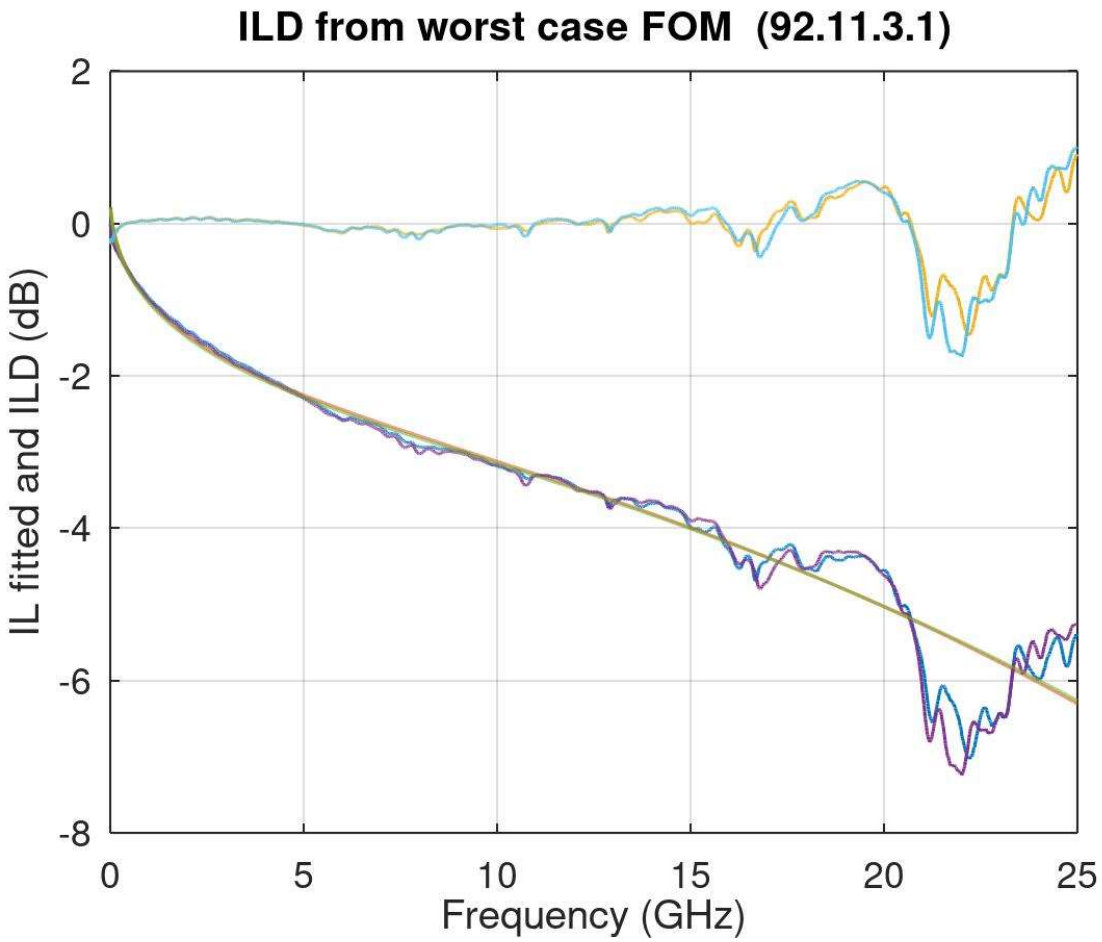



Figure 24. QSFP-DD HCB (LGCY) Mated ILD (Worst Case)

FOM (Figure of Merit) < .13 dB
IEEE 802.3cd 136B.1.1.1
IEEE 802.3bj 92.11.3.1

Tx1 FOM ILD = 0.066 dB
Tx2 FOM ILD = 0.036 dB
Tx3 FOM ILD = 0.061 dB
Tx4 FOM ILD = 0.033 dB

Rx1 FOM ILD = 0.039 dB
Rx2 FOM ILD = 0.036 dB
Rx3 FOM ILD = 0.042 dB
Rx4 FOM ILD = 0.057 dB

