Express Port FS1-E38 Features and Compatibility to SFF-8436

COMPATIBILITY

- Mating end compliant with SFF-8436 (mates with existing QSFP modules)
- Overall envelope height, width, depth compliant with SFF-8436 (fits into existing QSFP cages)
- Foot print compatible with SFF-8436 with addition of two grounding plate SMT pads

NEW FEATURES

- Added grounding plate to improve impedance
- Added grounding plate SMT pads to improve grounding and retention to PCB
- New over-molding construction
- New stamped and formed contacts to eliminate mating on cut edge
- New gull wing contact design

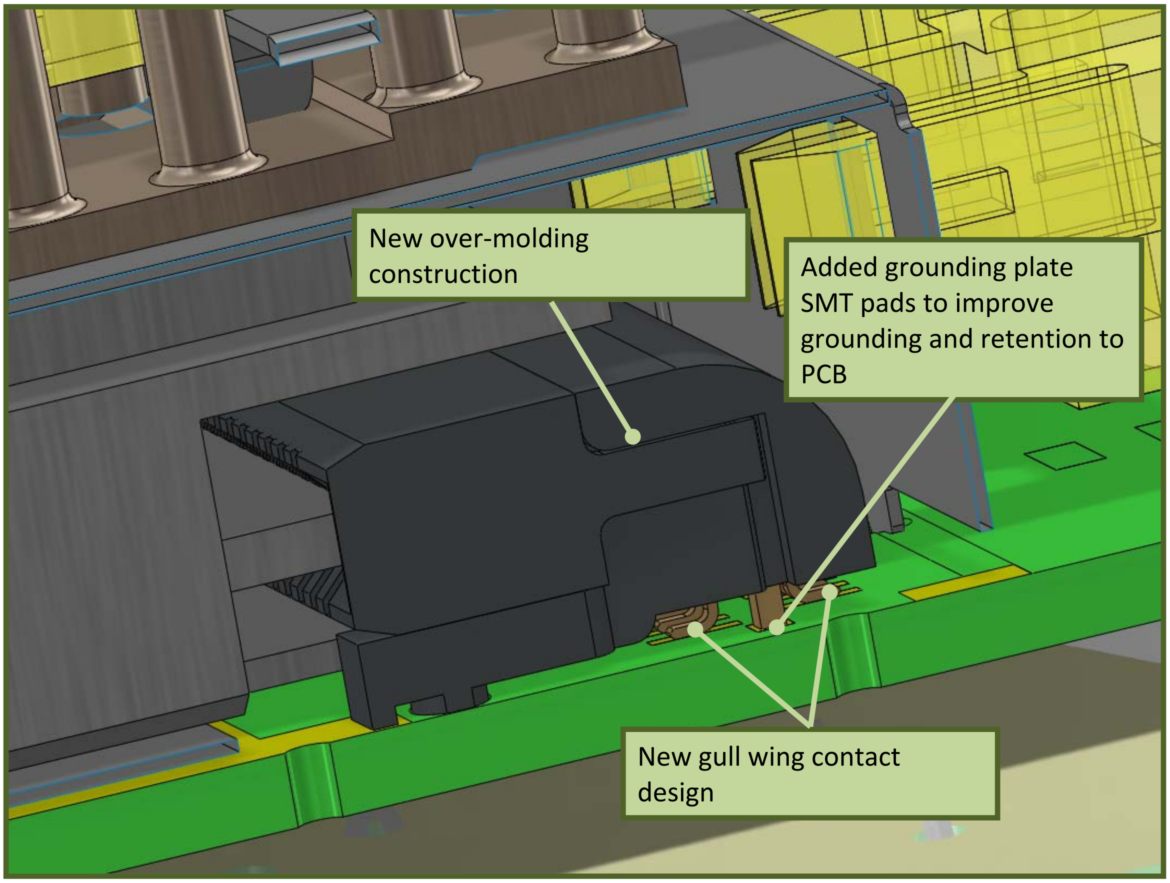

Figure 1- New Features

Express Port FS1-E38 Features and Compatibility to SFF-8436 (cont.)

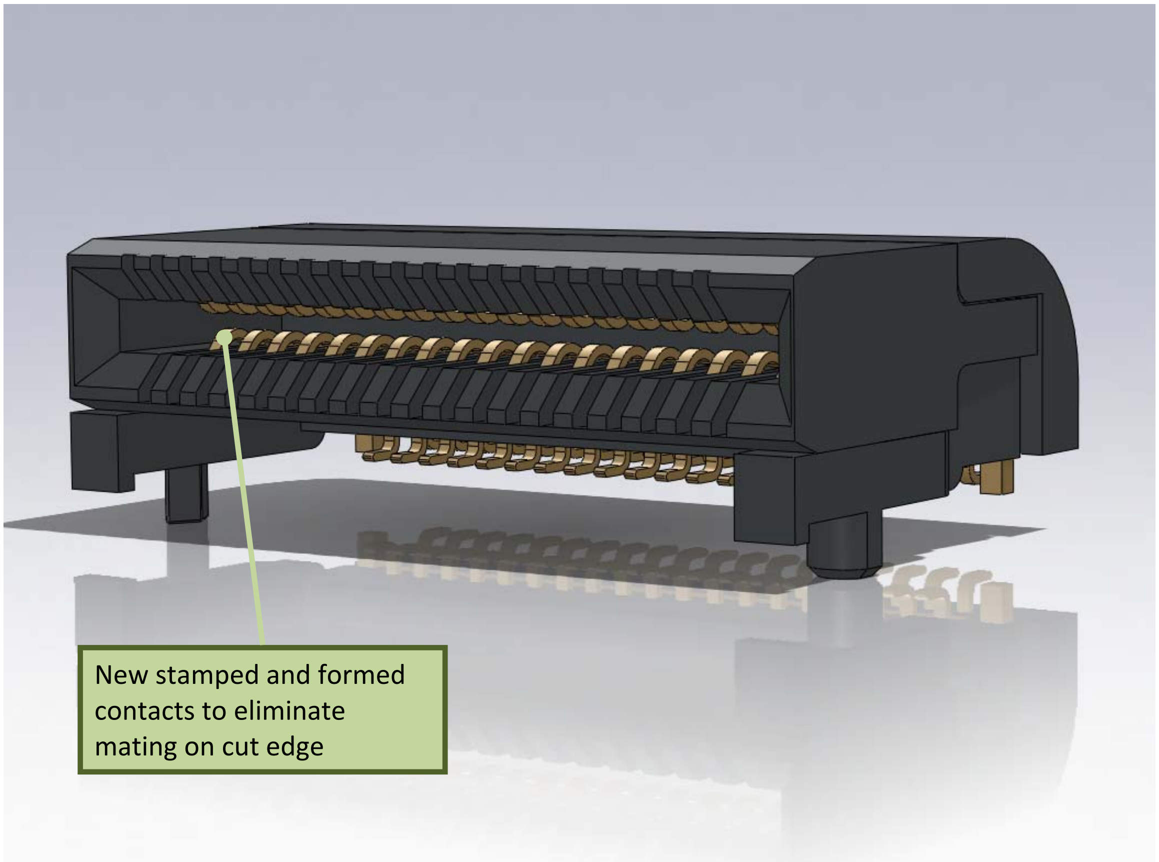

Figure 2 More New features

Express Port FS1-E38 Features and Compatibility to SFF-8436 (cont.)

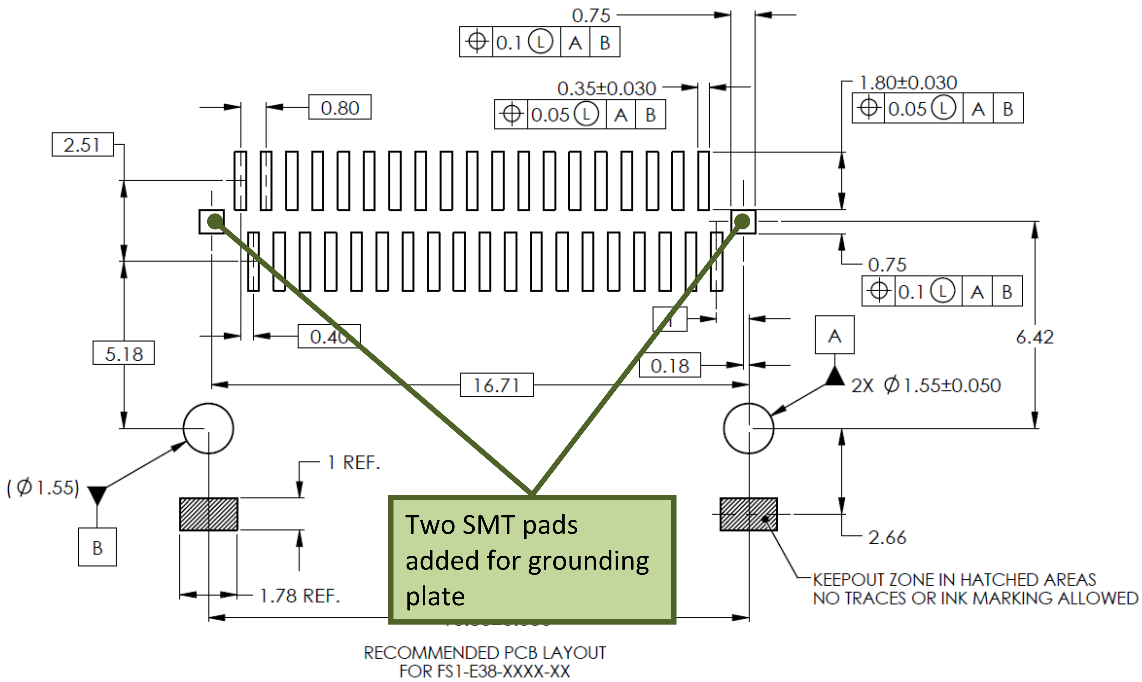

Figure 3 Foot print compatible with SFF-8436, with the addition of two grounding pads for grounding plate

Description of Models (cont.)

Model for Module Compliance Board and Host Compliance Board

The model for the **Module Compliance Board** is based on the Amphenol 564390002 high speed test card. The insertion loss characteristics of the high speed test card meet the proposed insertion loss characteristics of a 2x calibration trace divided by two of 0.975dB @ 5GHz and 2.125dB @ 12.5GHz. The model data used in the simulations are s4p data captures of the 1x and 2x calibration traces from the Amphenol 56439001 High Speed Calibration Board.

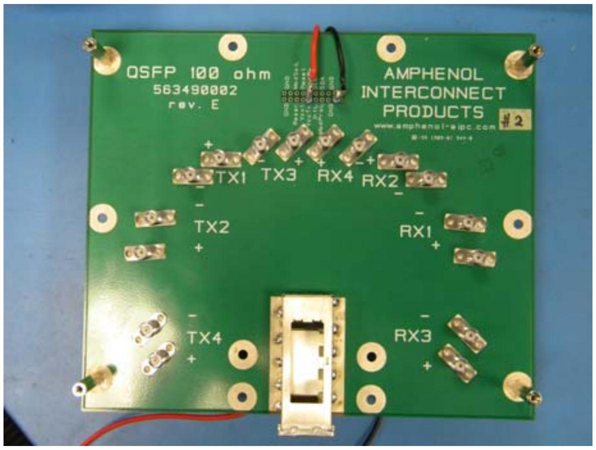

Figure 5 - Calibration / Test boards

The model for the **Host Compliance Board** is also based on the Amphenol 564390002 high speed test card. The insertion loss requirements for the Host Compliance board are 1.75dB @ 5GHz and 4dB @ 12.5GHz. This is approximated using the 2x calibration trace on the 564390001. The data is captures using a 4-port Rhode and Schwarz ZVA24 VNA using 1999 points in a 10MHz – 20GHz frequency range.

