IEEE P802.3df
Channel Models for 200 Gbps/Lane AUI C2M

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Intel

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Outline

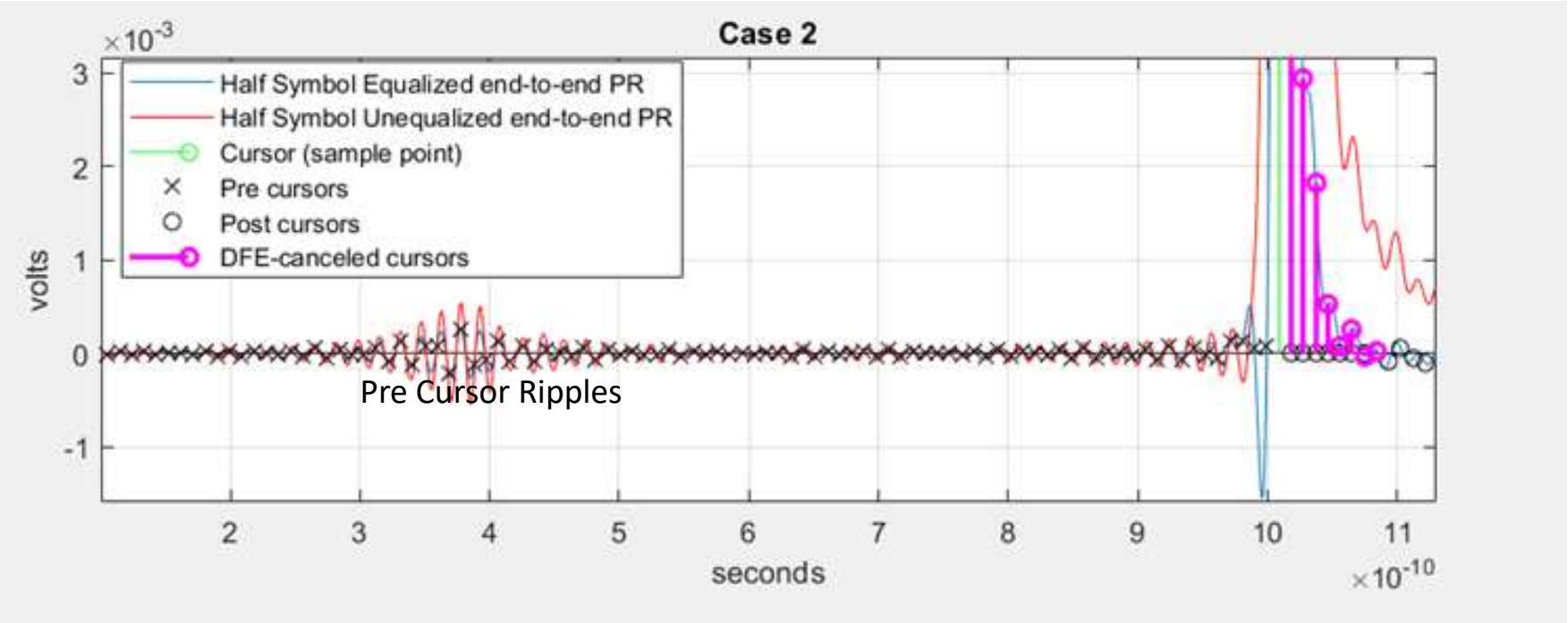
- ❑Goal
- ❑Issue
- ❑Channel Description
- ❑Channel Model Overview
- ❑Improved Board Via Model
- ❑COM Results: Prior vs. Improved Channels
- ❑Extended Channel Loss COM Results
- ❑Summary

Goals

- Improve channel quality of the original channels (akinwale_3df_01_20220502)

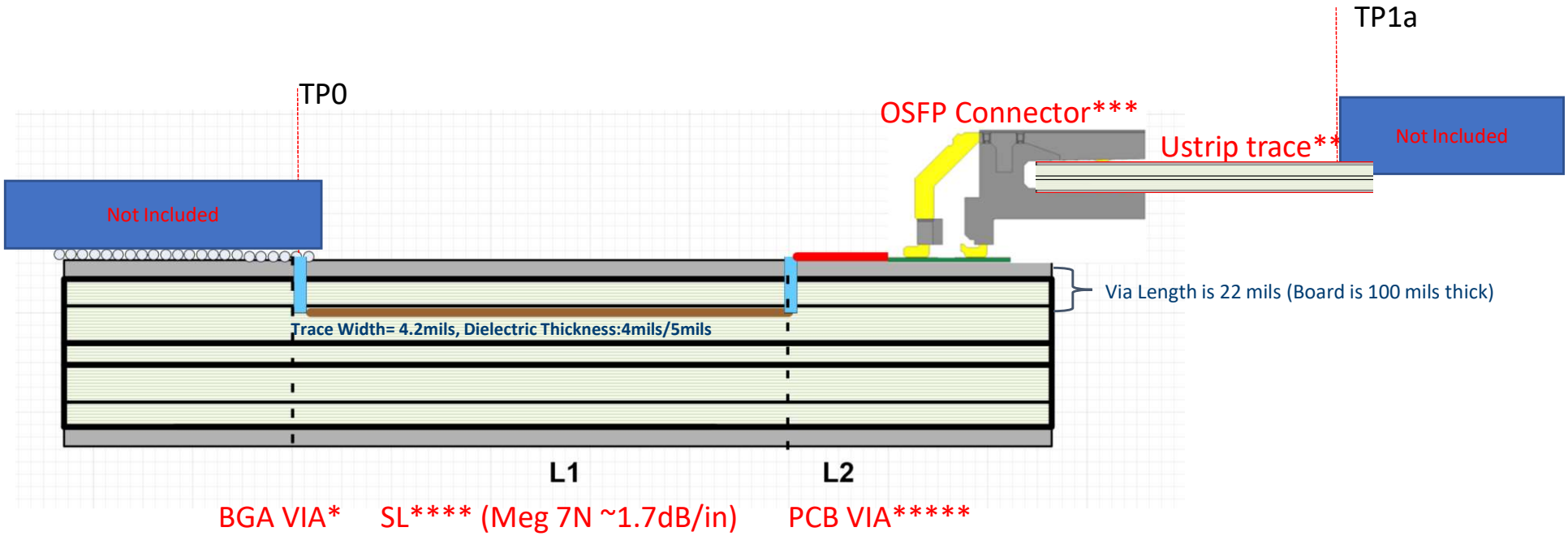
- Provide extended loss channels (up to 30dB) for AUI C2M max loss investigation