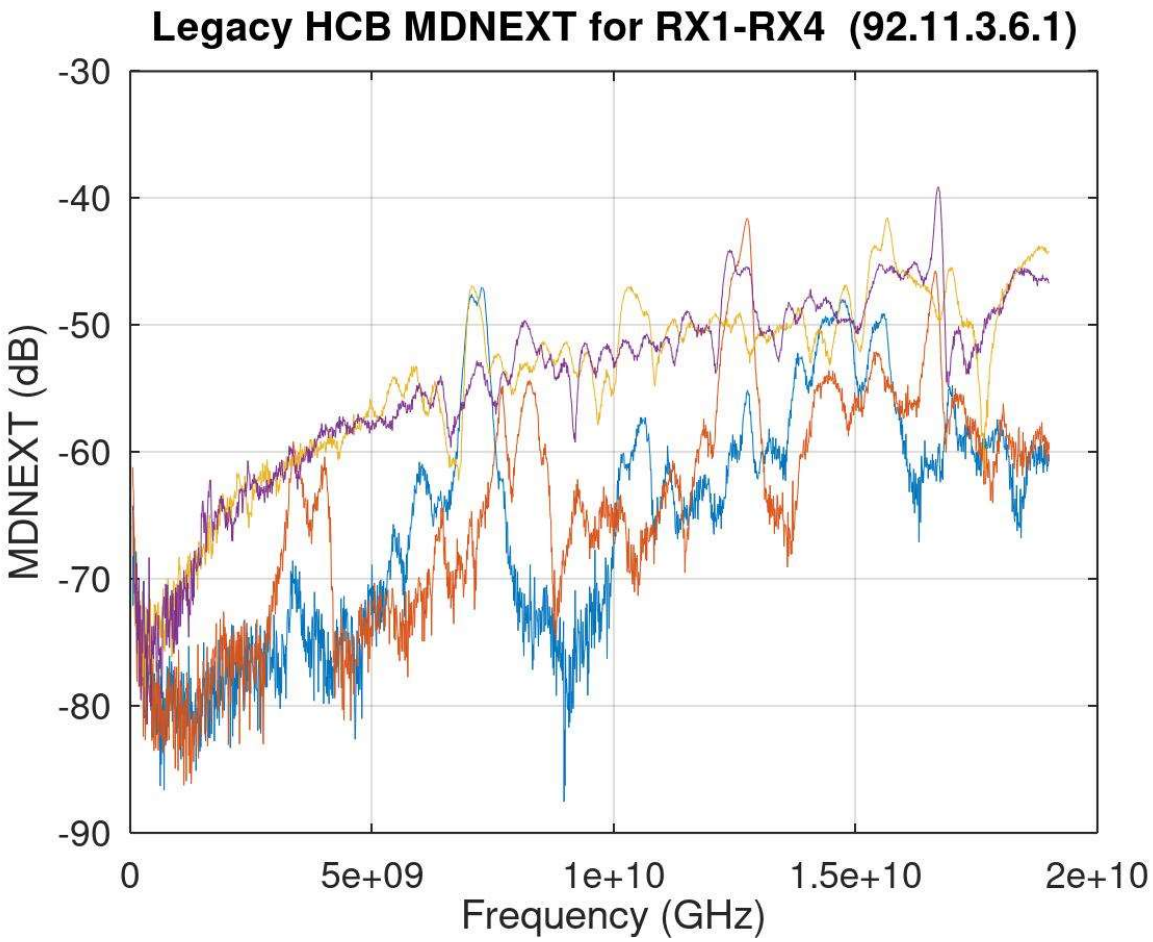



Figure 25. QSFP-DD HCB (LGCY) Mated MDNEXT dB

ICN NEXT = 1.6 mV
IEEE 802.3cd 136B.1.1.6

Rx1 ICN = 0.60 mV
Rx2 ICN = 0.64 mV
Rx3 ICN = 1.22 mV
Rx4 ICN = 1.22 mV

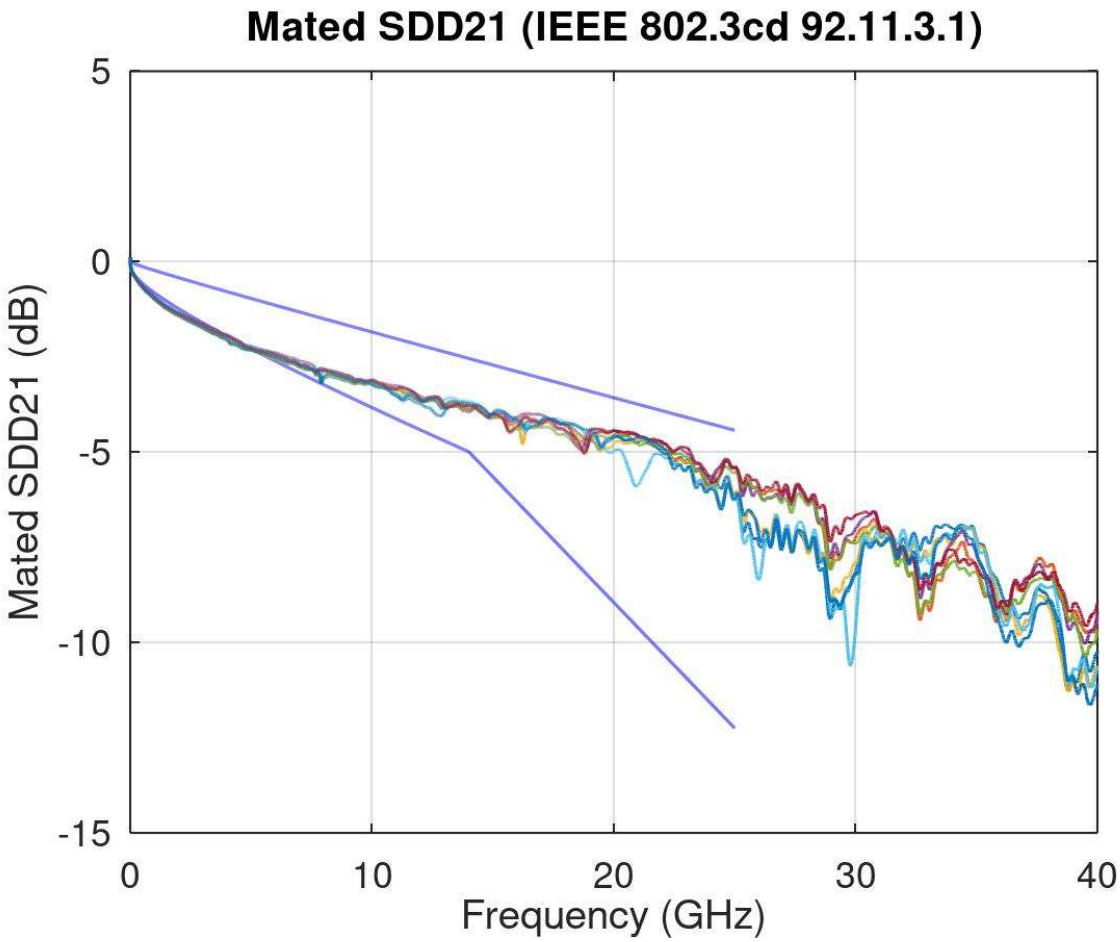



Figure 26. QSFP-DD HCB (DD) Insertion Loss

The insertion loss reflects the typical coaxial fixture loss profile where at the low frequencies the loss is at or slightly below the maximum loss limit then slopes to near the minimum loss limit.

The QSFP-DD Legacy channels are showing more resonances at the higher frequencies. The board impedance is low by 5% to 6% on some of the Legacy channels.