The simulation of the mated Module Compliance Board and Host Compliance Board is done in Ansoft Designer using the s4p data captures of the 1x and 2x calibration traces and the linked HFSS Model of the receptacle.

Description of Models (cont.)

HFSS Model Paddle card with Cable Termination

The QSFP paddle card model is a full model having 4 transmitter channels and 4 receiver channels. The model is terminated to 30AWG, 28AWG and 26AWG cable assemblies.

The port configuration of the models allows it to be linked to the QSFP+ receptacle model and a Cable Assembly model to predict the performance of a cable assembly at FDR and EDR data rates

The model is built and simulated using Ansoft HFSS v12.1.

Model linking is performed using Ansoft Designer v5.0.

Description of Models (cont.)

Model for Cable

The model for the Cable is measured s4p data using Spectra-Strip 160-2899-966 28AWG EXF cable and Spectra-Strip 160-2899-970 28AWG EXD. The data is captured using a Rhode and Schwarz ZVA24 VNA. The s4p data is then duplicated eight times to in Ansoft Designer to simulate an 8pr cable assembly. The model therefore does not contain the effect of NEXT and FEXT in the cable assembly. However it is thought to be small enough to have a negligible contribution to the overall system model.

The cable model is used to simulate a cable assembly mated to the receptacle and connected to a Module Compliance Board.

Module Compliance Board Model

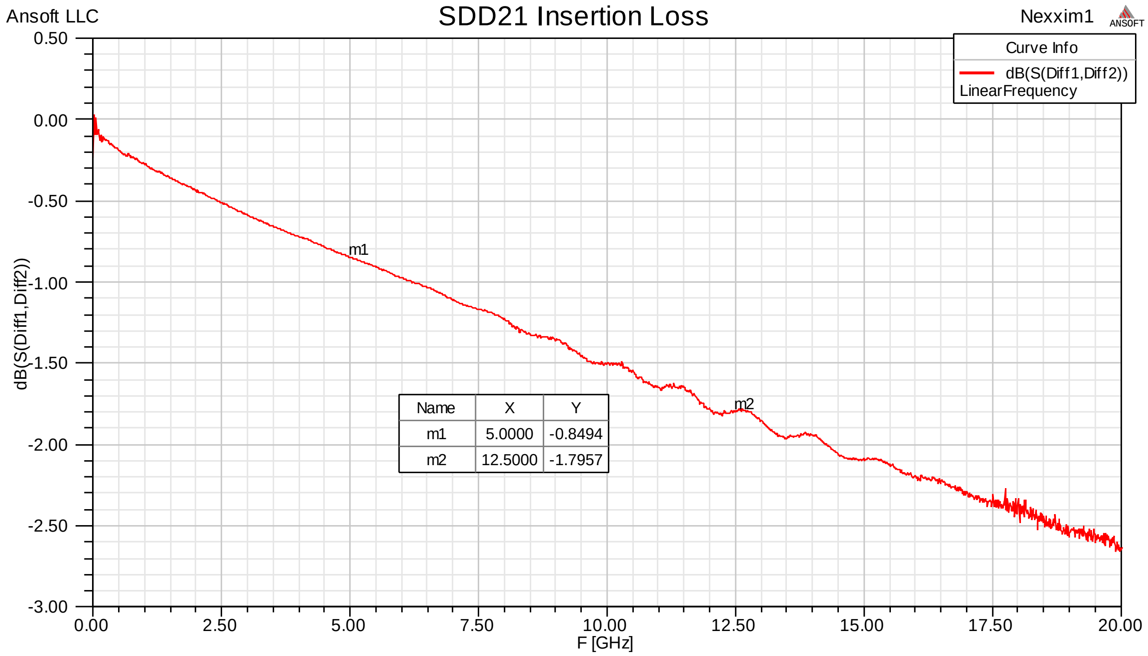

Figure 16 - Insertion Loss

Figure 17 - Return Loss

Host Compliance Board Model

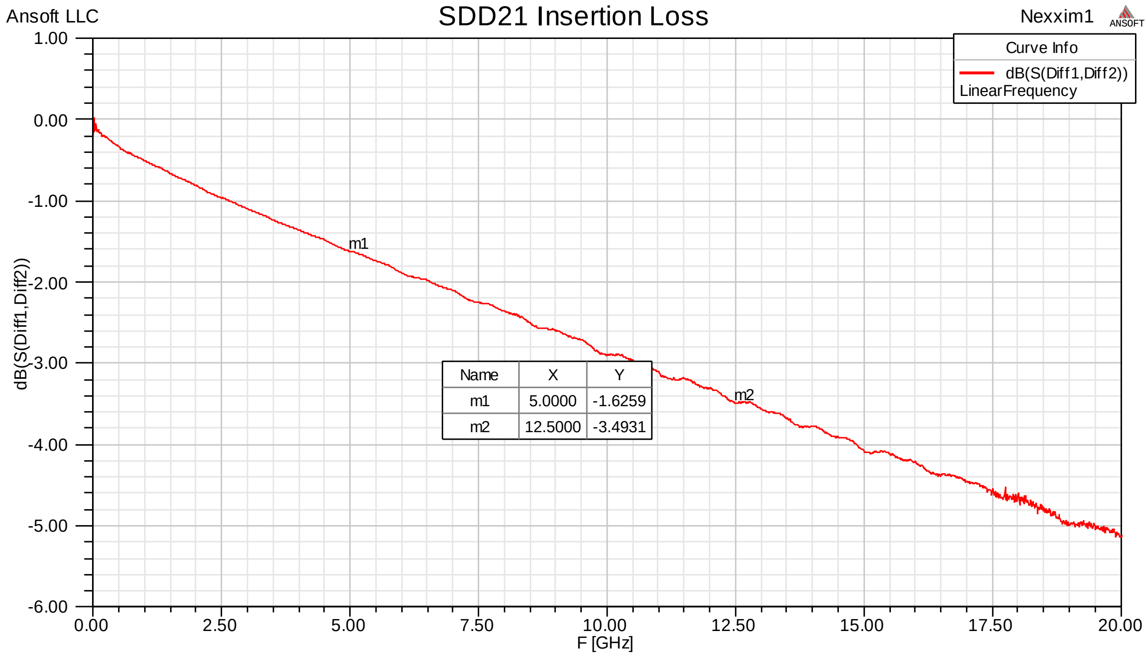

Figure 18 - Insertion Loss

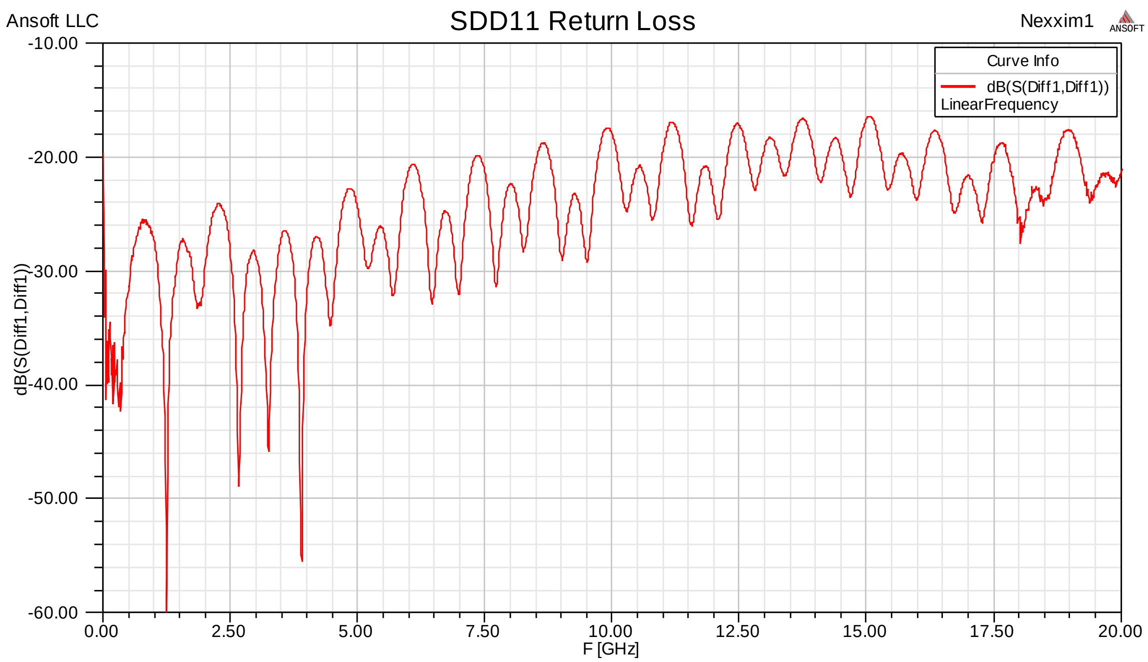

Figure 19 - Return Loss

Cable Model

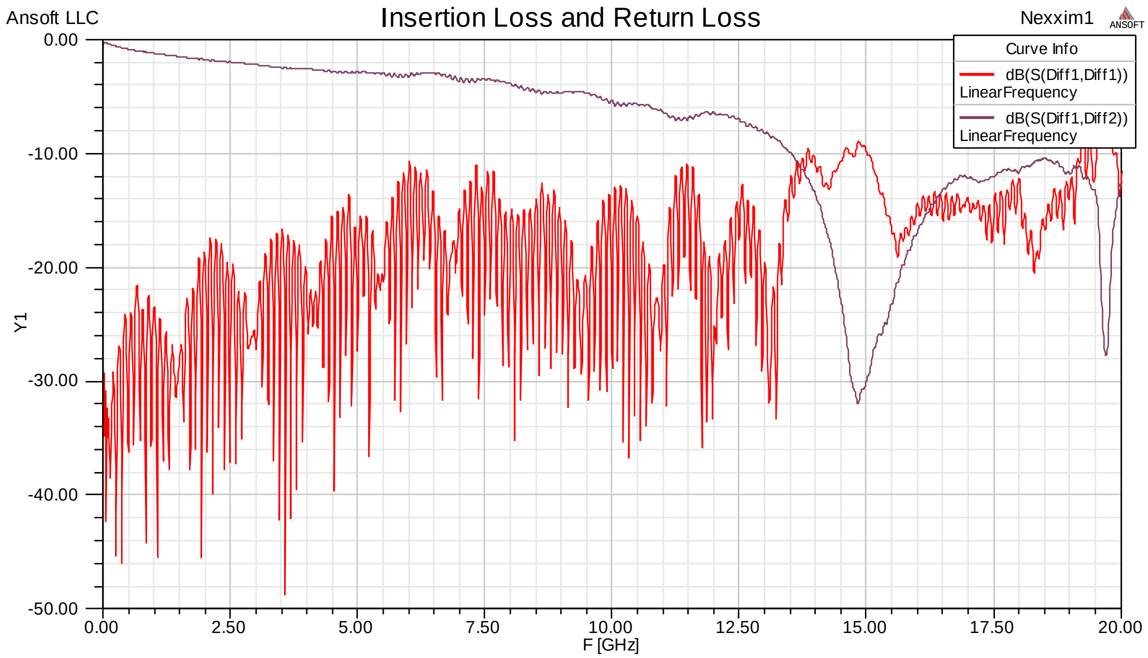

Figure 20 - 1m 28AWG EXF (Insertion Loss and Return Loss)