Issue: Non-Causal behavior in the pulse response



- A non-causal behavior was observed with the original channels.
- The non-causal issue has been fixed here

Channel Description



*BGA footprint included in the channel
**Module Loss is 3.5dB @ 53.125 GHz

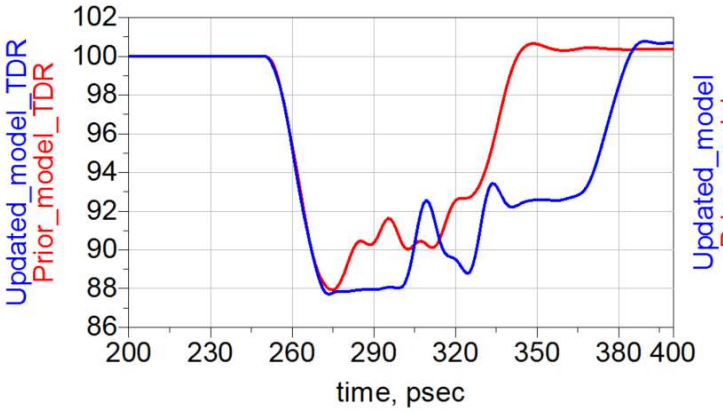
***Connector loss is 2.2dB @53.125GHz
****PCB Loss swept from ~4dB to ~24dB @53.125GHz
*****Vias are staggered uVia
*****Assumed 1 FEXT and 2 NEXT aggressors

Improved Channel Model Overview

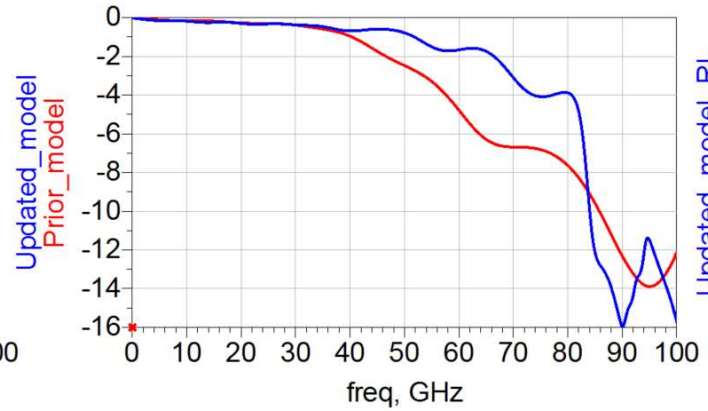
- Assumed PCB C2M Topology
  - TP0 to TP1a Loss Targets: 10dB, 11dB, 12dB, and 13dB
  - **NEW!** 14dB – 30dB
- Synthesized channel with OSFP200G Connector (a concept from Amphenol)
- PCB Trace Impedance: 85 ohms, 93 ohms, and 100 ohms
- Assumed use of staggered uVia technology.
- Transmission line loss is 1.7dB/in @ 53.125GHz
  - Skip Layer is not assumed
  - Trace Width is 4.6mils with Intra-pair spacing of 7.2mils

