



**Measurement Results of
3m 30AWG QSFP-to-4SFP Splitter Cable
for Technical Feasibility of 25Gbps/lane
Ethernet**

09/2014

Erdem Matoglu

erdem.matoglu@amphenol-tcs.com

[matoglu_25GE_01_0914.pdf](#)

Draft Objectives from 09/02/2014 AdHoc Meeting (nowell_090214_25GE_adhoc)

This presentation is to support the Twin-ax objectives discussed in the AdHoc meetings

Draft Objectives (Strong Consensus)

Backplane

- Define a single-lane 25 Gb/s PHY for operation over a printed circuit board backplane consistent with channels specified in IEEE Std 802.3bj-2014 Clause 93

Twin-ax options

- A. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m
- B. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m that re-uses the host board silicon transmitter and receiver characteristics specified in IEEE Std 802.3bj-2014 Annex 92A
- C. Define a single-lane 25 Gb/s PHY for operation over copper twin-axial cable consistent with the overall channel budget specified in IEEE Std 802.3bj-2014 Clause 92

Technical Feasibility from 08/28/2014 AdHoc Meeting (nowell_082814_25GE_adhoc)

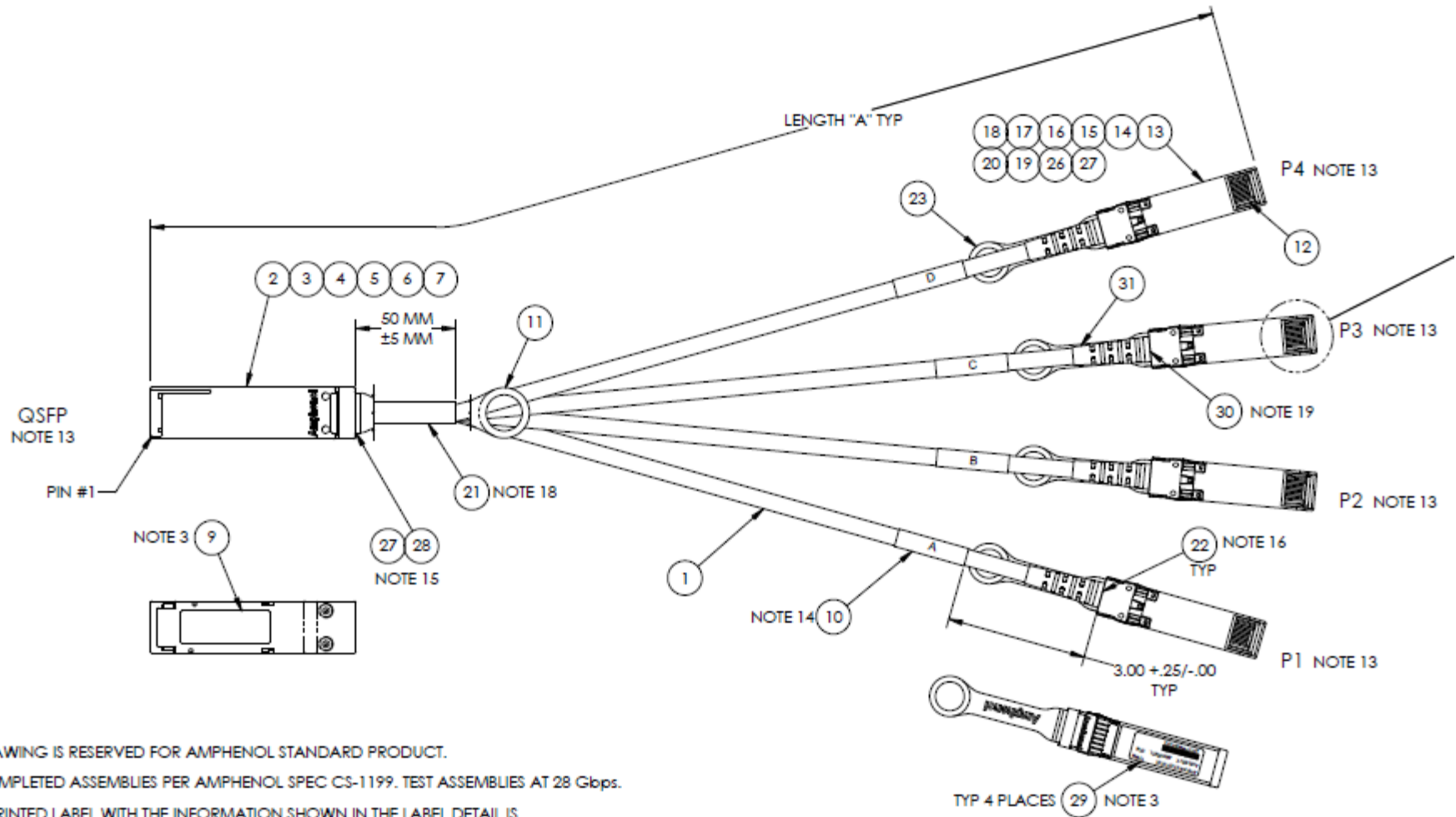
This existing 802.bj 100GBASE-CR4 technology and know-how has been applied to the design and measurement of the QSFP-4SFP splitter cable.