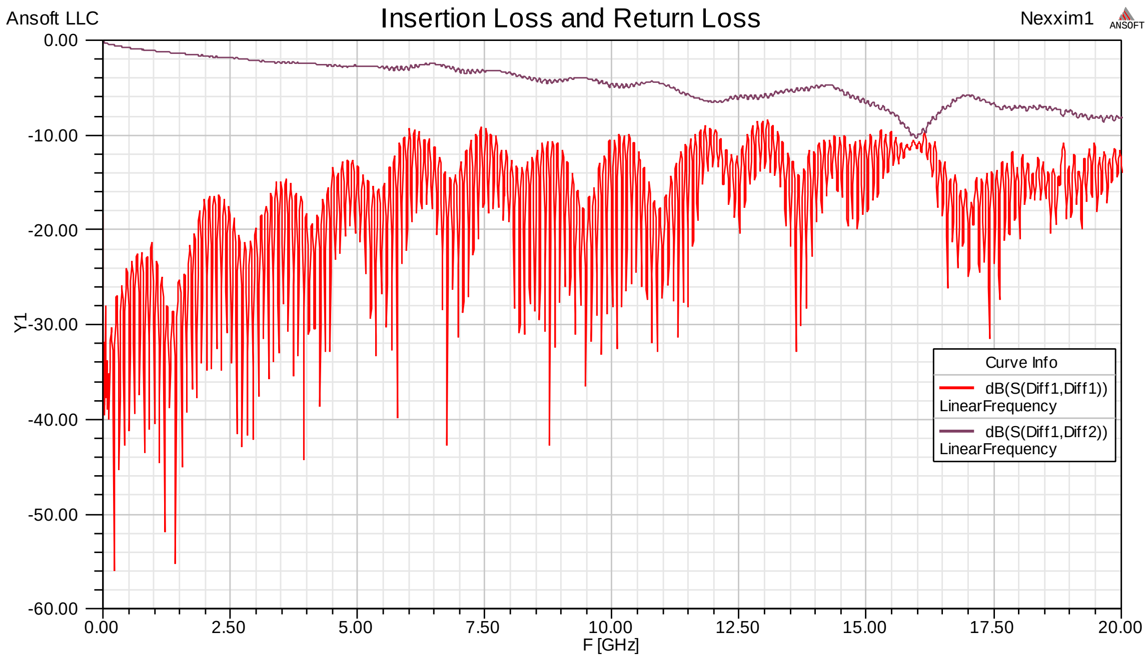

Figure 21 - 1m 28AWG EXD (Insertion Loss and Return Loss)

QSFP RECEPTACLE WITH COMPLAINCE BOARD RESULTS

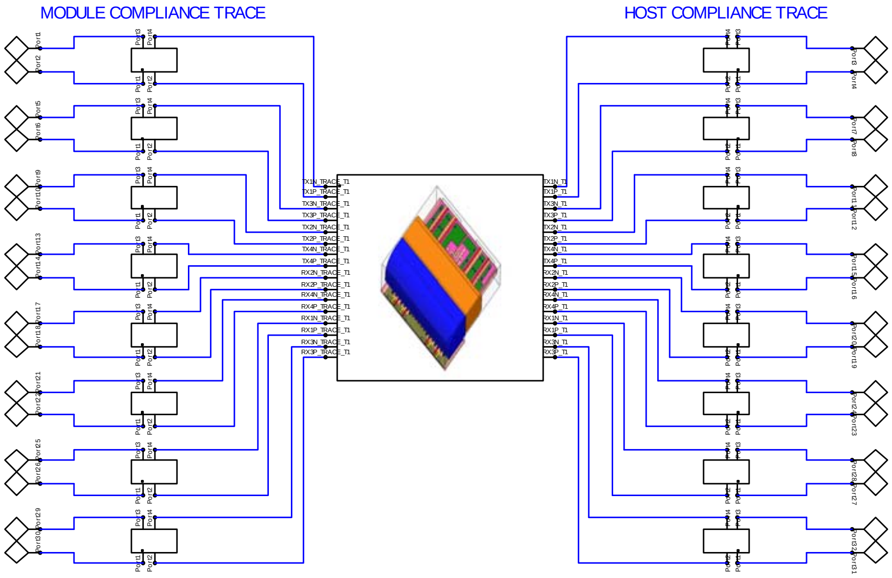

Figure 23 - QSFP+ Receptacle with Host Compliance and Module Compliance Boards

Table 1- Port Assignment for Model

Port 1	Port 2	Diff1	100ohm	Comm1	25ohm	Tx1_in
Port 3	Port 4	Diff2	100ohm	Comm2	25ohm	Tx1_out
Port 5	Port 6	Diff3	100ohm	Comm3	25ohm	Tx2_in
Port 7	Port 8	Diff4	100ohm	Comm4	25ohm	Tx2_out
Port 9	Port 10	Diff5	100ohm	Comm5	25ohm	Tx3_in
Port 11	Port 12	Diff6	100ohm	Comm6	25ohm	Tx3_out
Port 13	Port 14	Diff7	100ohm	Comm7	25ohm	Tx4_in
Port 15	Port 16	Diff8	100ohm	Comm8	25ohm	Tx4_out
Port 17	Port 18	Diff9	100ohm	Comm9	25ohm	Rx2_in
Port 19	Port 20	Diff10	100ohm	Comm10	25ohm	Rx2_out
Port 21	Port 22	Diff11	100ohm	Comm11	25ohm	Rx4_in
Port 23	Port 24	Diff12	100ohm	Comm12	25ohm	Rx4_out
Port 25	Port 26	Diff13	100ohm	Comm13	25ohm	Rx1_in
Port 27	Port 28	Diff14	100ohm	Comm14	25ohm	Rx1_out
Port 29	Port 30	Diff15	100ohm	Comm15	25ohm	Rx3_in
Port 31	Port 32	Diff16	100ohm	Comm16	25ohm	Rx3_out