Improved Board Via Model Comparison

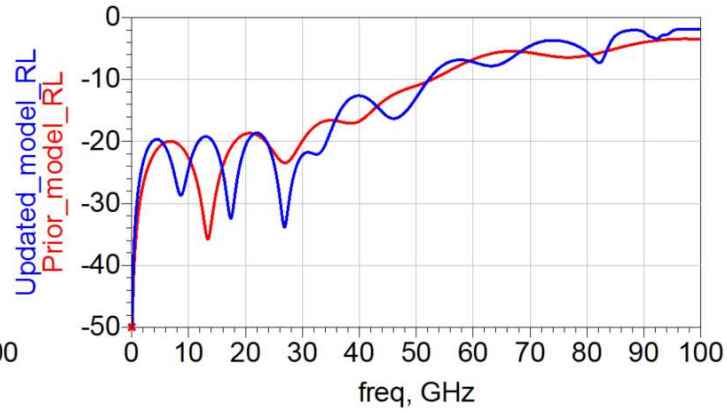
TDR: 10ps rise time



Insertion loss

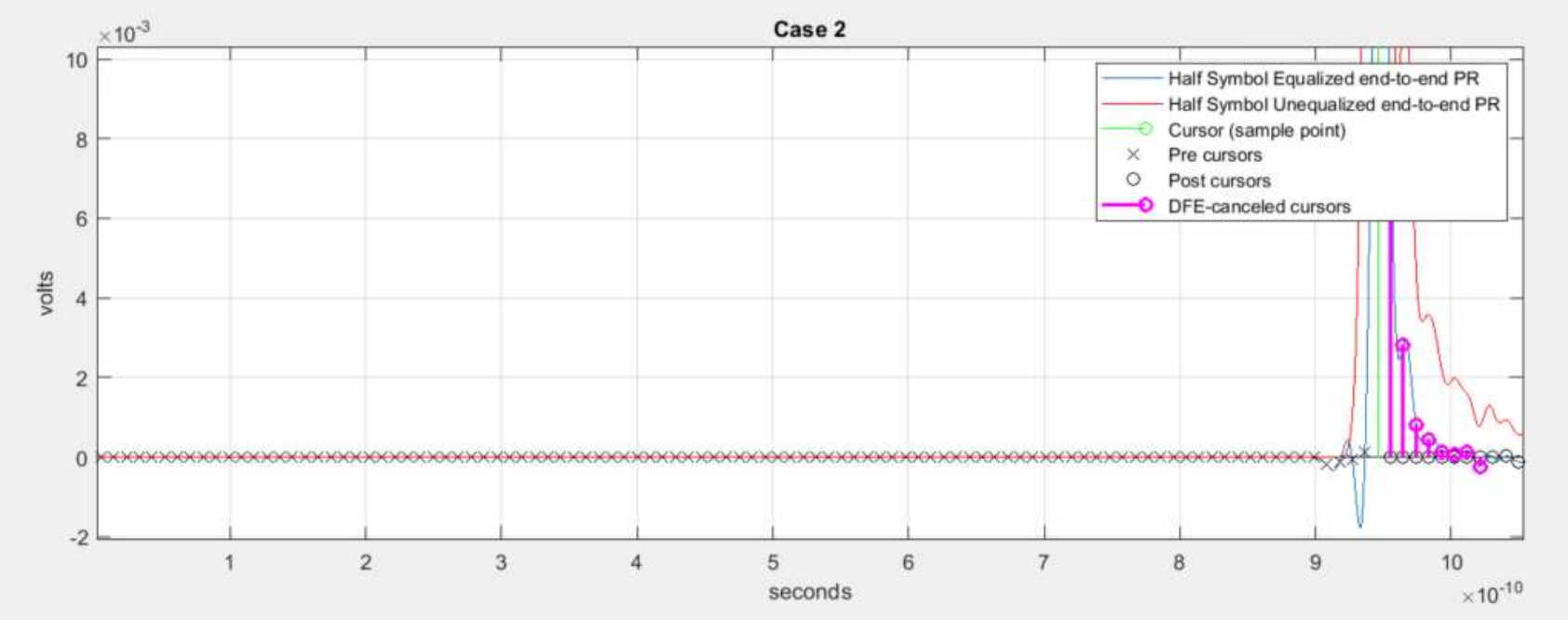


Return loss



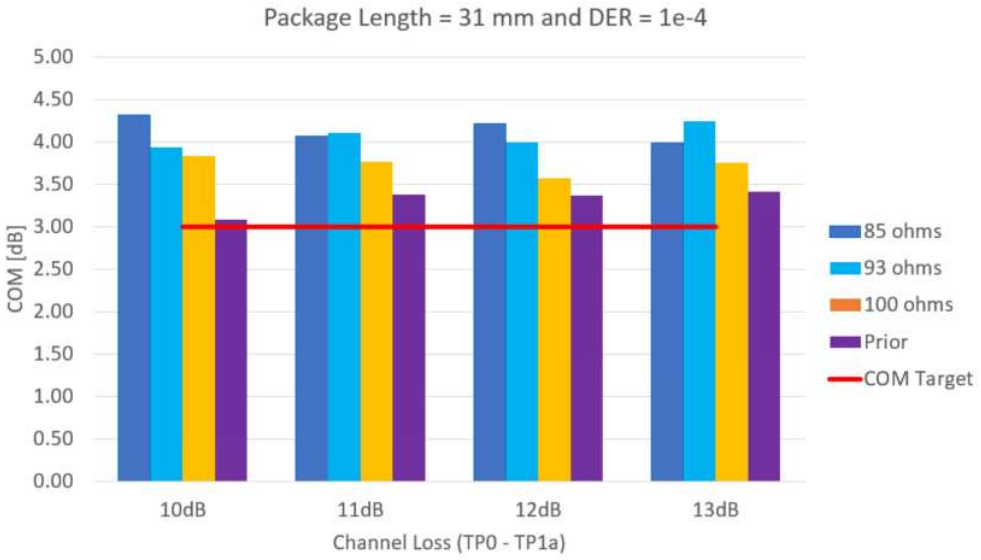
- Updated Board Via model provides about a 1-inch length improvement
- 1 inch is added to the host PCB w.r.t to prior channels