Technical Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

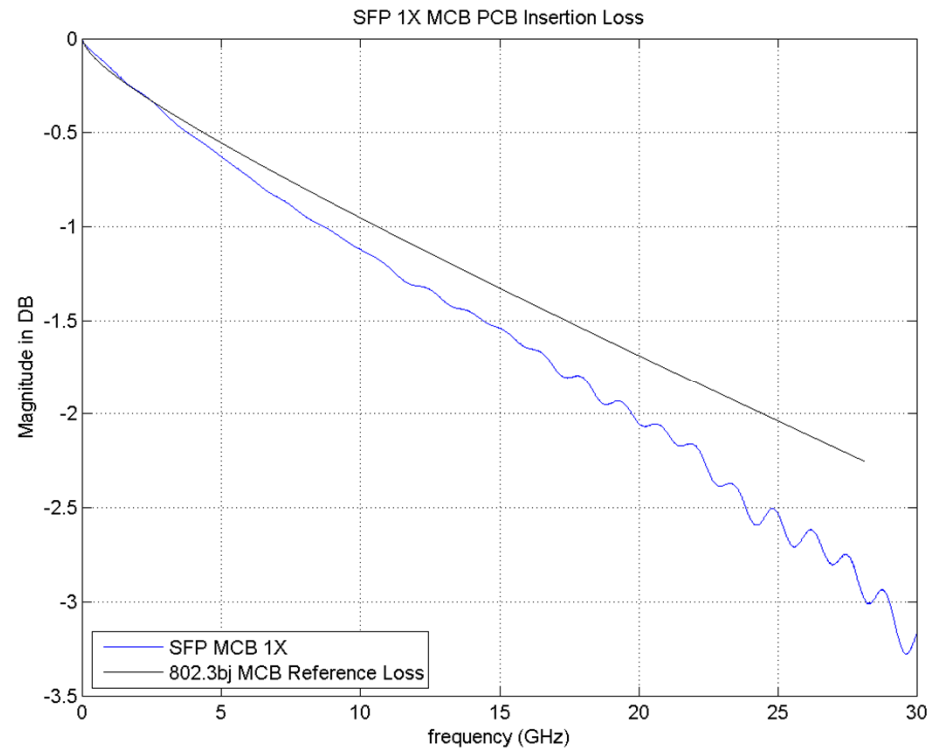
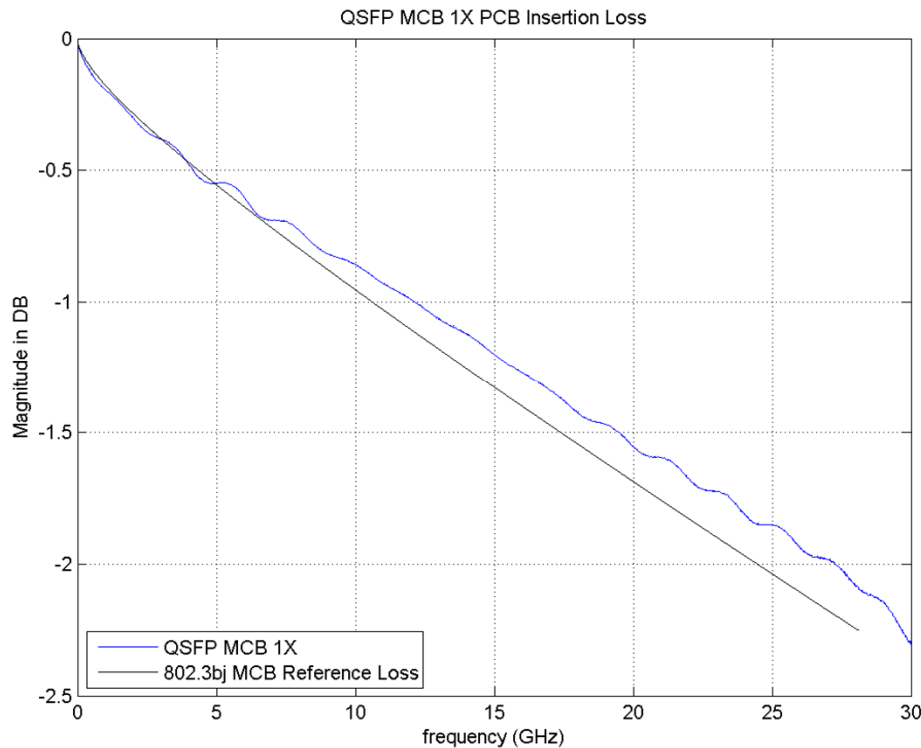
- a) Demonstrated system feasibility.
 - b) Proven similar technology via testing, modeling, simulation, etc.
 - c) Confidence in reliability.
- Systems based upon 25 Gb/s technology have been demonstrated and deployed in operational networks.
 - The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.
 - Component technology at 25Gb/s, developed for other Ethernet standard (IEEE Std 802.3bj) and project (IEEE P802.3bm), are available and in production.
 - The reliability of Ethernet components and systems has been established in the target environments with a high degree of confidence.