Amphenol

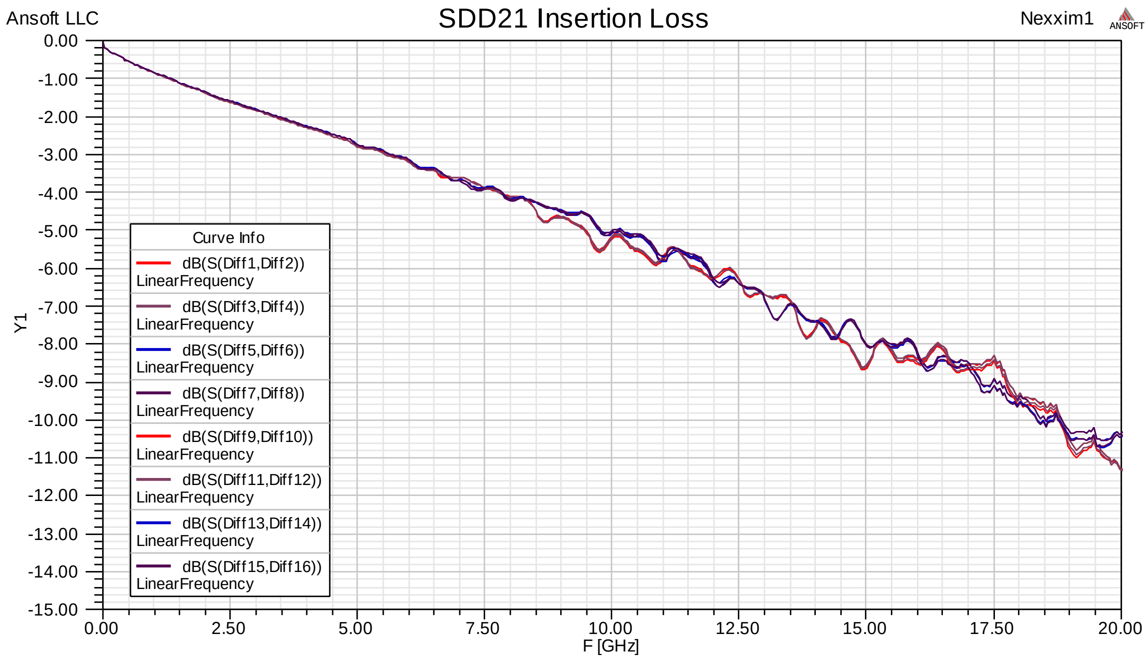

Figure 24 - Insertion Loss

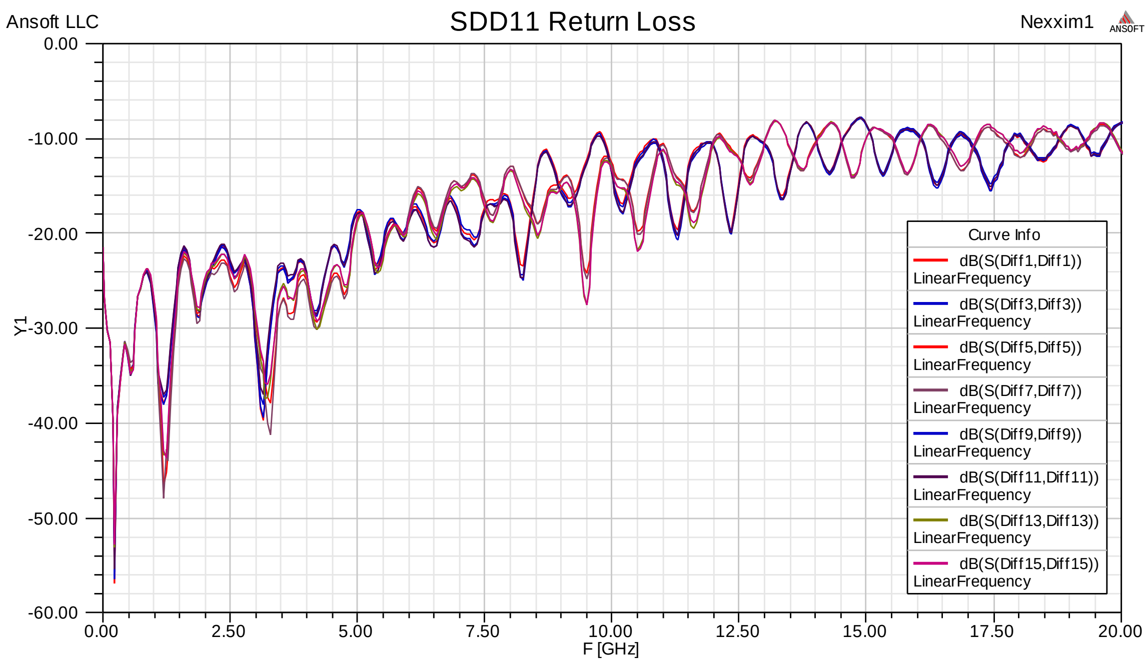

Figure 25 - Return Loss

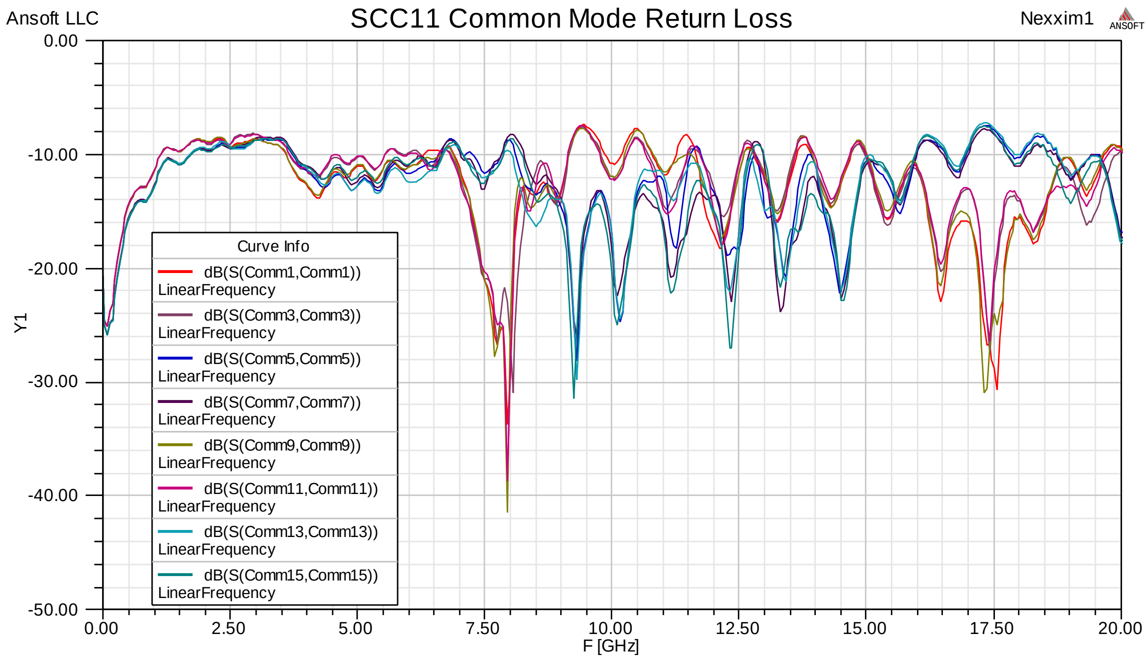

Figure 26 - Common Mode Return Loss

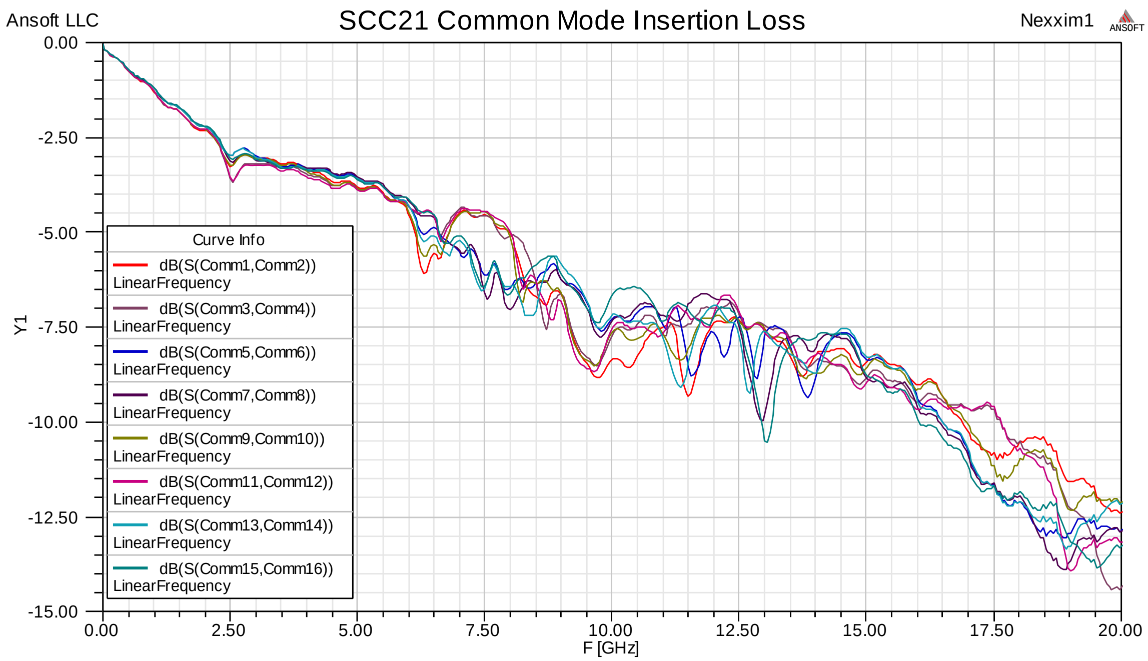

Figure 27 - Common Mode Insertion Loss

Amphenol

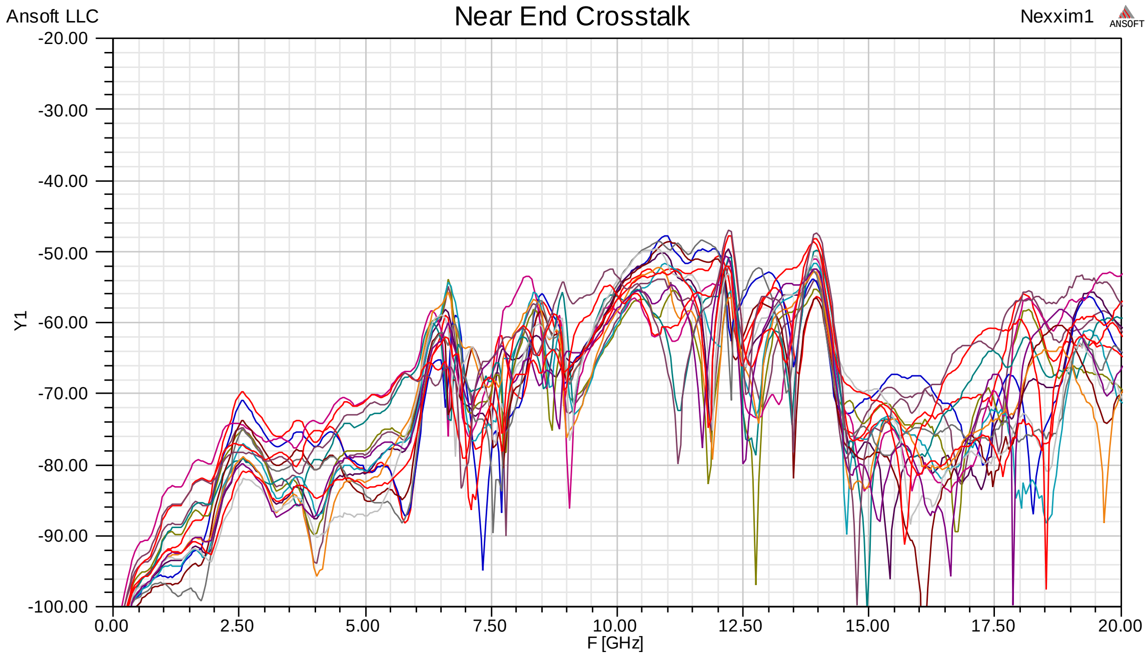

Figure 28 - Near End Crosstalk

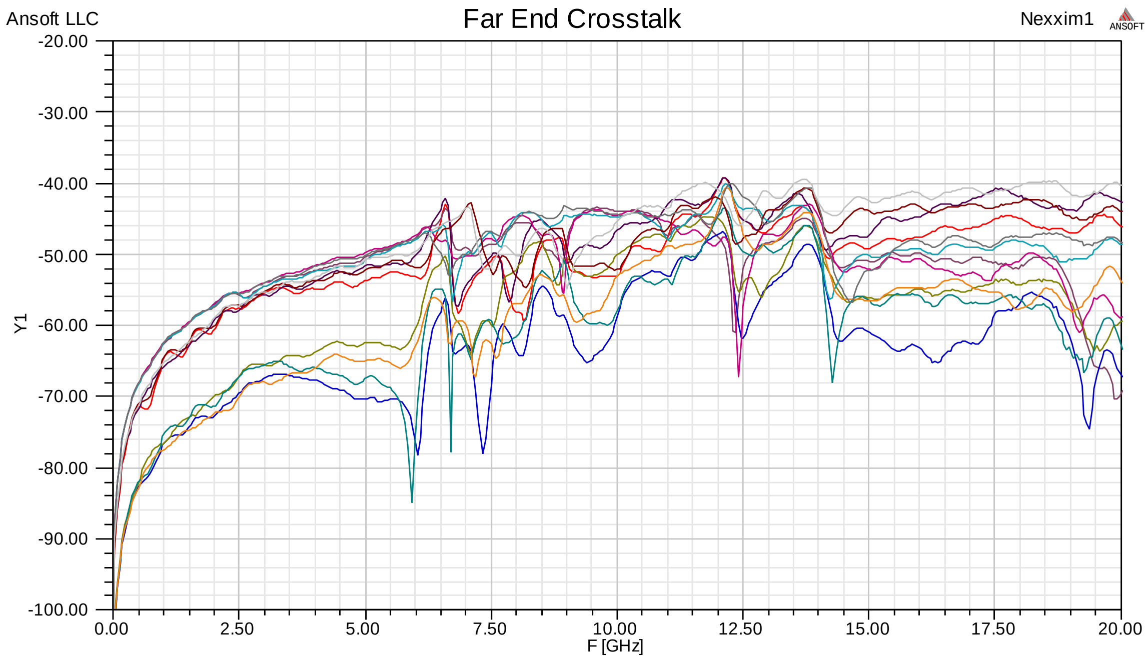

Figure 29 - Far End Crosstalk