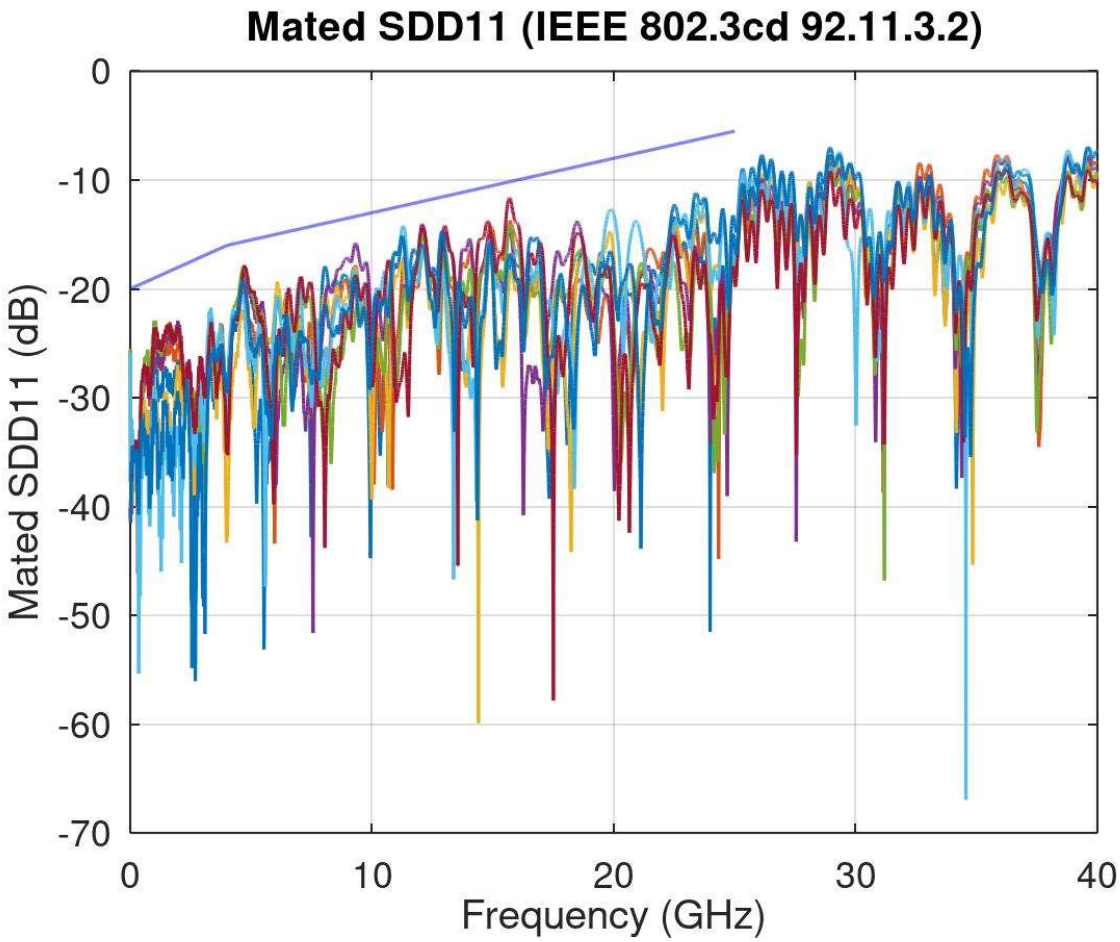



Figure 27. QSFP-DD HCB (DD) Return Loss

Meets IEEE 802.3cd Specification

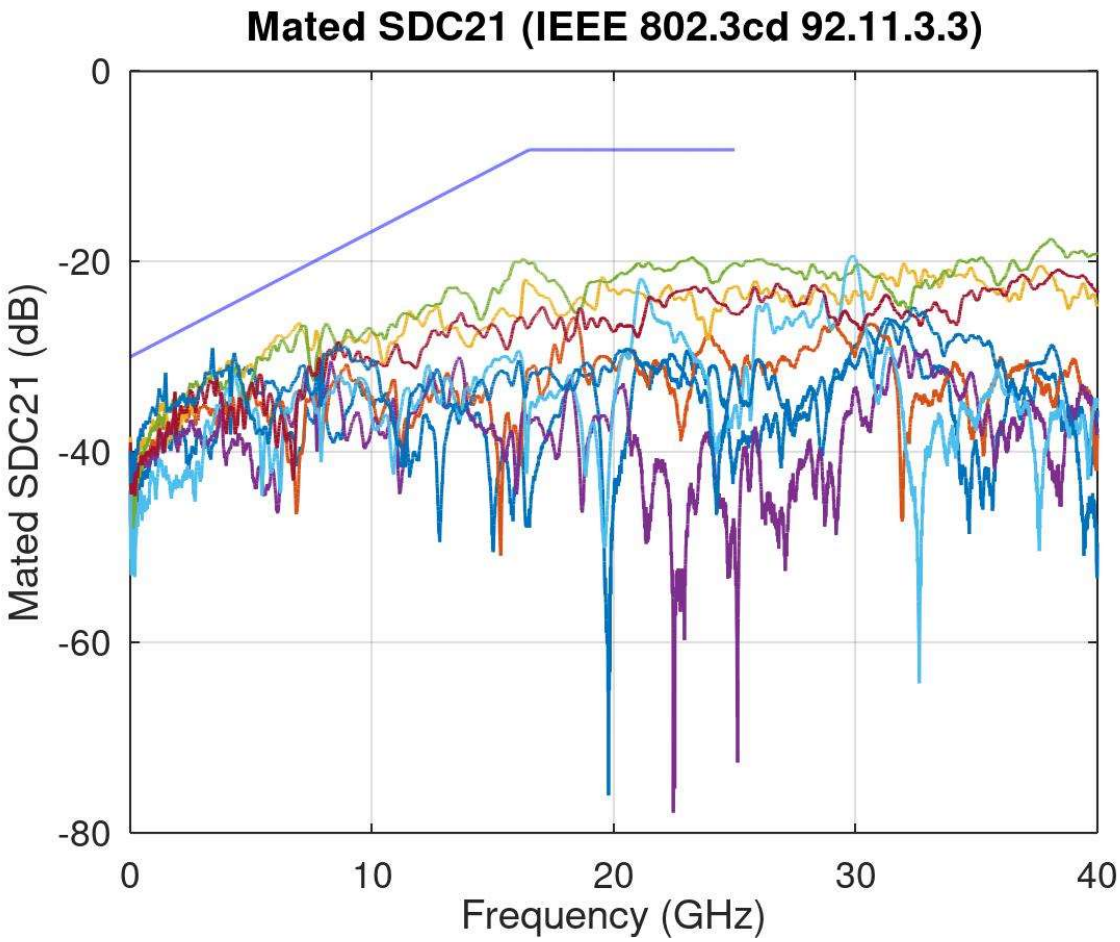



Figure 28. QSFP-DD HCB (DD) Mated Common Mode Conversion Insertion Loss