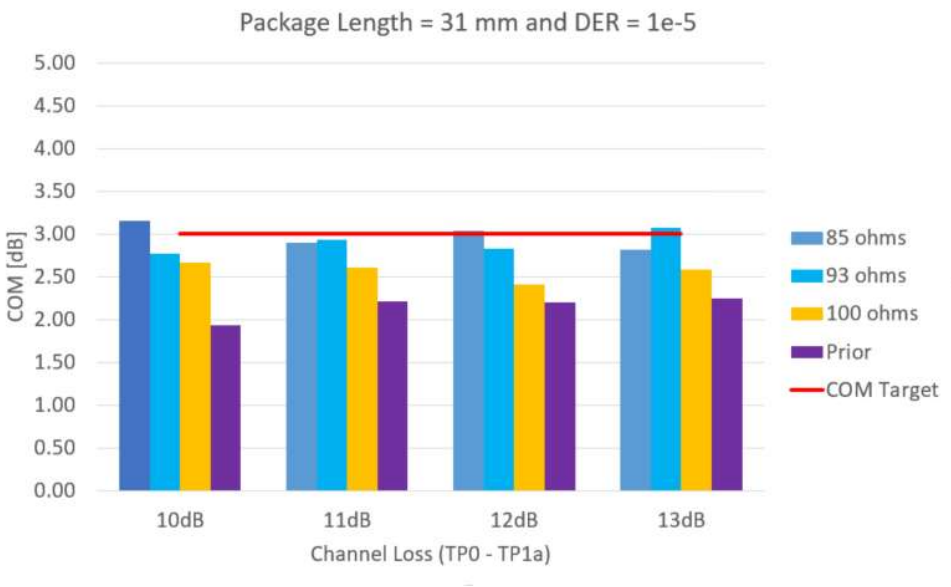
Fixed Pulse Response



The non-causal issue has been fixed [here]

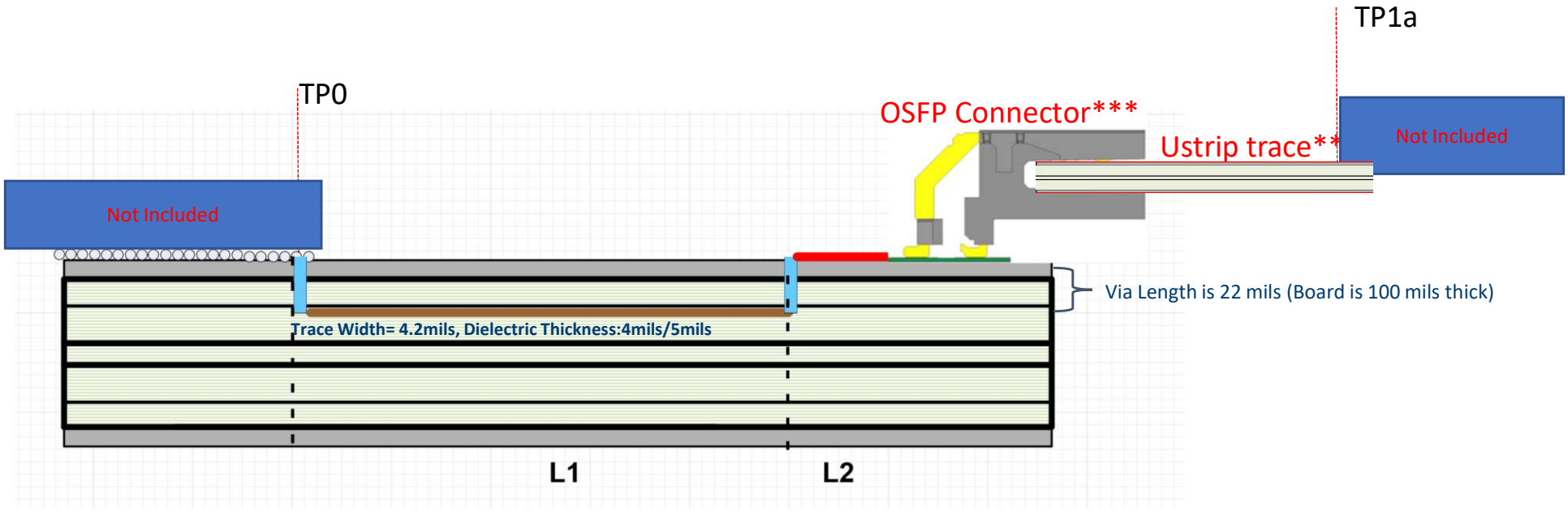
COM Comparison (Improved vs. Prior Channels)





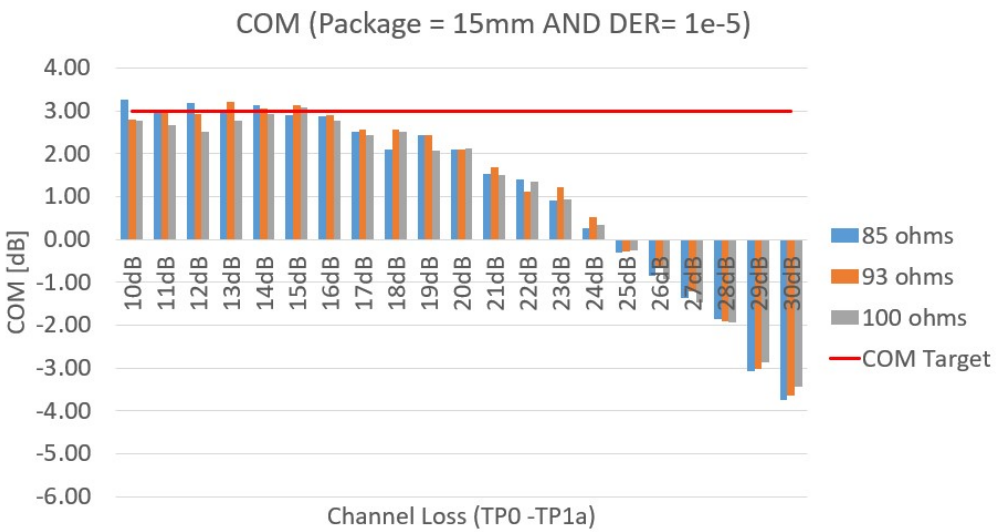
- ~ 25 % improvement in COM margins compared to prior channels
- Only Board T-Line impedance varied (prior channels used 85 ohms)