3m 30AWG QSFP-4SFP Splitter Cable



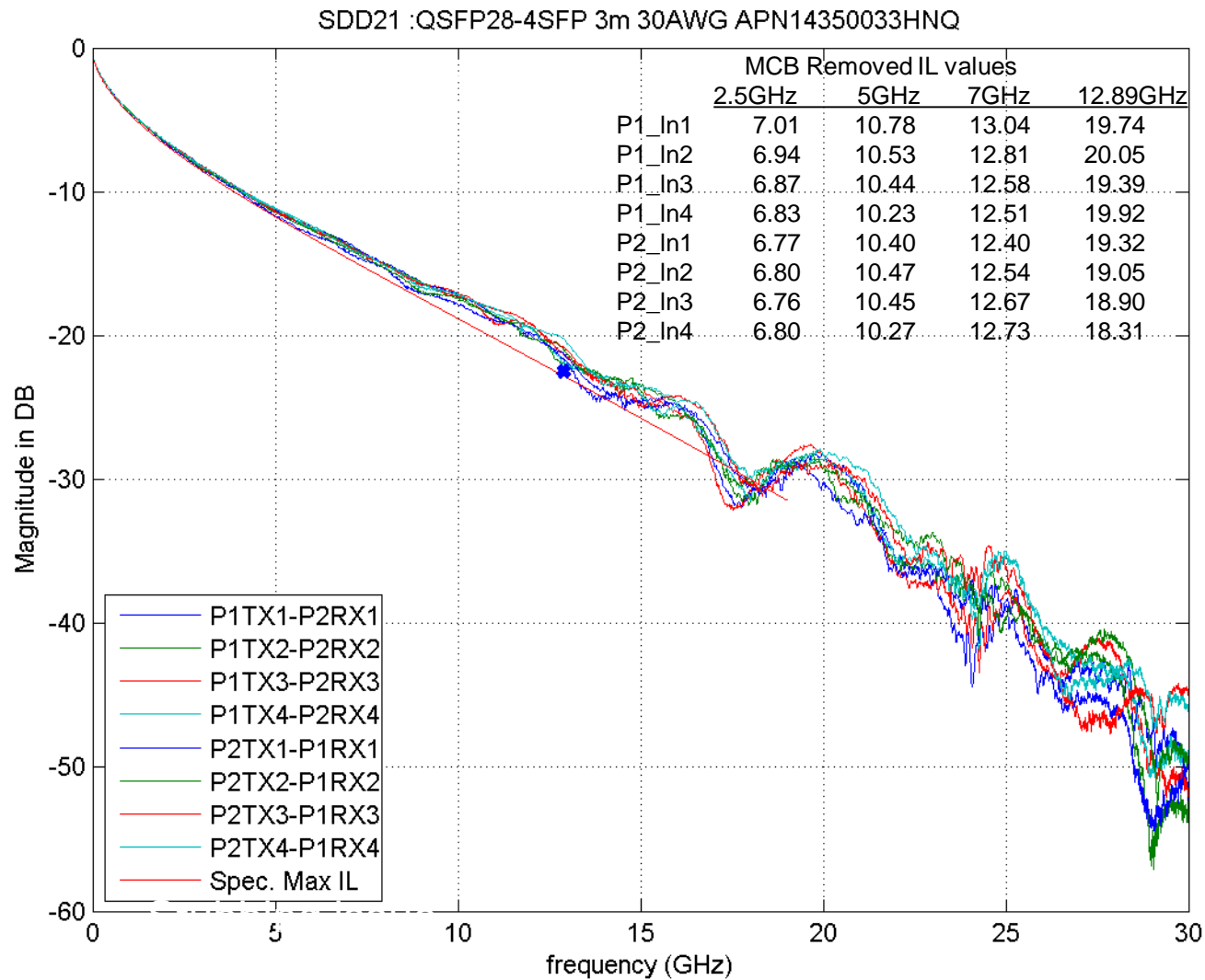
1. THIS DRAWING IS RESERVED FOR AMPHENOL STANDARD PRODUCT.
2. TEST COMPLETED ASSEMBLIES PER AMPHENOL SPEC CS-1199. TEST ASSEMBLIES AT 28 Gbps.
3. A PRE-PRINTED LABEL WITH THE INFORMATION SHOWN IN THE LABEL DETAIL IS POSITIONED WITHIN THE INDICATED AREA ON THE CABLE ASSEMBLY.

Measurement Test Card Losses for the QSFP and SFP plugs



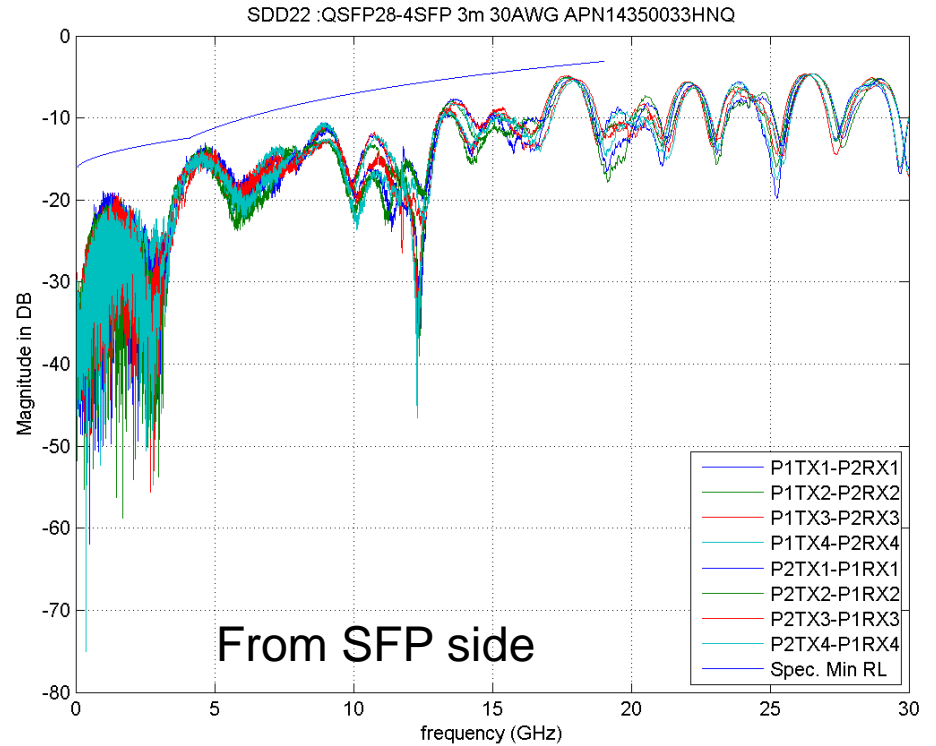
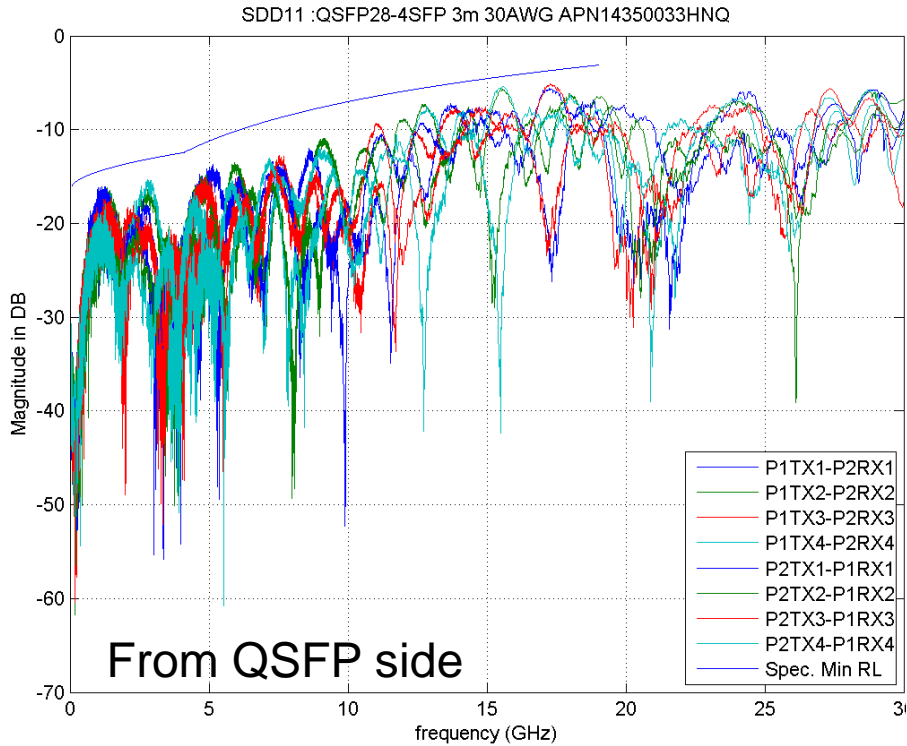
Total test card measurement loss is slightly higher (~0.2dB) than 802.3bj reference.
The 802.3bj 100G-CR-4 limits are not adjusted.
All measurements include the test card losses.