Meets IEEE 802.3cd Specification

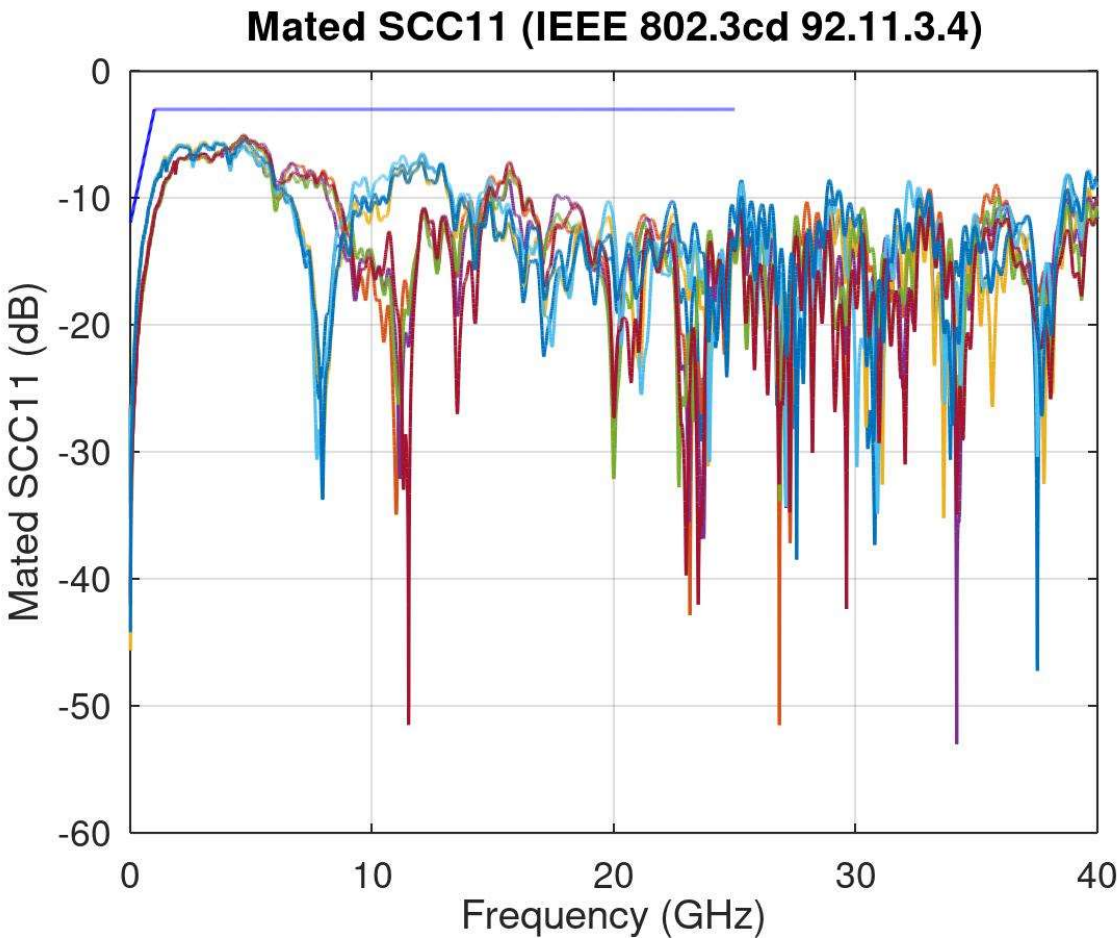



Figure 29. QSFP-DD HCB (DD) Mated Common Mode Return Loss

Meets IEEE 802.3cd Specification

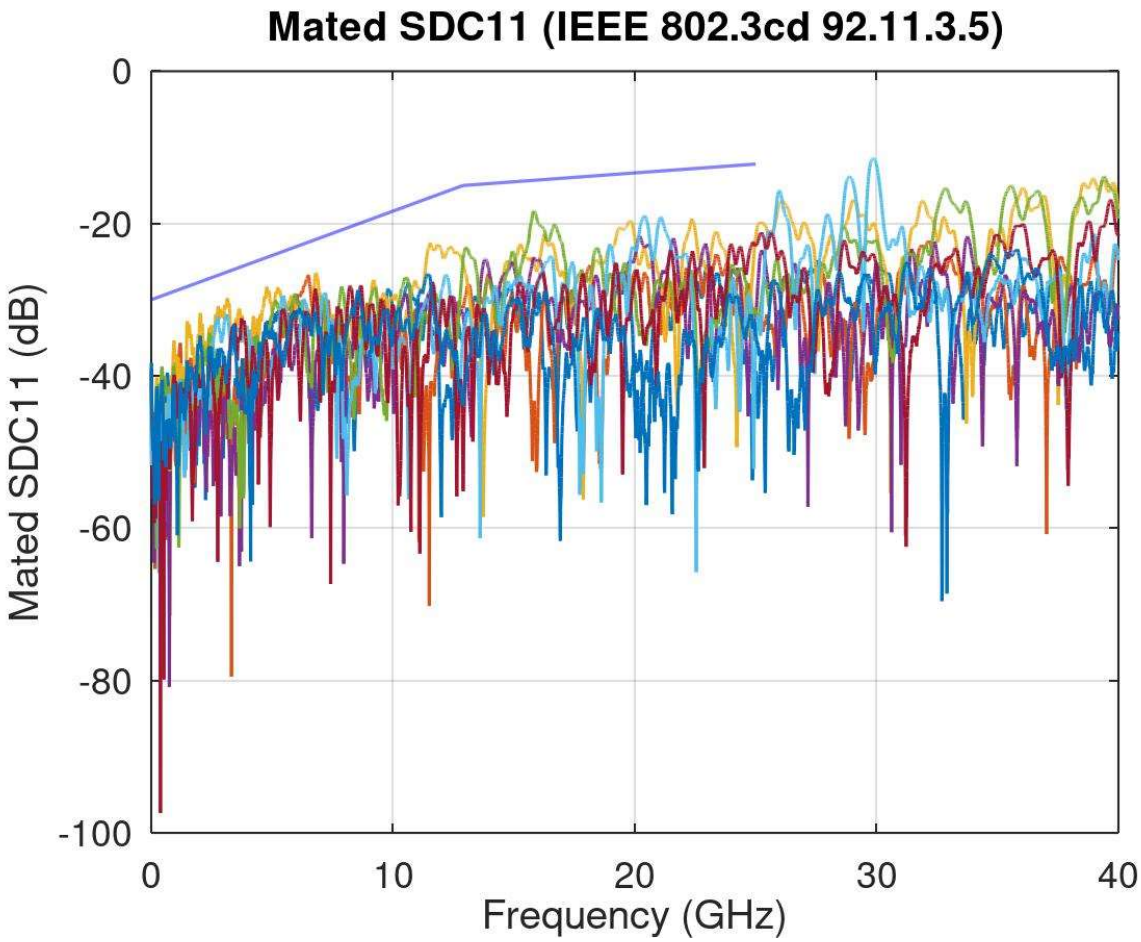