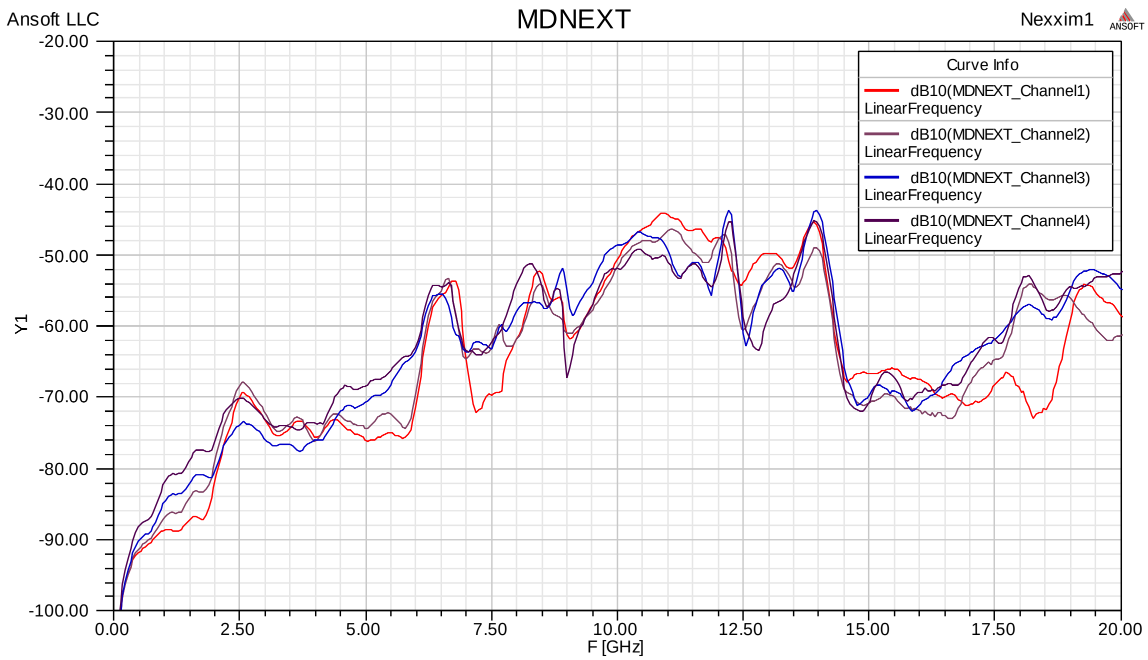

Figure 30 – Multi-Disturber Near End Crosstalk

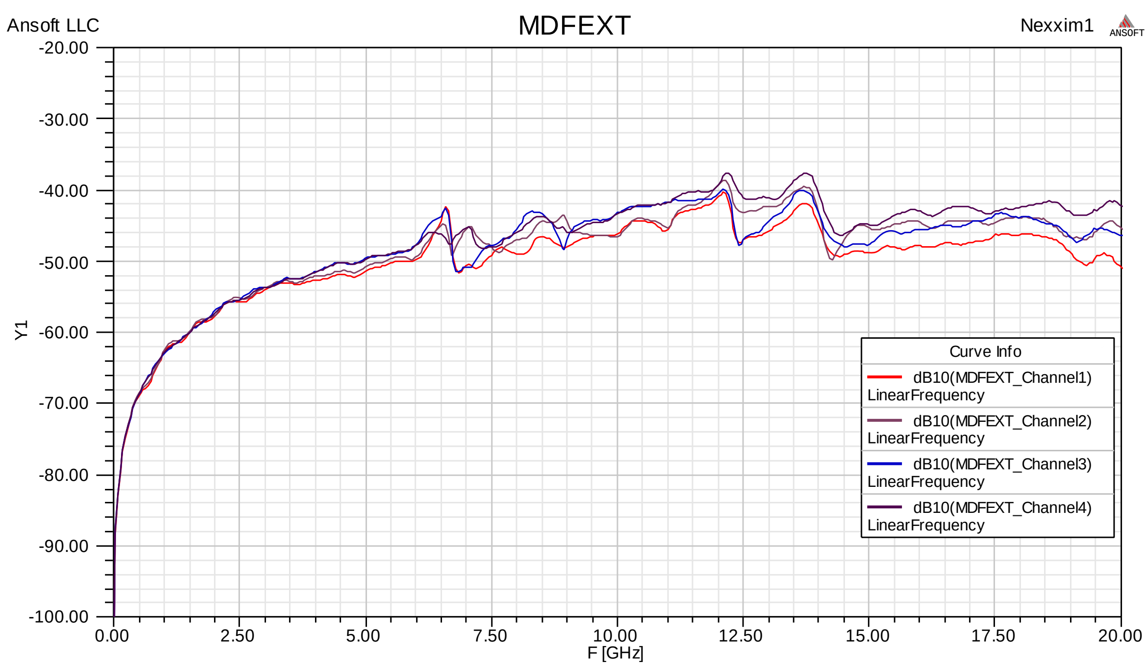

Figure 31 – Multi-Disturber Far End Crosstalk

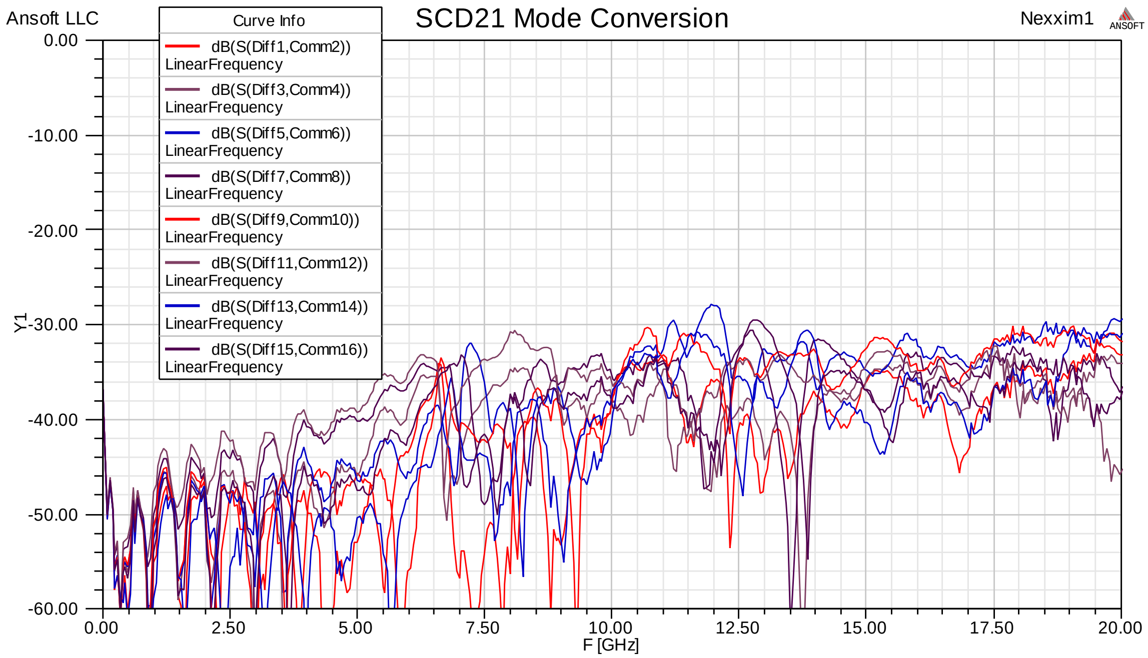

Figure 32 - Mode Conversion

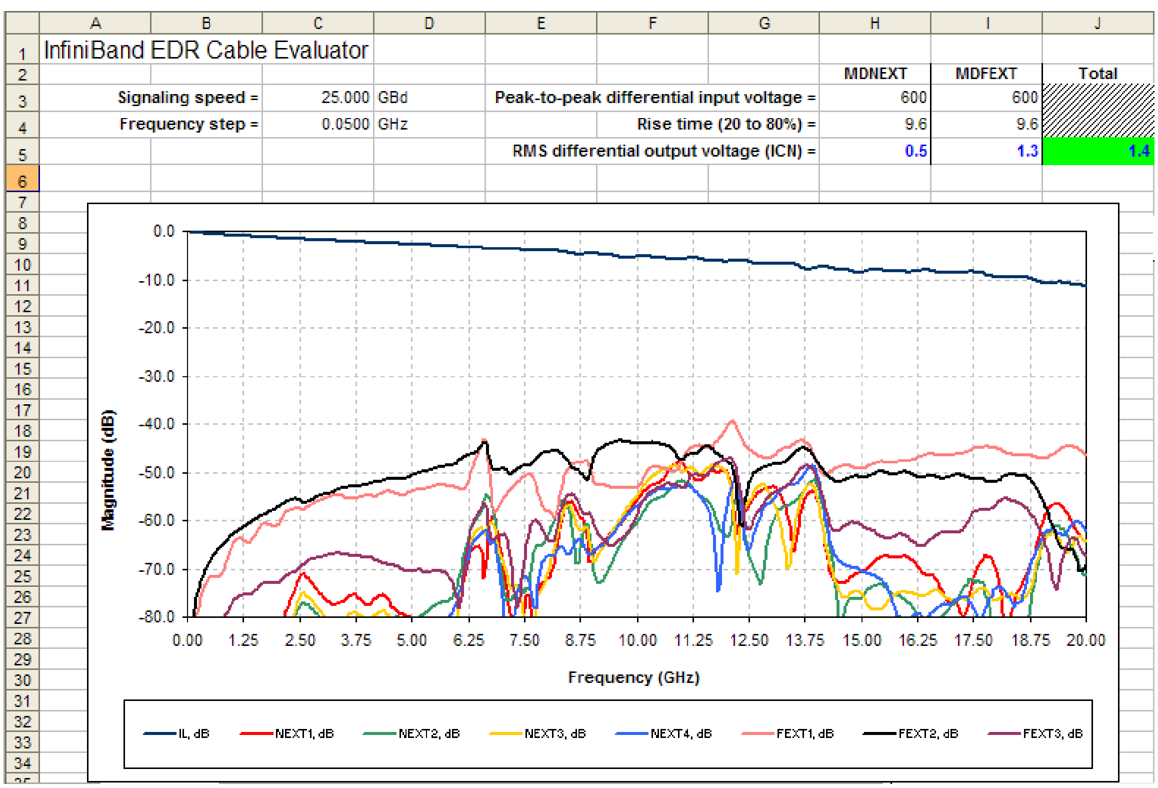

Figure 33 – Integrated Crosstalk Noise: 1.4mV rms

MODEL RESULTS – EYE DIAGRAMS

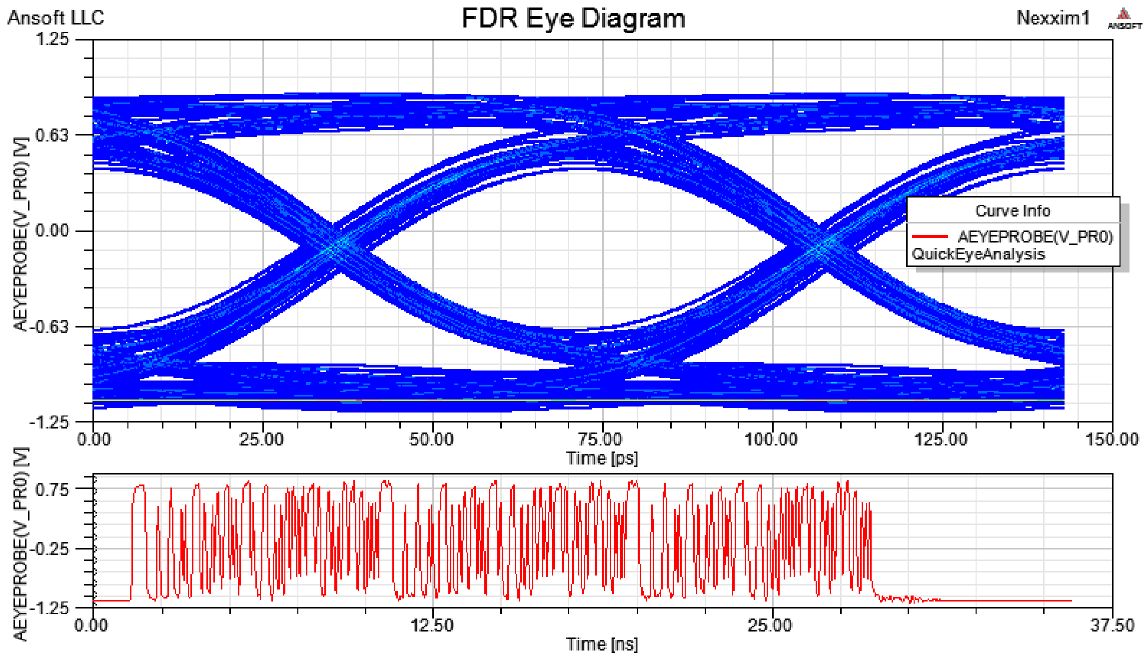

Figure 34 - PRBS7, Vin = 1Vp-p, 14Gbps, Eye Diagram without FFE (Tx1 channel simulated)