3m 30AWG QSFP-4SFP Splitter Cable Insertion Loss



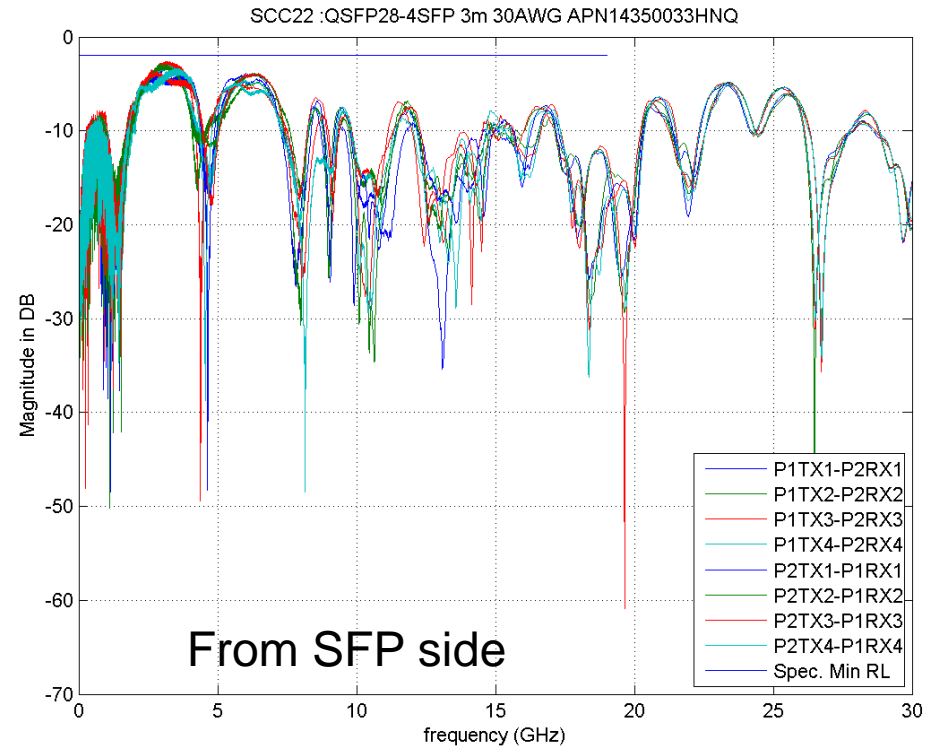
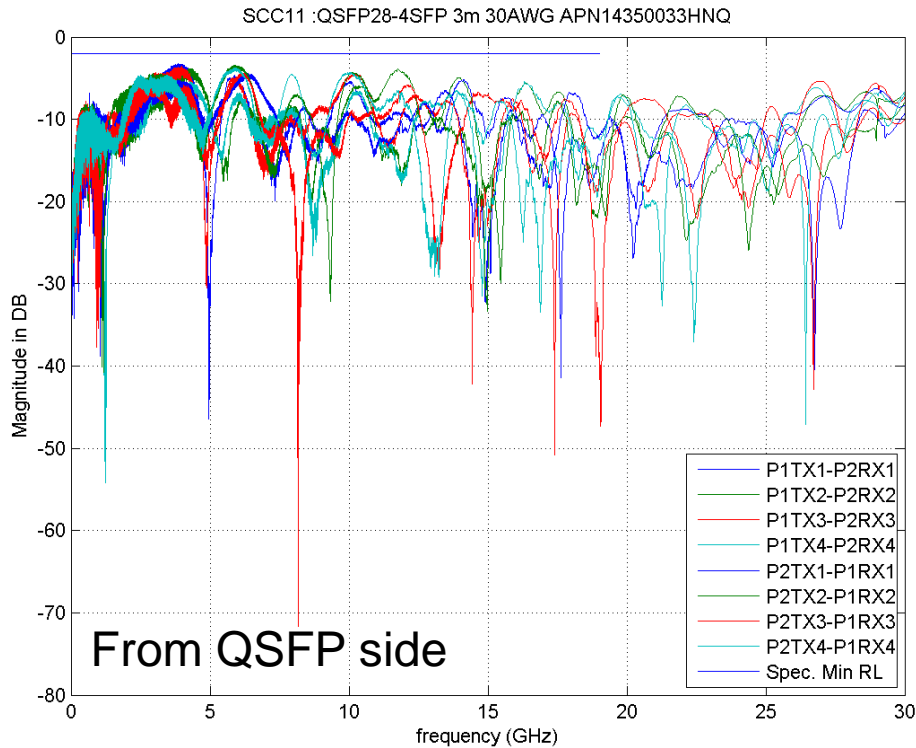
All measurements include the test fixture losses
 Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable Differential Return Loss