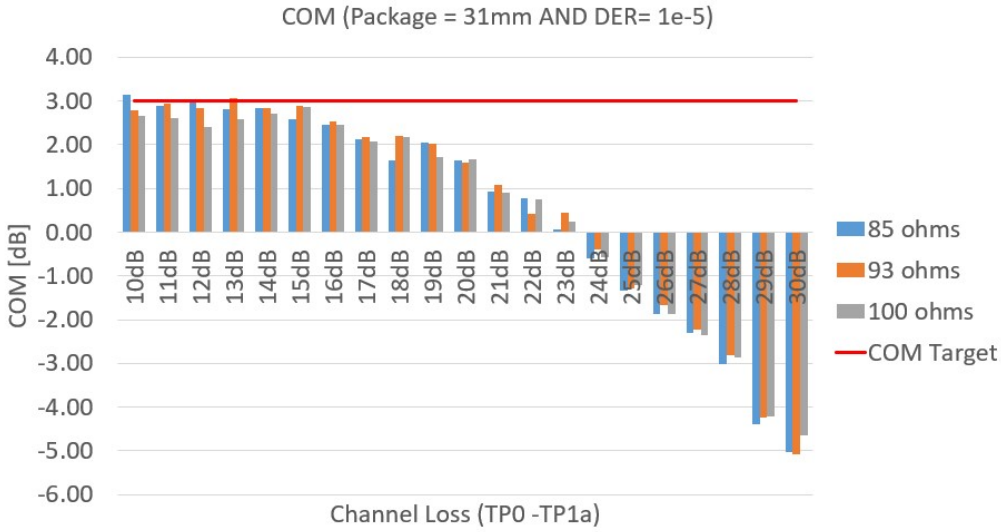
Extended Channel Loss Description



- The L1 segment (Host PCB) is the only component varied (Impedance and Loss)
- L1 length is swept to hit TP0 - TP1a loss of 10 dB to 30 dB

Extended Channel Loss COM





COM decreases as channel loss increases

Summary

- Provided improved AUI C2M channels that fix causality issues of prior submitted channels
- Provided new AUI C2M channels with extended loss to 30dB
- Included different impedance corners

Appendix

COM Setup

Table 93A-1 parameters			
Parameter	**Setting**	**Units**	**Information**
f_b	106.25	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[0.7e-4 0]	nF	[TX RX]
L_s	[0.12 0]	nH	[TX RX]
C_b	[0.3e-4 0]	nF	[TX RX]
z_p select	[1 2]		[test cases to run]
z_p (TX)	[15 31; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[0 0 ; 0 0]	mm	[test cases]
z_p (FEXT)	[15 31; 1.8 1.8]	mm	[test cases]
z_p (RX)	[0 0 ; 0 0]	mm	[test cases]
C_p	[0 0]	nF	[TX RX]
R_0	50	Ohm	
R_d	[50 50]	Ohm	[TX RX]
A_v	0.413	V	vp/vf=.694
A_fe	0.413	V	vp/vf=.694
A_ne	0.45	V	
L	4		
M	32	Samp/UI	
samples_for_C2M	32	Samp/UI	
T_O	0	mUI	
AC_CM_RMS	0	V	[test cases]
filter and Eq			
f_r	0.75	*fb	
c(0)	0.54		min
c(-1)	[-0.34:0.02:0.1]		[min:step:max]
c(-2)	[-0.1:0.02:0.1]		[min:step:max]
c(-3)	[-0.1:0.02:0.1]		[min:step:max]
c(-4)	[-0.04:0.02:0.04]		[min:step:max]
c(1)	[-0.1:0.02:0.2]		[min:step:max]
N_b	8	UI	
b_max(1)	0.85		As/dffe1
b_max(2..N_b)	[0.03 0.03 -0.02*ones(1,5)]		As/dfe2..N_b
b_min(1)	0.3		As/dffe1
b_min(2..N_b)	[0.05 0.05 -0.03*ones(1,5)]		As/dfe2..N_b
g_DC	[-13:1:-2]	dB	[min:step:max]
f_z	42.5	GHz	
f_p1	42.5	GHz	
f_p2	106.25	GHz	
g_DC_HP	[-3:0.5:-0]		[min:step:max]
f_HP_PZ	2.65625	GHz	
G_Qual	[-2 -13 ;-3 -12; -4 -11;-5 -10]	dB	ranges
G2_Qual	[0 -1 -2 -3]	dB	ranges
GDC_Min	0	dB	0 disables check. maybe different for each interface.