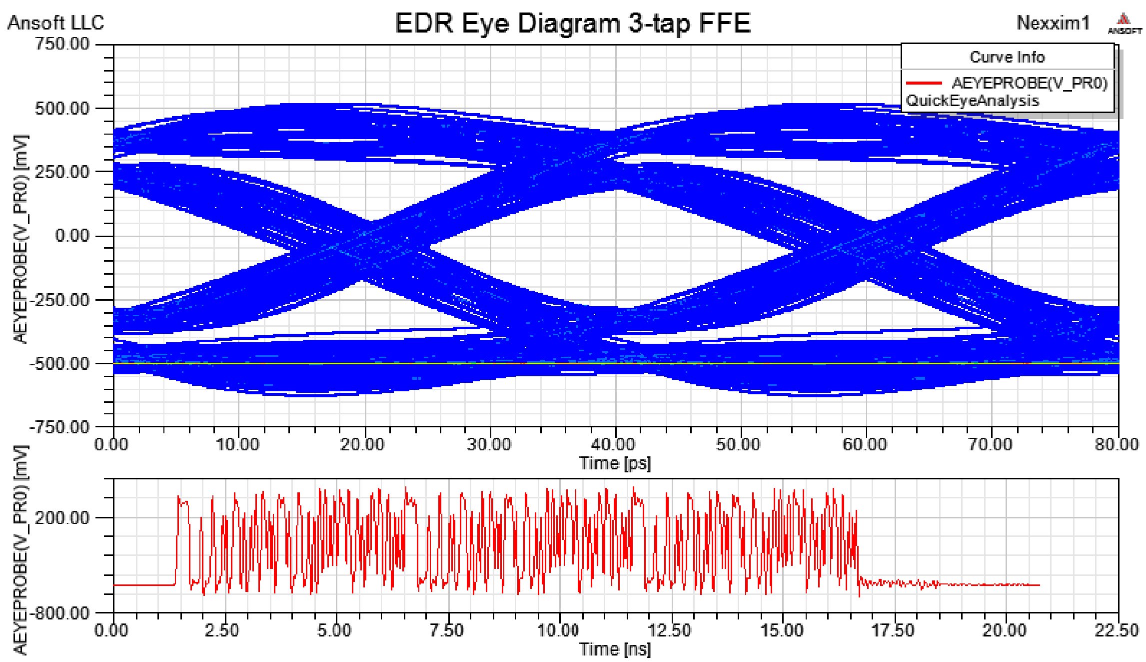

Figure 35- PRBS7, Vin = 1Vp-p, 25Gbps, Eye Diagram with 3-tap FFE

COMPLETE CABLE ASSEMBLY MODEL

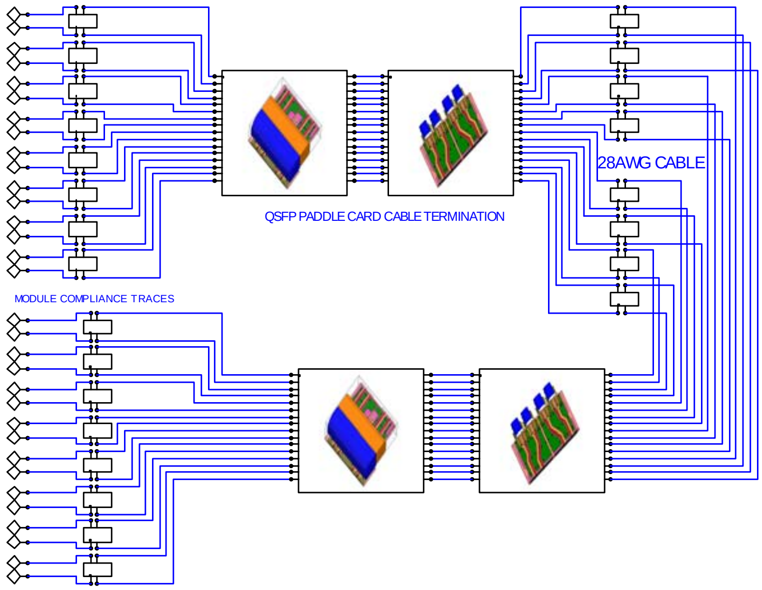

Figure 36 - Simulated 1m 28AWG EXF QSFP+ Cable Assembly and 1m 28AWG EXD QSFP+ Cable Assembly

Table 2- Port Assignment for Model

Port 1	Port 2	Diff1	100ohm	Comm1	25ohm	Tx1_in
Port 3	Port 4	Diff2	100ohm	Comm2	25ohm	Rx1_out
Port 5	Port 6	Diff3	100ohm	Comm3	25ohm	Tx2_in
Port 7	Port 8	Diff4	100ohm	Comm4	25ohm	Rx2_out
Port 9	Port 10	Diff5	100ohm	Comm5	25ohm	Tx3_in
Port 11	Port 12	Diff6	100ohm	Comm6	25ohm	Rx3_out
Port 13	Port 14	Diff7	100ohm	Comm7	25ohm	Tx4_in
Port 15	Port 16	Diff8	100ohm	Comm8	25ohm	Rx4_out
Port 17	Port 18	Diff9	100ohm	Comm9	25ohm	Rx2_in
Port 19	Port 20	Diff10	100ohm	Comm10	25ohm	Tx2_out
Port 21	Port 22	Diff11	100ohm	Comm11	25ohm	Rx4_in
Port 23	Port 24	Diff12	100ohm	Comm12	25ohm	Tx4_out
Port 25	Port 26	Diff13	100ohm	Comm13	25ohm	Rx1_in
Port 27	Port 28	Diff14	100ohm	Comm14	25ohm	Tx1_out
Port 29	Port 30	Diff15	100ohm	Comm15	25ohm	Rx3_in
Port 31	Port 32	Diff16	100ohm	Comm16	25ohm	Tx3_out