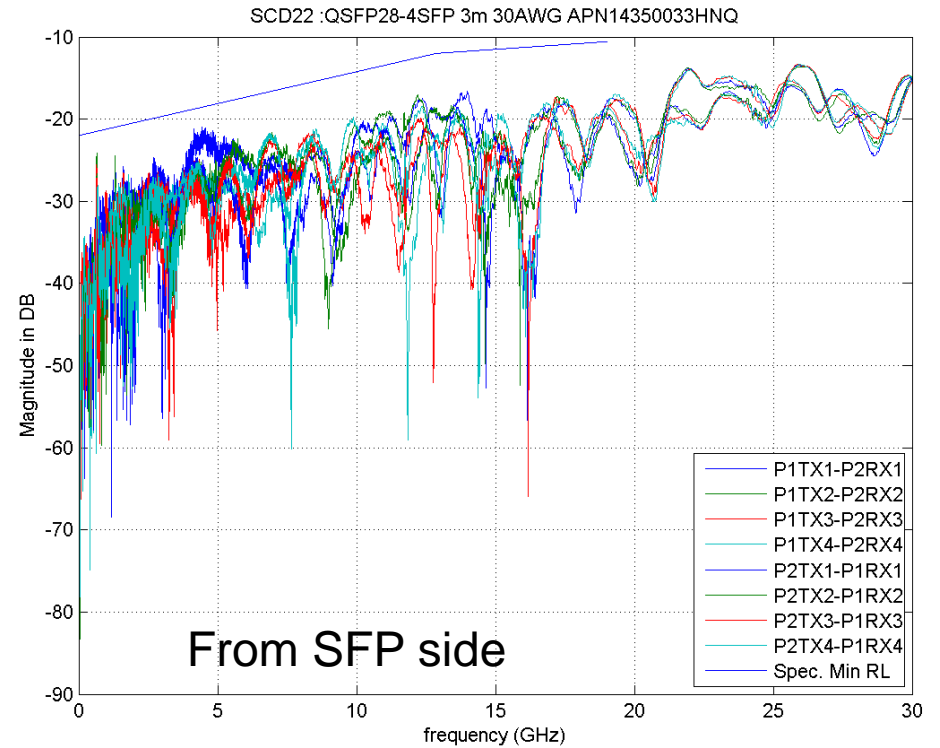
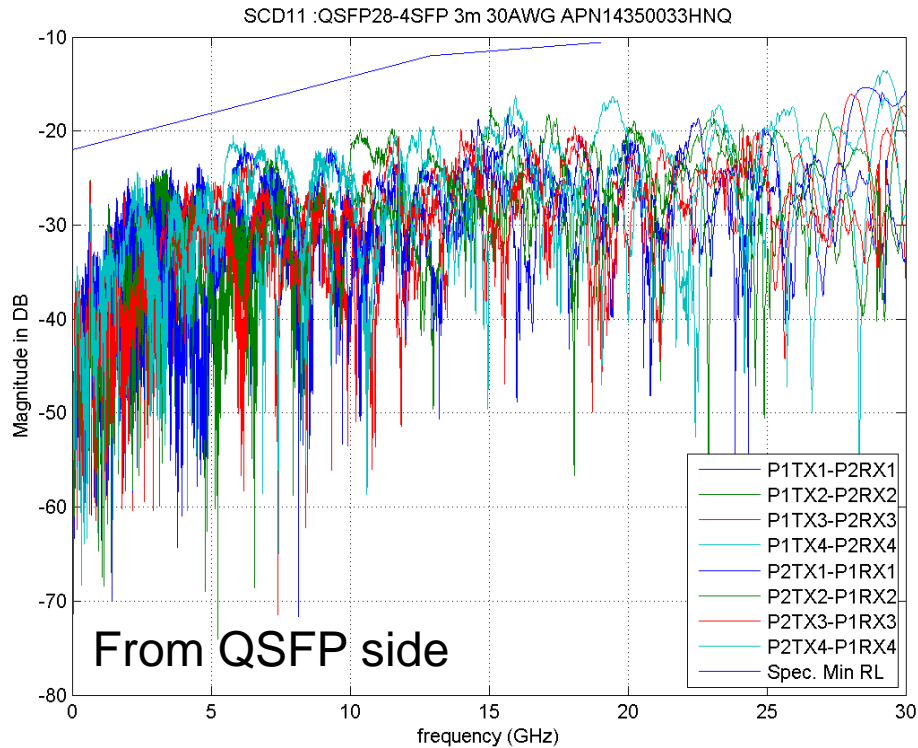
All measurements include the test fixture losses
Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable Common-Mode Return Loss