Figure 30. QSFP-DD HCB (DD) Mated Common-Mode Conversion Return Loss

Meets IEEE 802.3cd Specification

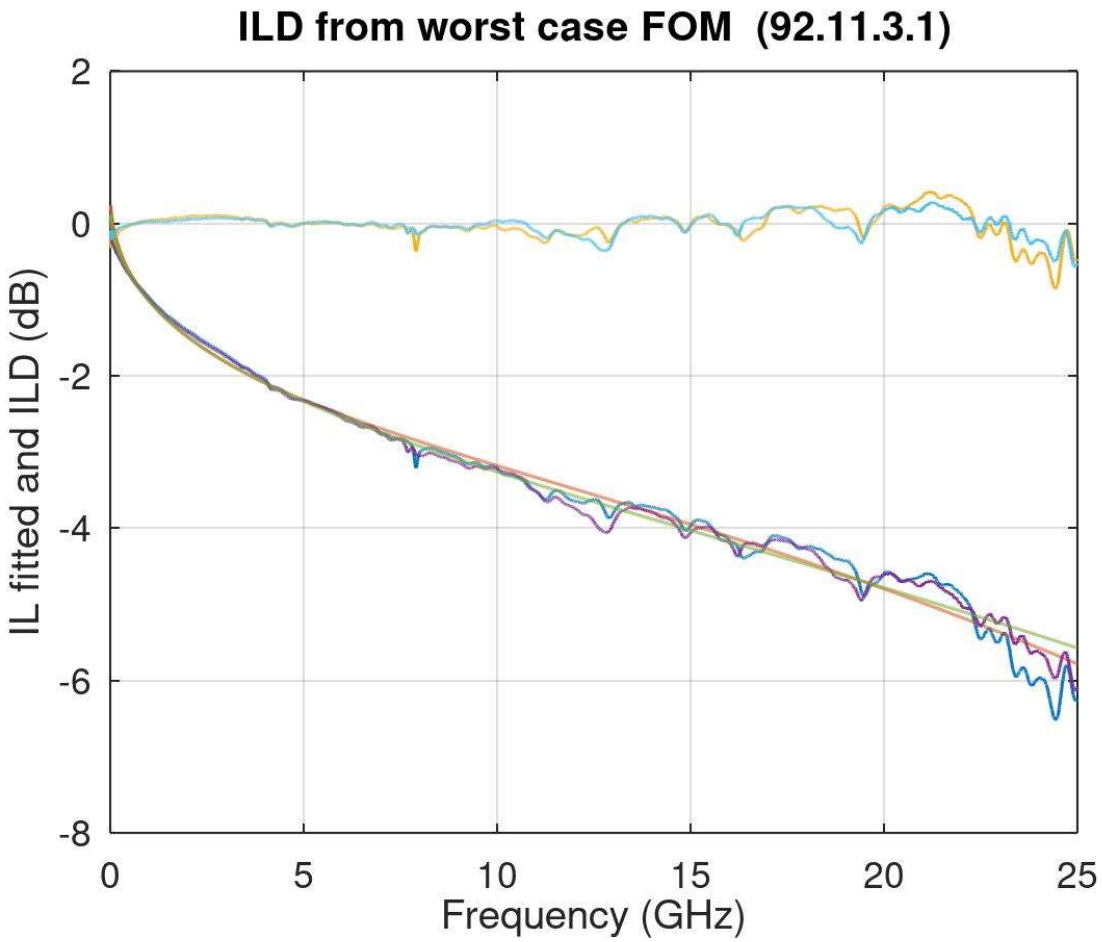



Figure 31. QSFP-DD HCB (DD) Mated ILD (Worst Case)

FOM (Figure of Merit) < .13 dB
IEEE 802.3cd 136B.1.1.1
IEEE 802.3bj 92.11.3.1

Tx1 FOM ILD = 0.053 dB
Tx2 FOM ILD = 0.030 dB
Tx3 FOM ILD = 0.050 dB
Tx4 FOM ILD = 0.038 dB

Rx1 FOM ILD = 0.032 dB
Rx2 FOM ILD = 0.054 dB
Rx3 FOM ILD = 0.039 dB
Rx4 FOM ILD = 0.059 dB