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	1	logical
CSV_REPORT	1	logical
RESULT_DIR	.\results\100GEL_C2M_host_{dat	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	C2M_eval_	
COM_CONTRIBUTION	0	logical
Local Search	2	
Operational		
VEC Pass threshold	12	db
EH_min	10	mV
ERL Pass threshold	7.3	dB
Min_VEO_Test	0	mV
DER_0	1.00E-05	
T_r	0.00375	ns
FORCE_TR	1	5
PMD_type	C2M	
BREAD_CRUMBS	0	logical
SAVE_CONFIG2MAT	1	logical
PLOT_CM	0	logical
TDR and ERL options		
TDR	1	logical
ERL	1	logical
ERL_ONLY	0	logical
TR_TDR	0.01	ns
N	800	
beta_x	0	
rho_x	0.618	
fixture delay time	[0 0.2e-9]	[port1 port2] different for each test fixture
TDR_W_TXPKG	1	
N_bx	0	UI
Tukey_Window	1	
Receiver testing		
RX_CALIBRATION	0	logical
Sigma BBN step	5.00E-03	V
Noise, jitter		
sigma_RJ	0.01	UI
A_DD	0.02	UI
eta_0	2.05E-08	V^2/GHz
SNR_TX	32.5	dB
R_LM	0.95	

Table 93A–3 parameters		
Parameter	**Setting**	**Units**
package_tl_gamma0_a1_a2	[0 0.000644085 0.00018018]	
package_tl_tau	5.700E-03	ns/mm
package_Z_c	[87.5 87.5 ; 92.5 92.5]	Ohm
ICN & FOM_ILD parameters		
f_v	0.594	*Fb
f_f	0.594	GHz f_r specified in first column
f_n	0.594	GHz
f_2	80	GHz
A_ft	0.600	V
A_nt	0.600	V
Histogram_Window_Weigh	Gaussian	gaussian. triangle, rectangle
sigma_r	0.02	sigma in UI fo or gaus.. Wind

Table 92–12 parameters		
Parameter	**Setting**	
board_tl_gamma0_a1_a2	[0 3.8206e-04 9.5909e-05]	
board_tl_tau	0.00579	ns/mm
board_Z_c	100	Ohm
z_bp (TX)	407	mm
z_bp (NEXT)	407	mm
z_bp (FEXT)	407	mm
z_bp (RX)	407	mm
C_0	0	nF
C_1	0	nF
Include PCB	0	logical

upodated for D3.1

Referenced: tli_3df_01b_220316
COM: version 3.7
Highlighted **Red**: Changed

Prior Channel Results

								DER= 1e-4	DER= 1e-5
Channel	**Tx Package Length[mm]**	**FOM_ILD**	**MDNEXT_ICNmV**	**MDFEXT_ICN_mV**	**ICN_mV**	**ERL**	**fitted_IL_dB_at_Fnq**	**COM[dB]**	**COM[dB]**
C2M_PCB_10dB	15	0.53	1.18	3.72	3.91	12.27	10.38	1.69	0.55
C2M_PCB_10dB	31	0.53	1.18	3.72	3.91	12.27	10.38	2.26	1.10
C2M_PCB_11dB	15	0.58	1.16	3.41	3.60	12.77	11.14	1.74	0.59
C2M_PCB_11dB	31	0.58	1.16	3.41	3.60	12.77	11.14	2.67	1.51
C2M_PCB_12dB	15	0.54	1.15	3.16	3.37	13.24	12.00	2.20	1.04
C2M_PCB_12dB	31	0.54	1.15	3.16	3.37	13.24	12.00	2.51	1.34
C2M_PCB_13dB	15	0.53	1.14	2.90	3.12	13.67	12.88	2.34	1.19
C2M_PCB_13dB	31	0.53	1.14	2.90	3.12	13.67	12.88	2.40	1.24

COM: version 3.7

Improved Channel Results (1)