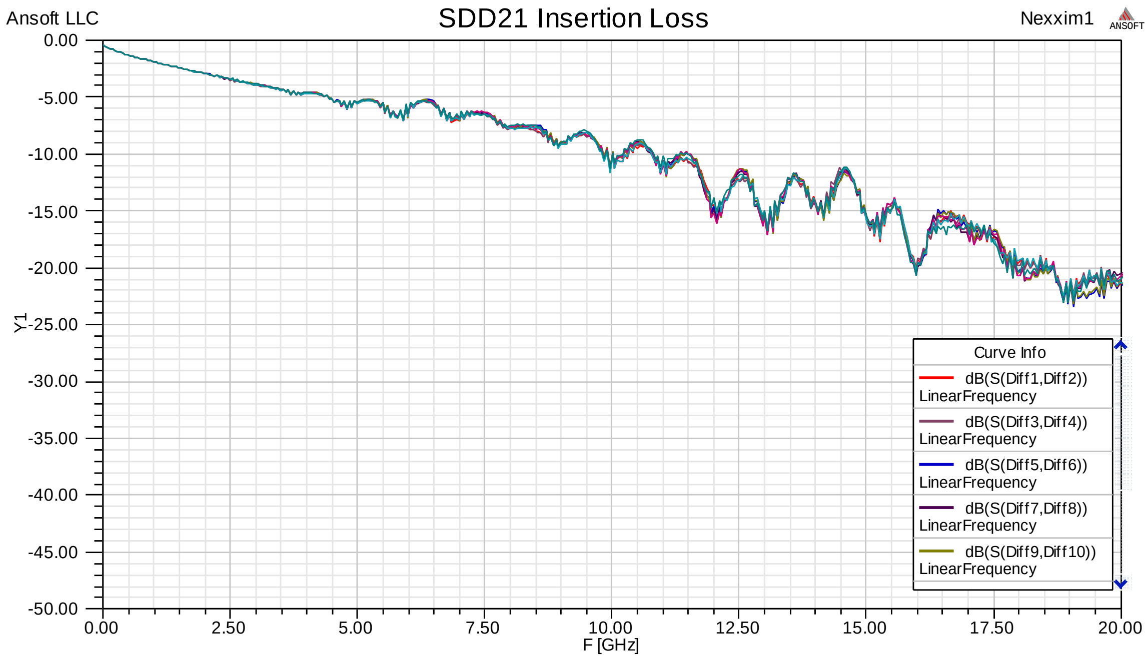

Figure 43 - Insertion Loss – 1m 28AWG EXD

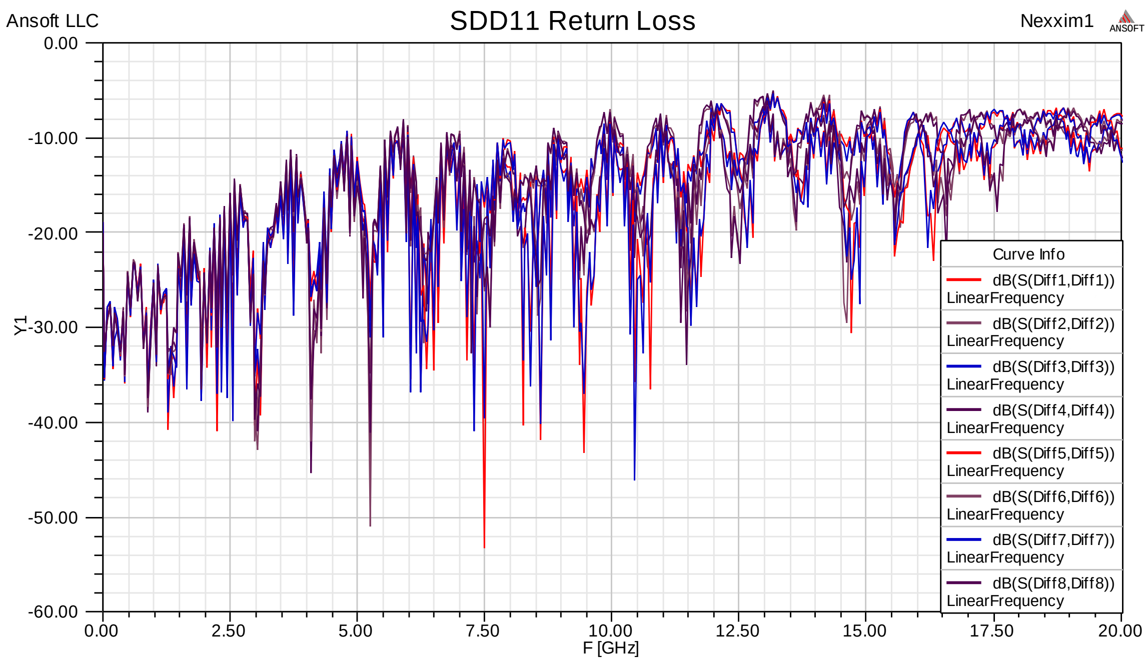

Figure 44 - Return Loss – 1m 28AWG EXD

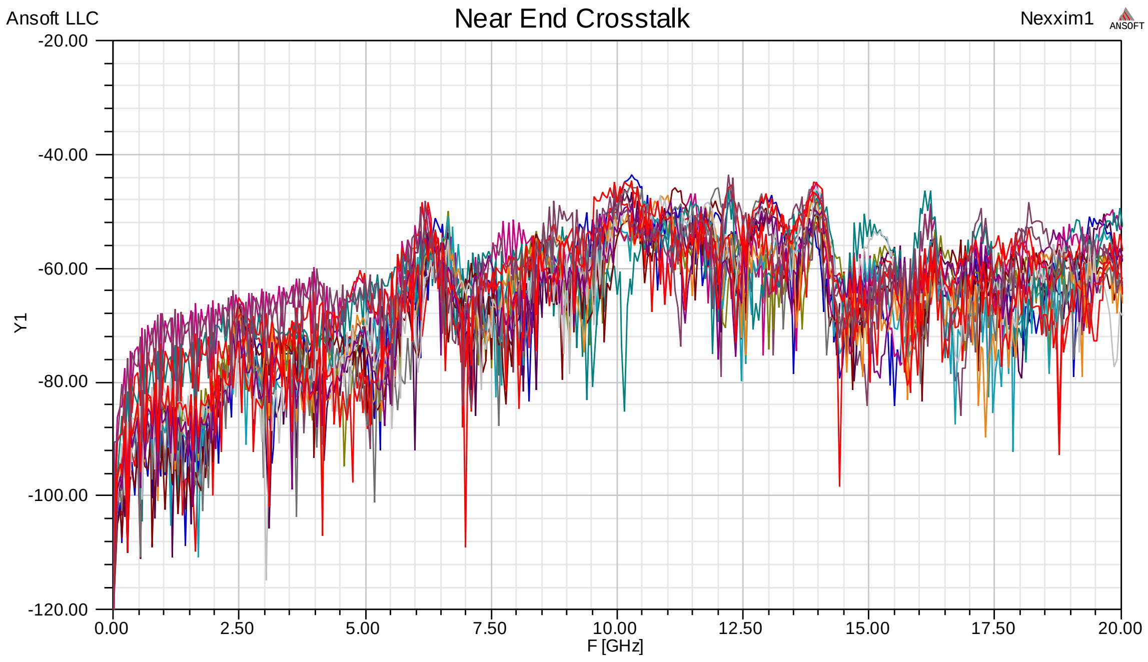

Figure 45 - Near End Crosstalk – 1m 28AWG EXD

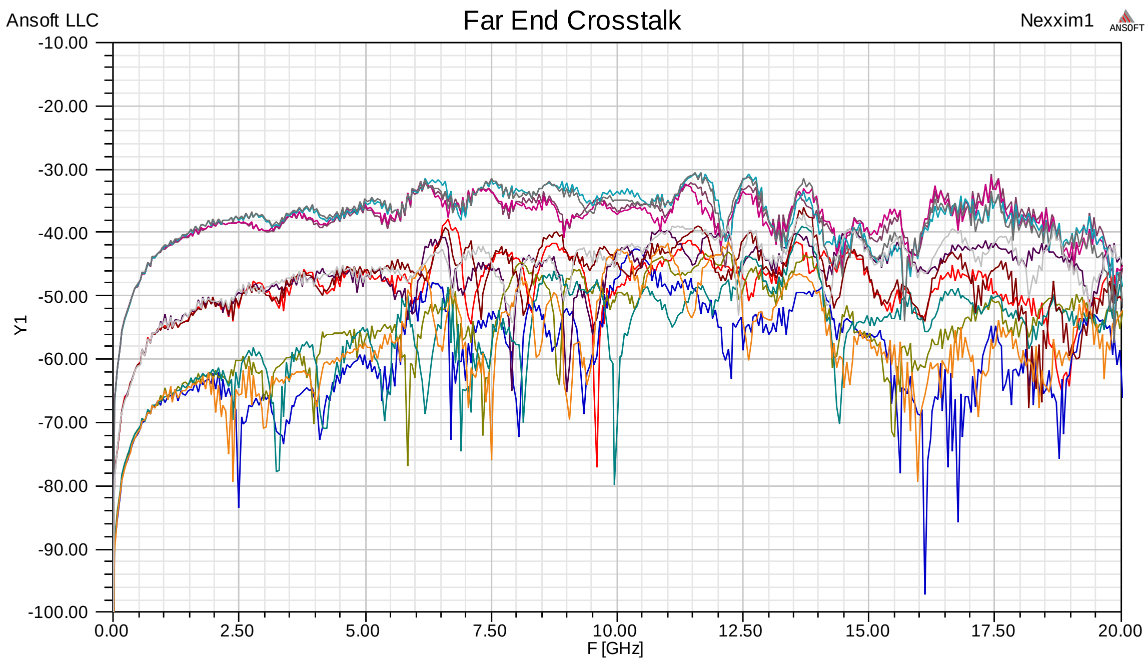

Figure 46 - Far End Crosstalk– 1m 28AWG EXD

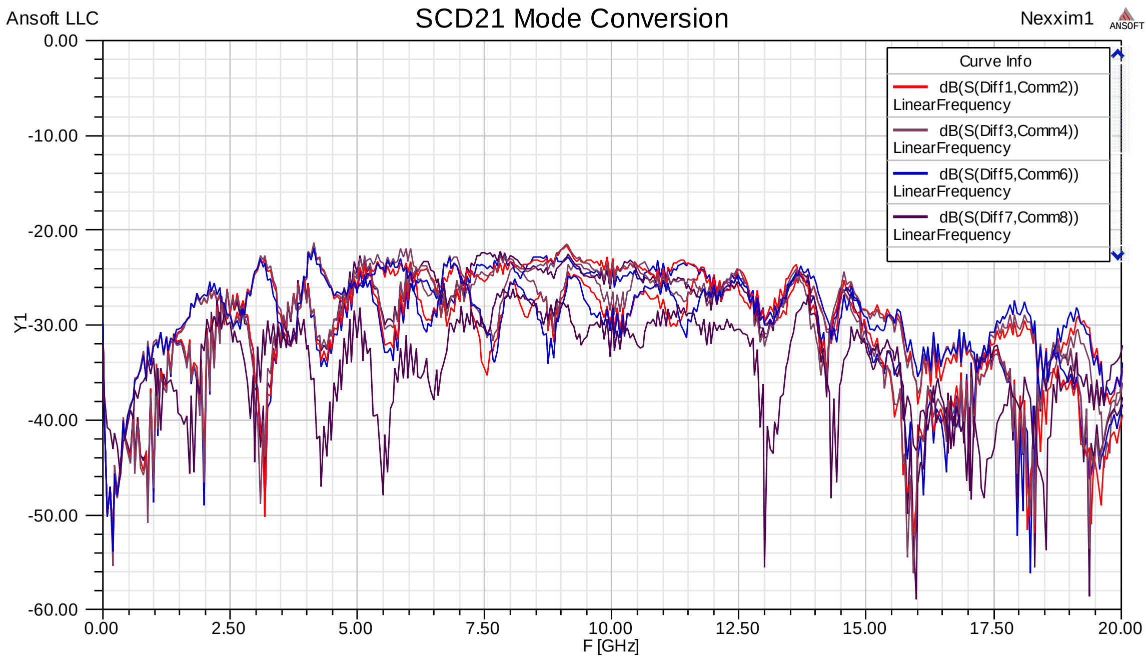

Figure 47 - Mode Conversion– 1m 28AWG EXD

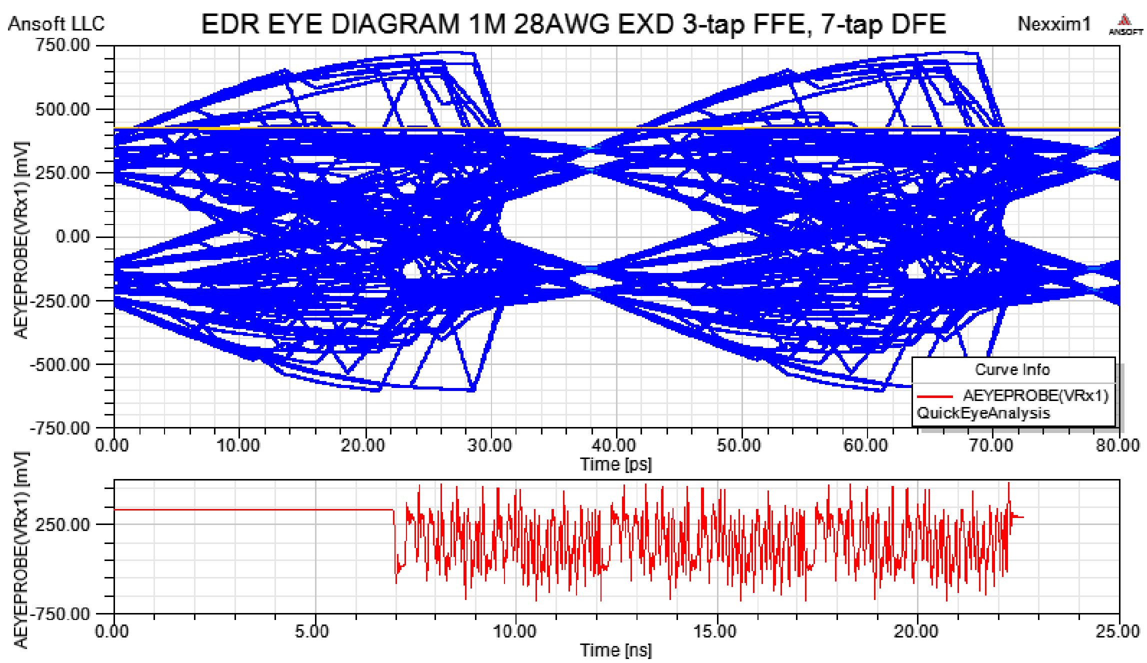