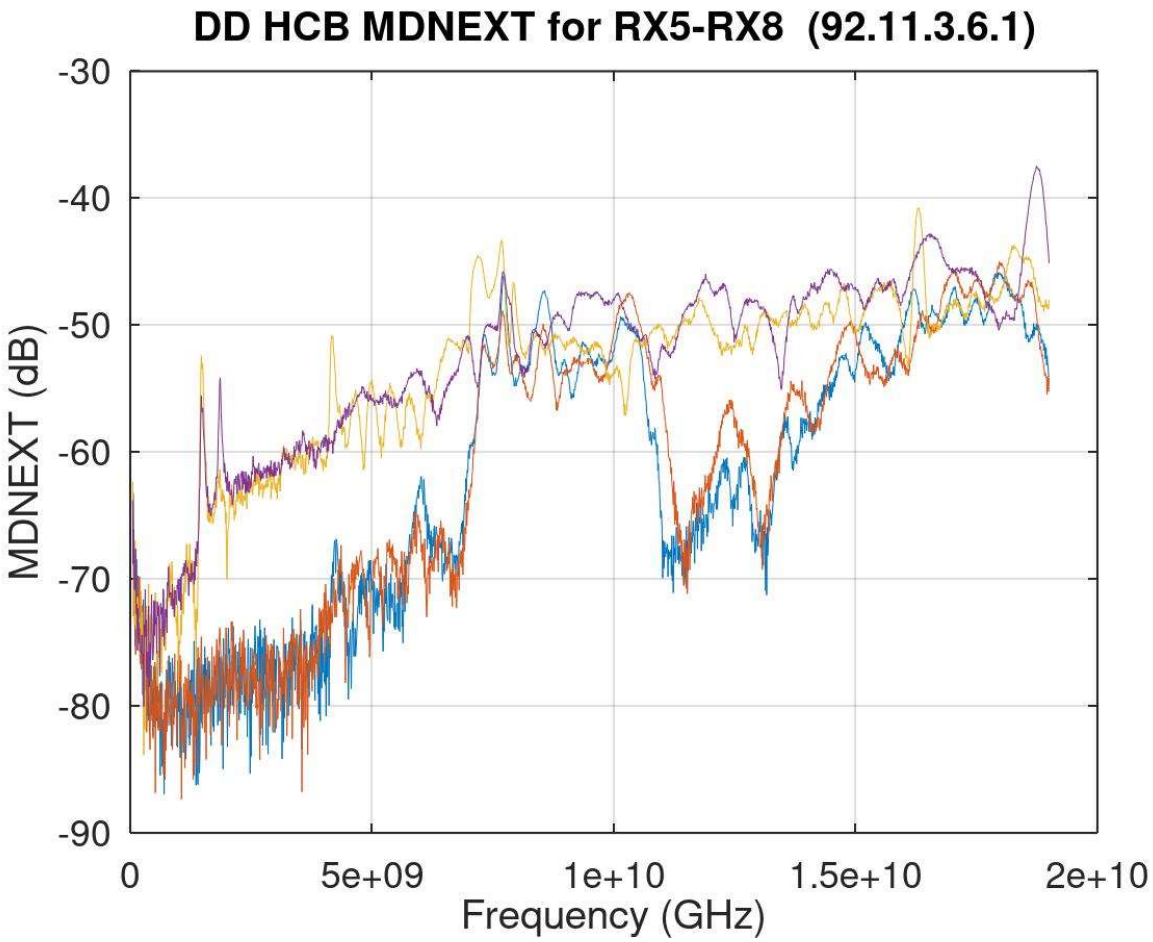



Figure 32. QSFP-DD HCB (DD) Mated MDNEXT dB

ICN NEXT = 1.6 mV
IEEE 802.3cd 136B.1.1.6

Rx5 ICN = 0.83 mV
Rx6 ICN = 0.83 mV
Rx7 ICN = 1.35 mV
Rx8 ICN = 1.45 mV

## QSFP-DD Mated Total ICN

## Total ICN NEXT = 4.4 mV (IEEE 802.3cd 136B.1.1.6)

| | LGCY NEXT | RX FEXT | Total mV |
|---|---|---|---|
| RX1 | 0.60 | 3.30 | **3.35** |
| RX2 | 0.64 | 2.42 | **2.50** |
| RX3 | 1.22 | 3.17 | **3.40** |
| Rx4 | 1.22 | 2.36 | **2.66** |

| | DD NEXT | RX FEXT | Total mV |
|---|---|---|---|
| RX5 | 0.83 | 3.42 | **3.52** |
| RX6 | 0.83 | 3.80 | **3.89** |
| RX7 | 1.35 | 3.41 | **3.67** |
| RX8 | 1.45 | 3.77 | **4.04** |

# QSFP-DD MCB (Receptacle) Test Adapter Reference Information

This section contains a schematic diagram of the QSFPDD-TPAHK-MCB-R Power Connections.