Channel	Tx Package Length [mm]	FOM_ILD	MDNEXT_ICN_92_46_mV	MDFEXT_ICN_92_47_mV	ICN_mV	ERL	fitted_IL_dB_at_Fnq	COM_dB_ (1e-4)	COM_dB (1e-5)
C2M_PCB_85ohms_10dB_202208016_v2.s4p	15	0.59	1.15	3.71	3.89	12.18	10.42	4.41	3.25
	31	0.59	1.15	3.71	3.89	12.18	10.42	4.31	3.15
C2M_PCB_85ohms_11dB_202208016_v2.s4p	15	0.58	1.10	3.43	3.60	12.49	11.29	4.19	3.02
	31	0.58	1.10	3.43	3.60	12.49	11.29	4.06	2.90
C2M_PCB_85ohms_12dB_202208016_v2.s4p	15	0.58	1.07	3.17	3.34	12.81	12.15	4.35	3.17
	31	0.58	1.07	3.17	3.34	12.81	12.15	4.21	3.03
C2M_PCB_85ohms_13dB_202208016_v2.s4p	15	0.58	1.05	2.93	3.12	13.14	13.01	4.19	3.02
	31	0.58	1.05	2.93	3.12	13.14	13.01	3.98	2.82
C2M_PCB_85ohms_14dB_202208016_v2.s4p	15	0.59	1.04	2.72	2.91	13.46	13.86	4.30	3.13
	31	0.59	1.04	2.72	2.91	13.46	13.86	4.03	2.85
C2M_PCB_85ohms_15dB_202208016_v2.s4p	15	0.59	1.03	2.52	2.73	13.73	14.70	4.06	2.90
	31	0.59	1.03	2.52	2.73	13.73	14.70	3.76	2.59
C2M_PCB_85ohms_16dB_202208016_v2.s4p	15	0.61	1.02	2.18	2.41	14.15	16.39	4.04	2.87
	31	0.61	1.02	2.18	2.41	14.15	16.39	3.63	2.45
C2M_PCB_85ohms_17dB_202208016_v2.s4p	15	0.62	1.02	2.04	2.28	14.33	17.22	3.68	2.51
	31	0.62	1.02	2.04	2.28	14.33	17.22	3.28	2.12
C2M_PCB_85ohms_18dB_202208016_v2.s4p	15	0.63	1.02	1.90	2.16	14.49	18.06	3.24	2.08
	31	0.63	1.02	1.90	2.16	14.49	18.06	2.78	1.63
C2M_PCB_85ohms_19dB_202208016_v2.s4p	15	0.65	1.01	1.78	2.05	14.64	18.89	3.62	2.44
	31	0.65	1.01	1.78	2.05	14.64	18.89	3.22	2.04
C2M_PCB_85ohms_20dB_202208016_v2.s4p	15	0.66	1.01	1.66	1.95	14.77	19.72	3.28	2.10
	31	0.66	1.01	1.66	1.95	14.77	19.72	2.79	1.63
C2M_PCB_85ohms_21dB_202208016_v2.s4p	15	0.69	1.01	1.46	1.78	14.97	21.37	2.71	1.54
	31	0.69	1.01	1.46	1.78	14.97	21.37	2.10	0.93
C2M_PCB_85ohms_22dB_202208016_v2.s4p	15	0.70	1.01	1.37	1.71	15.06	22.20	2.58	1.40
	31	0.70	1.01	1.37	1.71	15.06	22.20	1.96	0.78
C2M_PCB_85ohms_23dB_202208016_v2.s4p	15	0.71	1.01	1.29	1.64	15.13	23.03	2.08	0.91
	31	0.71	1.01	1.29	1.64	15.13	23.03	1.23	0.06
C2M_PCB_85ohms_24dB_202208016_v2.s4p	15	0.72	1.01	1.22	1.58	15.19	23.85	1.42	0.26
	31	0.72	1.01	1.22	1.58	15.19	23.85	0.55	-0.60
C2M_PCB_85ohms_25dB_202208016_v2.s4p	15	0.75	1.01	1.09	1.49	15.29	25.50	0.88	-0.30
	31	0.75	1.01	1.09	1.49	15.29	25.50	-0.17	-1.34
C2M_PCB_85ohms_26dB_202208016_v2.s4p	15	0.76	1.01	1.03	1.44	15.34	26.33	0.30	-0.86
	31	0.76	1.01	1.03	1.44	15.34	26.33	-0.70	-1.86
C2M_PCB_85ohms_27dB_202208016_v2.s4p	15	0.77	1.01	0.98	1.41	15.38	27.16	-0.21	-1.38
	31	0.77	1.01	0.98	1.41	15.38	27.16	-1.15	-2.31
C2M_PCB_85ohms_28dB_202208016_v2.s4p	15	0.78	1.01	0.93	1.37	15.41	27.99	-0.69	-1.85
	31	0.78	1.01	0.93	1.37	15.41	27.99	-1.86	-3.03
C2M_PCB_85ohms_29dB_202208016_v2.s4p	15	0.80	1.01	0.84	1.32	15.46	29.65	-1.93	-3.09
	31	0.80	1.01	0.84	1.32	15.46	29.65	-3.25	-4.40
C2M_PCB_85ohms_30dB_202208016_v2.s4p	15	0.81	1.01	0.80	1.29	15.48	30.48	-2.59	-3.75
	31	0.81	1.01	0.80	1.29	15.48	30.48	-3.87	-5.03

Improved Channel Results (2)