Figure 48 – Eye Diagram, 25Gbps, PRBS7, 1Vp-p

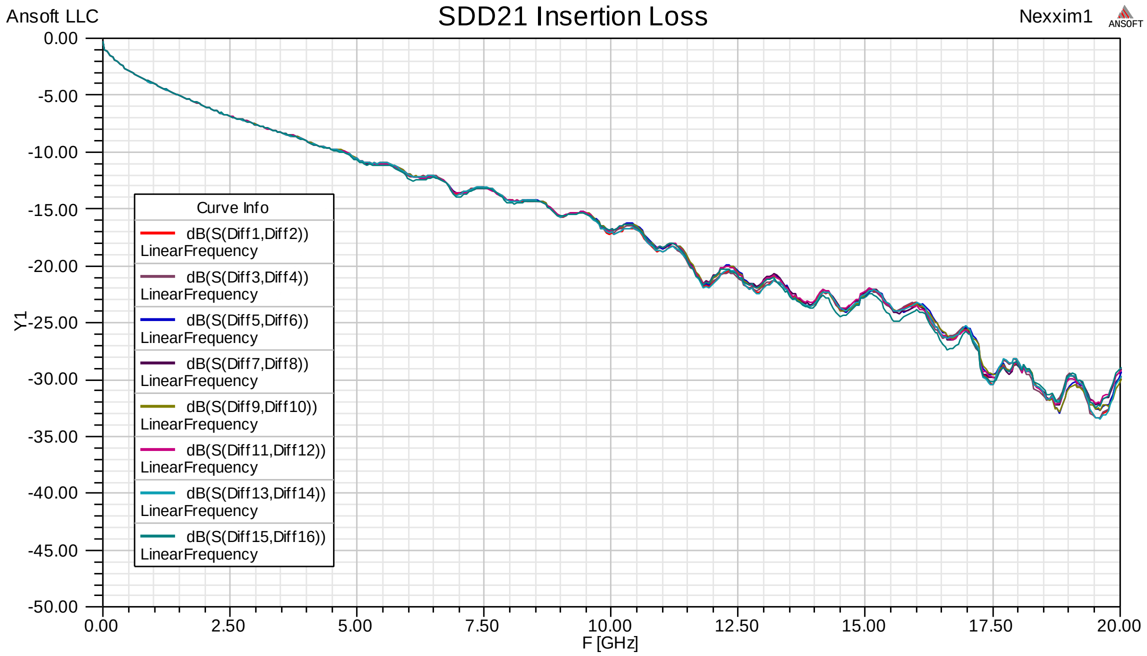

Figure 49 - Insertion Loss – 3m 28AWG EXD

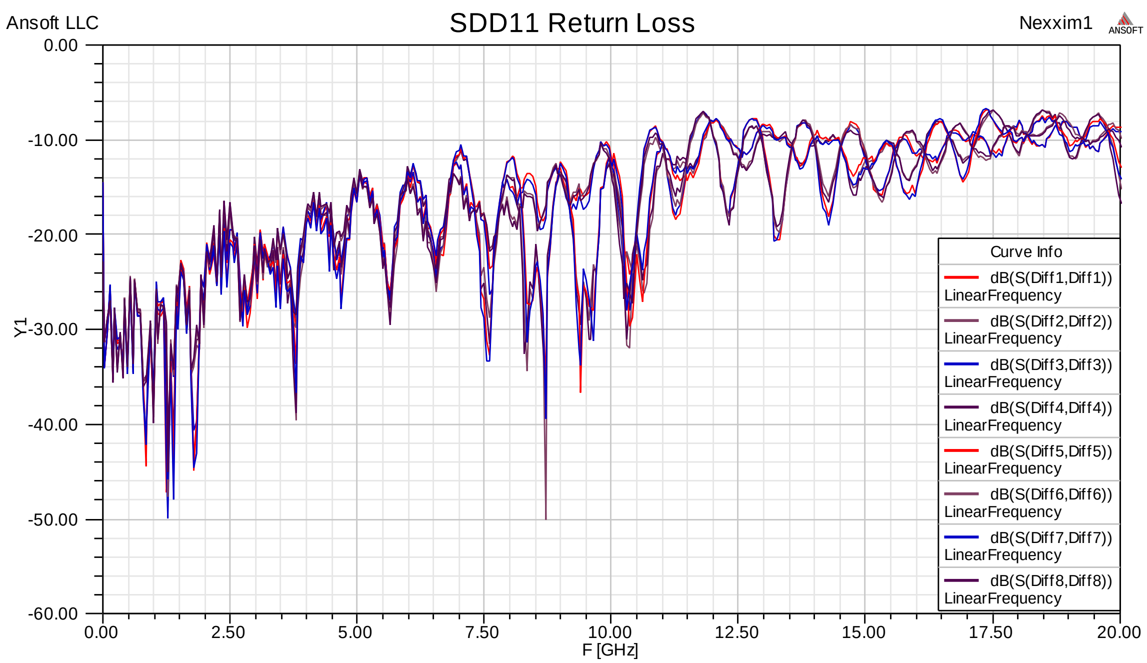

Figure 50 - Return Loss – 3m 28AWG EXD

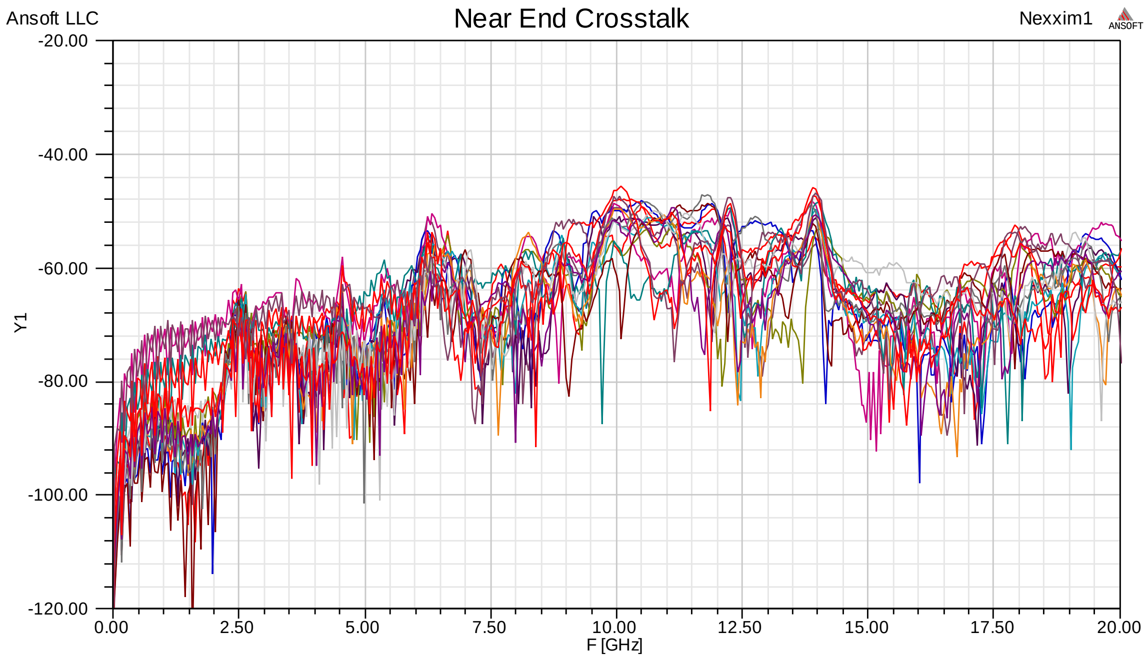

Figure 51 - Near End Crosstalk – 3m 28AWG EXD

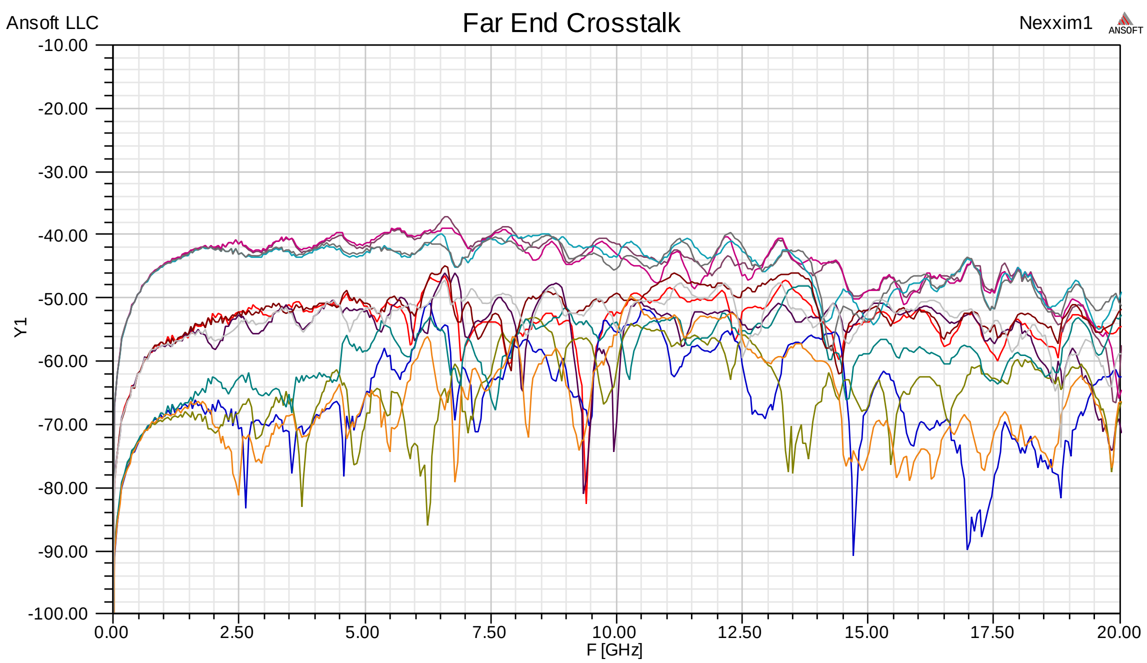

Figure 52 - Far End Crosstalk– 3m 28AWG EXD

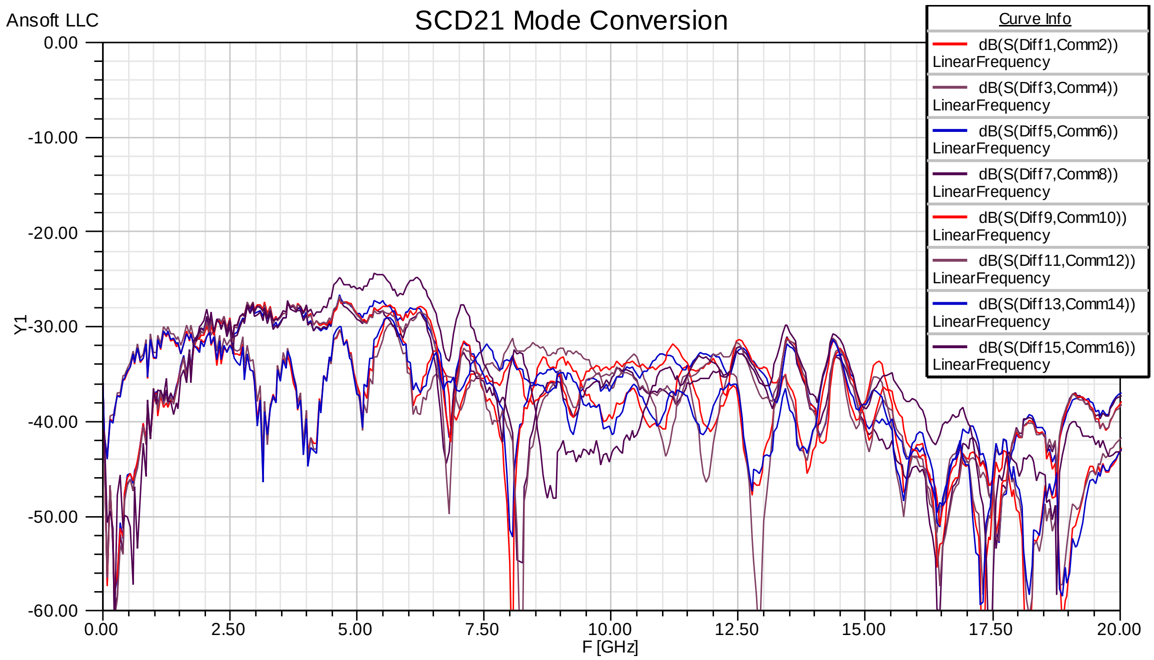

Figure 53 - Mode Conversion– 3m 28AWG EXD