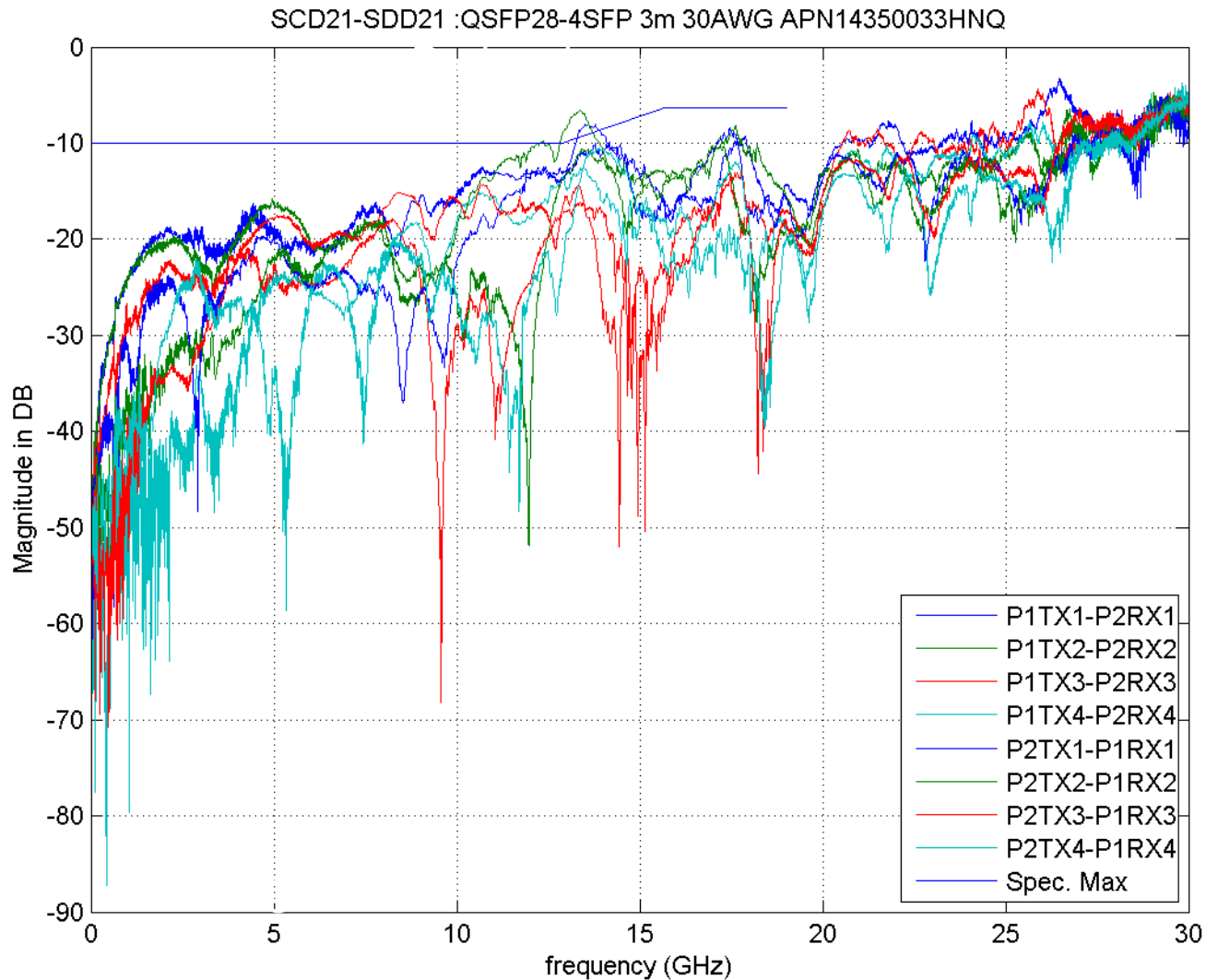
All measurements include the test fixture losses
Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable Differential-to-Common Return Loss