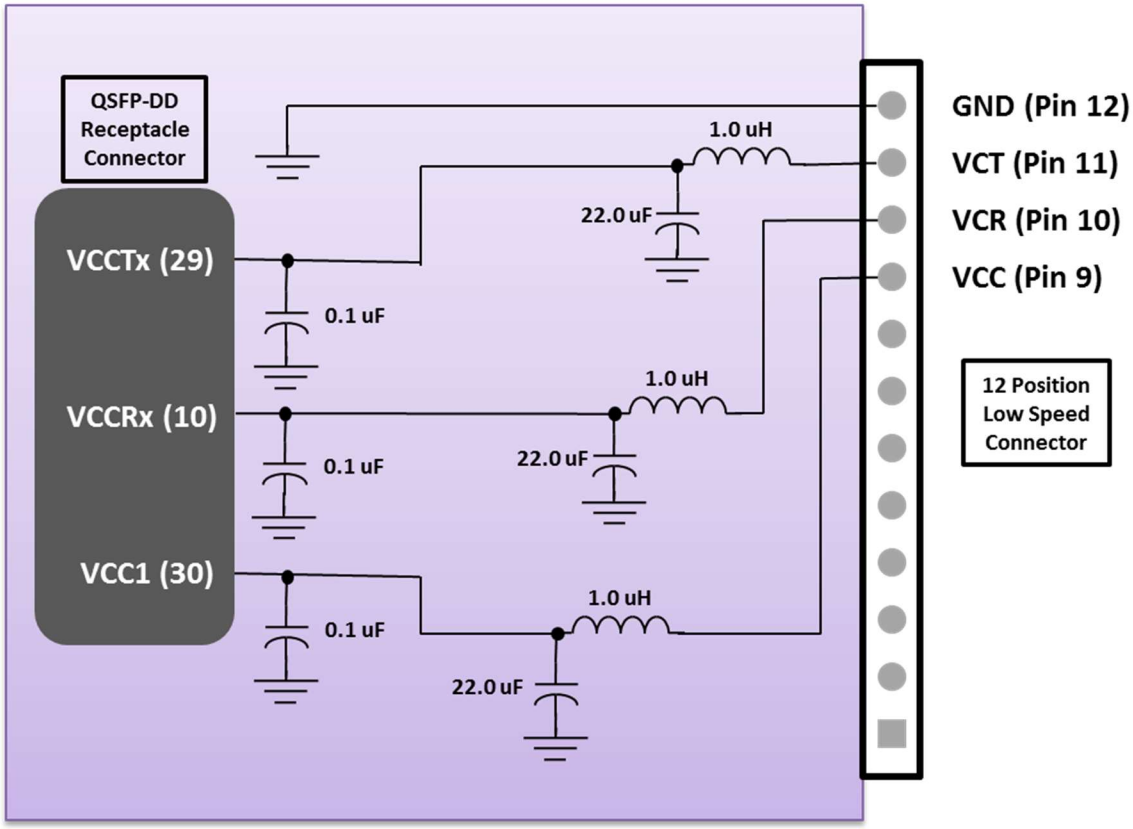



Figure 33. QSFPDD-TPAHK-MCB-R Power Connections

# Compliance with Environmental Legislation

Wilder Technologies, LLC, is dedicated to complying with the requirements of all applicable environmental legislation and regulations, including appropriate recycling and/or disposal of our products.

## WEEE Compliance Statement

The European Union adopted Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE), with requirements that went into effect August 13, 2005. WEEE is intended to reduce the disposal of waste from electrical and electronic equipment by establishing guidelines for prevention, reuse, recycling and recovery.

Wilder Technologies has practices and processes in place to conform to the requirements in this important Directive.

In support of our environmental goals, effective January 1st, 2009 Wilder Technologies, LLC has partnered with EG Metals Inc. – Metal and Electronics Recycling of Hillsboro, Oregon, www.egmetalrecycling.com, to recycle our obsolete and electronic waste in accordance with the European Union Directive 2002/96/EC on waste electrical and electronic equipment ("WEEE Directive").

As a service to our customers, Wilder Technologies is also available for managing the proper recycling and/or disposal of all Wilder Technologies products that have reached the end of their useful life. For further information and return instructions, contact support@wilder-tech.com.

## Compliance to RoHS 2 Substance Restrictions

Wilder Technologies, LLC certifies that the parts described in this document are compliant to the substance restrictions of Directive 2011/65/EU and Amendment Directive (EU) 2015/863 of the European Parliament, and of the Council of 8 June, 2011 and 31 March, 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2 Directive), prohibiting the use in homogeneous materials in excess of the listed maximum concentration value, except in cases where use is allowed by applicable exemptions listed in Annex III and Annex IV of the Directive.

Compliance with RoHS 2 has been verified through internal controls at design and production sites, including establishment of processes for specifying and controlling materials and segregation of non-compliant parts, receipt of supplier declarations of compliance and/or analytical test.

# Glossary of Terms

| TERMINOLOGY | DEFINITION |
|---|---|
| Aggressor | A signal imposed on a system (i.e., cable assembly) to measure response on other signal carriers. |
| Decibel (dB) | Ten times the common logarithm (i.e. log10) of the ratio of relative powers. |
| Far-end crosstalk or FEXT | Crosstalk that is propagated in a disturbed channel in the same direction as the propagation of a signal in the aggressor channel. The terminals of the aggressor channel and the victim channel are usually close to each other. |
| Informative | The designation of a test that is not required for compliance. |
| Insertion loss | The ratio, expressed in dB, of incident power to delivered power. |
| Near-end crosstalk or NEXT | Crosstalk that is propagated in a disturbed channel in the opposite direction as the propagation of a signal in the aggressor channel. The terminals of the aggressor channel and the victim channel are usually close to each other. |
| Normative | The designation of a test that is required for compliance. |
| Return Loss | The ratio, expressed in dB, of incident power to reflected power. |
| QSFP-DD | 50 Gbps 8X Pluggable Transceiver (High-Density Quad Small Form Factor Pluggable) |
| QSFP-DD Host | The QSFP-DD Host is the fixed end of the connection supporting IEEE 802.3. |
| QSFP-DD Module | The QSFP-DD Module is the moveable end of the connection supporting IEEE 802.3. |
| QSFP-DD TPA | QSFP-DD Test Point Access. A specialized assembly that interfaces to a QSFP-DD host or module and enables access of signals for measurement or stimulation. |
| Victim | A signal carrier on a system that has a response imposed on it by other signals in the system. |

# Index

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