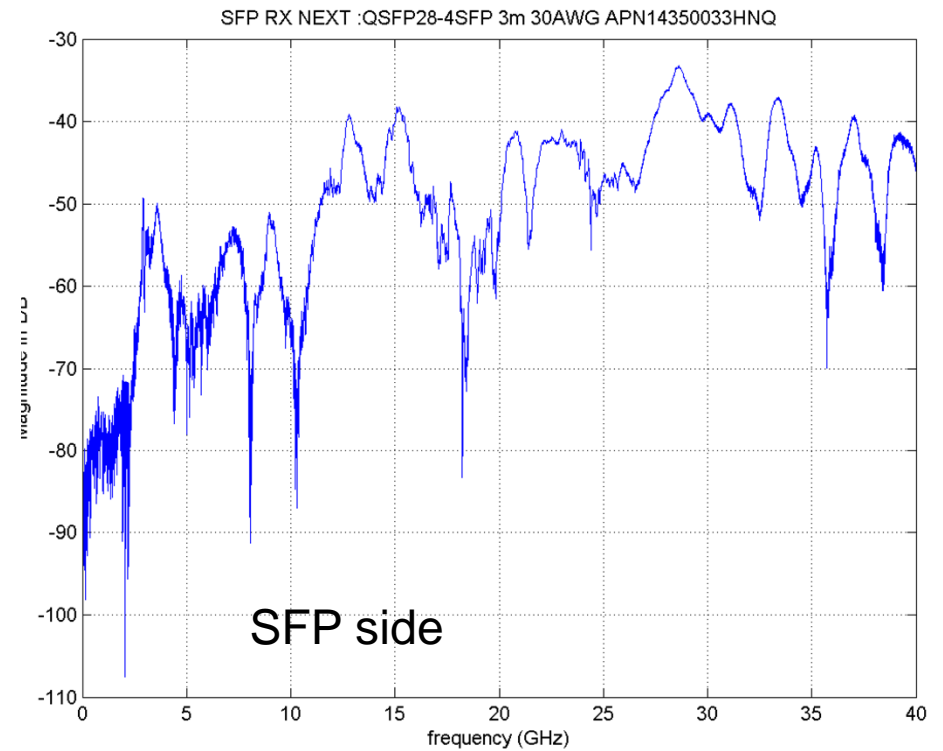
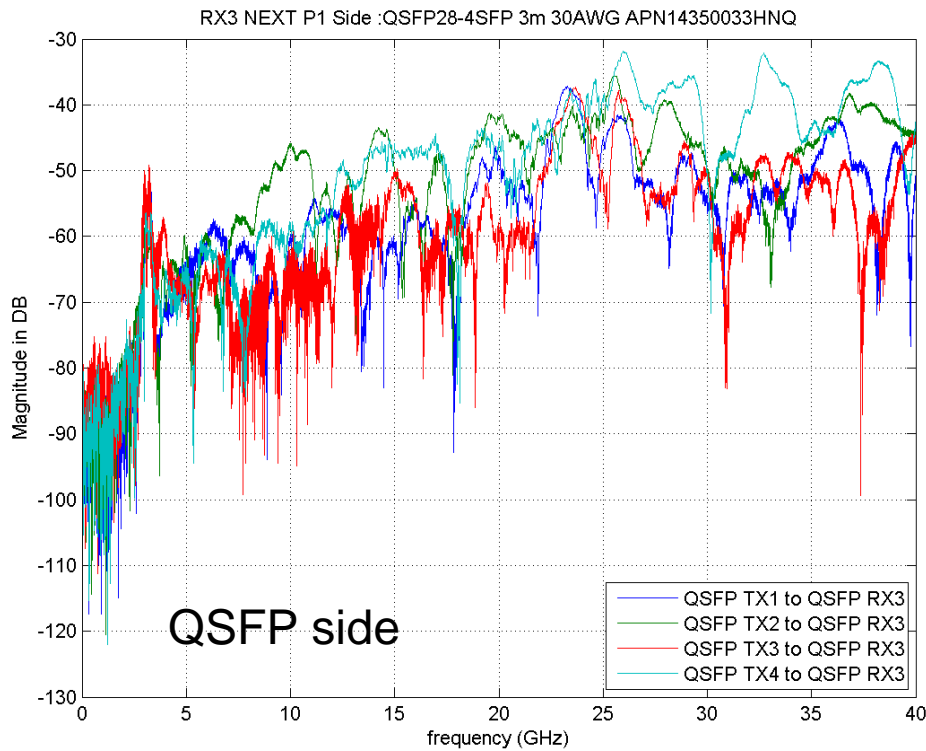
All measurements include the test fixture losses
Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable Differential to Common Insertion Loss Adjusted



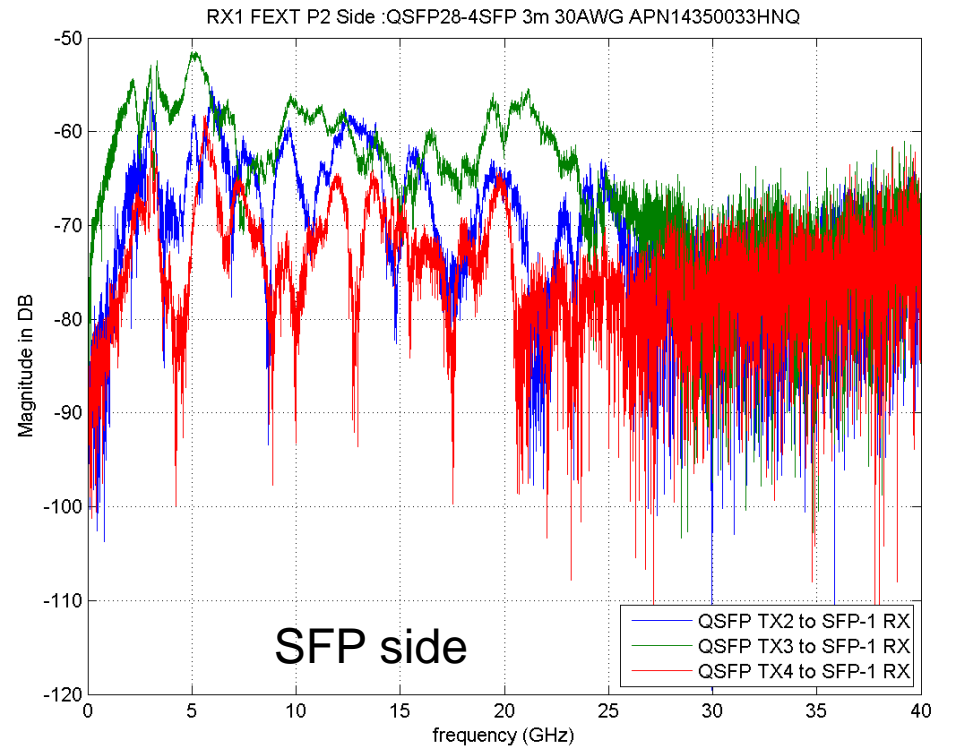
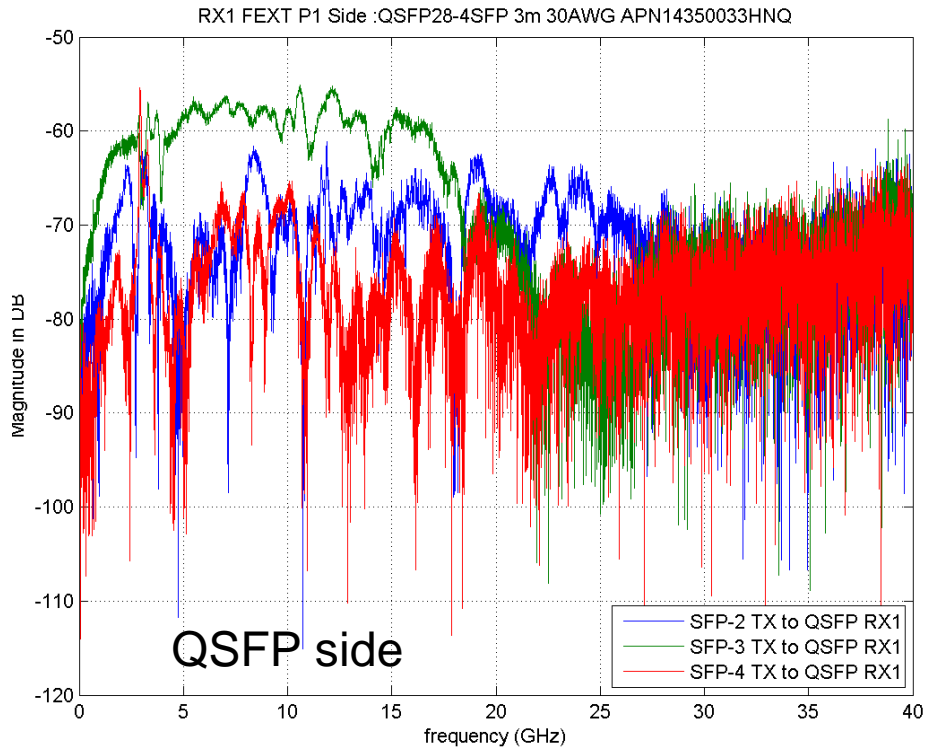
All measurements include the test fixture losses
Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable Near-End Crosstalk



All measurements include the test fixture losses
Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable Far-End Crosstalk



All measurements include the test fixture losses
Specification limits are from 802.3bj 100GBASE CR-4 Clause 92

3m 30AWG QSFP-4SFP Splitter Cable COM

COM is computed per IEEE802.3bj Section 92.10.7 with parameters and Test1 & Test 2 specified in Table 93-8. The specification requirement is minimum 3dB

Table 93A-1 parameters				I/O control			Table 93A-3 parameters		
Parameter	Setting	Units	Information				Parameter	Setting	Units
f_b	25.78125	GBd		DIAGNOSTICS	0	logical	package_tl_gamma0_a1_a2	[0 1.734e-3 1.455e-4]	
f_min	0.05	GHz		DISPLAY_WINDOW	0	logical	package_tl_tau	6.141E-03	ns/mm
Delta_f	0.005	GHz		Display frequency domain	0	logical	package_Z_c	78.2	Ohm
C_d	[2.5e-4 2.5e-4]	nF	[TX RX]	CSV_REPORT	1	logical			
z_p select	[1 2]		[test cases to run]	SAVE_FIGURE_to_CSV	0	logical			
z_p (TX)	[12 30]	mm	[test cases]	RESULT_DIR	.\test_results_C92\				
z_p (NEXT)	[12 12]	mm	[test cases]	SAVE_FIGURES	0	logical			
z_p (FEXT)	[12 30]	mm	[test cases]	Port Order	[1 3 4 2]				
z_p (RX)	[12 30]	mm	[test cases]	Receiver testing			Table 92-12 parameters		
C_p	[1.8e-4 1.8e-4]	nF	[TX RX]	RX_CALIBRATION	0	logical	board_tl_gamma0_a1_a2	[0 4.114e-4 2.547e-4]	
R_0	50	Ohm		Sigma BBN step	5.00E-03	V	board_tl_tau	6.191E-03	ns/mm
R_d	[55 55]	Ohm	[TX RX]	IDEAL_TX_TERM	0	logical	board_Z_c	109.8	Ohm
f_r	0.75	*fb		T_r	8.00E-03	ns	z_bp (TX)	151	mm
c(0)	0.62		min	Non standard control options			z_bp (NEXT)	72	mm
c(-1)	[-0.18:0.02:0]		[min:step:max]	INC_PACKAGE	1	logical	z_bp (FEXT)	72	mm
c(1)	[-0.38:0.02:0]		[min:step:max]	IDEAL_RX_TERM	0	logical	z_bp (RX)	151	mm
g_DC	[-12:1:0]	dB	[min:step:max]	INCLUDE_CTLLE	1	logical			
f_z	6.4453125	GHz		INCLUDE_TX_RX_FILTER	1	logical			
f_p1	6.4453125	GHz							
f_p2	25.78125	GHz							
A_v	0.4	V							
A_fe	0.4	V							
A_ne	0.6	V							
L	2								
M	32								
N_b	14	UI							
b_max(1)	1								
b_max(2..N_b)	1								
sigma_RJ	0.01	UI							
A_DD	0.05	UI							
eta_0	5.20E-08	V ² /GHz							
SNR_TX	27	dB							
R_LM	1								
DER_0	1.00E-05								
Operational control									
COM Pass threshold	3	dB							
Include PCB	1	logical							

BER = 10⁻⁵ Assumes FEC

Lane	COM-Test1 (dB)	COM-Test2 (dB)
SFP1_RX	4.5389	3.2104
SFP2_RX	4.7614	3.5828
SFP3_RX	4.0406	2.8896
SFP4_RX	4.4002	3.223
QSFP_RX1	4.6866	3.5175
QSFP_RX2	5.0362	3.7819
QSFP_RX3	4.7765	3.5828
QSFP_RX4	5.1612	3.89

Test 1 and Test 2 differs by device package length zp
Com Test 2 models 30mm package length.
Com Test 1 models 12mm device package length