Impedance	Channel	Tx Package Length [mm]	FOM_ILD	MDNEXT_ICN_mV	MDFEXT_ICN_mV	ICN_mV	ERL	fitted_IL_dB_at_Fnq	COM_dB (1e-4)	COM_dB (1e-5)
93 ohms	C2M_PCB_93ohms_10dB_202208016_v2.s4p	15	0.52	1.11	3.21	3.40	12.39	10.34	3.95	2.79
		31	0.52	1.11	3.21	3.40	12.39	10.34	3.94	2.77
	C2M_PCB_93ohms_11dB_202208016_v2.s4p	15	0.52	1.08	2.89	3.09	12.81	11.20	4.11	2.94
		31	0.52	1.08	2.89	3.09	12.81	11.20	4.10	2.94
	C2M_PCB_93ohms_12dB_202208016_v2.s4p	15	0.52	1.05	2.61	2.81	13.21	12.05	4.10	2.93
		31	0.52	1.05	2.61	2.81	13.21	12.05	3.99	2.83
	C2M_PCB_93ohms_13dB_202208016_v2.s4p	15	0.52	1.02	2.35	2.57	13.57	12.89	4.37	3.20
		31	0.52	1.02	2.35	2.57	13.57	12.89	4.25	3.07
	C2M_PCB_93ohms_14dB_202208016_v2.s4p	15	0.55	1.01	2.33	2.54	13.14	13.79	4.22	3.05
		31	0.55	1.01	2.33	2.54	13.14	13.79	4.01	2.83
	C2M_PCB_93ohms_15dB_202208016_v2.s4p	15	0.55	1.00	2.11	2.34	13.38	14.62	4.31	3.13
		31	0.55	1.00	2.11	2.34	13.38	14.62	4.06	2.88
	C2M_PCB_93ohms_16dB_202208016_v2.s4p	15	0.57	0.99	1.74	2.00	13.82	16.27	4.06	2.89
		31	0.57	0.99	1.74	2.00	13.82	16.27	3.70	2.53
	C2M_PCB_93ohms_17dB_202208016_v2.s4p	15	0.58	0.99	1.58	1.86	13.99	17.10	3.72	2.56
		31	0.58	0.99	1.58	1.86	13.99	17.10	3.34	2.18
	C2M_PCB_93ohms_18dB_202208016_v2.s4p	15	0.59	0.99	1.43	1.74	14.15	17.91	3.74	2.57
		31	0.59	0.99	1.43	1.74	14.15	17.91	3.37	2.20
	C2M_PCB_93ohms_19dB_202208016_v2.s4p	15	0.60	0.98	1.30	1.63	14.29	18.73	3.60	2.43
		31	0.60	0.98	1.30	1.63	14.29	18.73	3.21	2.03
	C2M_PCB_93ohms_20dB_202208016_v2.s4p	15	0.61	0.98	1.18	1.53	14.42	19.55	3.26	2.10
		31	0.61	0.98	1.18	1.53	14.42	19.55	2.77	1.60
	C2M_PCB_93ohms_21dB_202208016_v2.s4p	15	0.64	0.98	0.97	1.38	14.63	21.17	2.87	1.69
		31	0.64	0.98	0.97	1.38	14.63	21.17	2.26	1.08
	C2M_PCB_93ohms_22dB_202208016_v2.s4p	15	0.65	0.98	0.88	1.32	14.72	21.98	2.28	1.12
		31	0.65	0.98	0.88	1.32	14.72	21.98	1.59	0.43
	C2M_PCB_93ohms_23dB_202208016_v2.s4p	15	0.66	0.98	0.80	1.27	14.80	22.79	2.38	1.21
		31	0.66	0.98	0.80	1.27	14.80	22.79	1.62	0.45
	C2M_PCB_93ohms_24dB_202208016_v2.s4p	15	0.68	0.98	0.73	1.22	14.86	23.60	1.67	0.51
		31	0.68	0.98	0.73	1.22	14.86	23.60	0.75	-0.41
	C2M_PCB_93ohms_25dB_202208016_v2.s4p	15	0.70	0.98	0.61	1.15	14.98	25.21	0.89	-0.28
		31	0.70	0.98	0.61	1.15	14.98	25.21	-0.13	-1.30
	C2M_PCB_93ohms_26dB_202208016_v2.s4p	15	0.71	0.98	0.55	1.13	15.03	26.02	0.52	-0.65
		31	0.71	0.98	0.55	1.13	15.03	26.02	-0.51	-1.68
	C2M_PCB_93ohms_27dB_202208016_v2.s4p	15	0.73	0.98	0.50	1.10	15.08	26.83	-0.04	-1.21
		31	0.73	0.98	0.50	1.10	15.08	26.83	-1.06	-2.23
	C2M_PCB_93ohms_28dB_202208016_v2.s4p	15	0.74	0.98	0.46	1.08	15.12	27.63	-0.75	-1.91
		31	0.74	0.98	0.46	1.08	15.12	27.63	-1.65	-2.80
	C2M_PCB_93ohms_29dB_202208016_v2.s4p	15	0.76	0.98	0.39	1.06	15.18	29.25	-1.88	-3.03
		31	0.76	0.98	0.39	1.06	15.18	29.25	-3.10	-4.24
	C2M_PCB_93ohms_30dB_202208016_v2.s4p	15	0.77	0.98	0.36	1.04	15.21	30.06	-2.51	-3.65
		31	0.77	0.98	0.36	1.04	15.21	30.06	-3.95	-5.08

Improved Channel Results (3)

Impedance	Channel	Tx Package Length [mm]	FOM_ILD	MDNEXT_ICN_mV	MDFEXT_ICN_mV	ICN_mV	ERL	fitted_IL_dB_at_Fnq	COM_dB (1e-4)	COM_dB (1e-5)
100 ohms	C2M_PCB_100ohms_10dB_202208016_v2.s4p	15	0.54	1.09	3.30	3.47	11.24	10.43	3.94	2.78
		31	0.54	1.09	3.30	3.47	11.24	10.43	3.83	2.66
	C2M_PCB_100ohms_11dB_202208016_v2.s4p	15	0.53	1.05	2.92	3.10	11.60	11.28	3.84	2.68
		31	0.53	1.05	2.92	3.10	11.60	11.28	3.77	2.61
	C2M_PCB_100ohms_12dB_202208016_v2.s4p	15	0.52	1.02	2.59	2.78	11.88	12.12	3.68	2.51
		31	0.52	1.02	2.59	2.78	11.88	12.12	3.57	2.41
	C2M_PCB_100ohms_13dB_202208016_v2.s4p	15	0.52	1.00	2.29	2.50	12.13	12.96	3.94	2.77
		31	0.52	1.00	2.29	2.50	12.13	12.96	3.75	2.58
	C2M_PCB_100ohms_14dB_202208016_v2.s4p	15	0.52	0.99	2.03	2.26	12.36	13.79	4.10	2.93
		31	0.52	0.99	2.03	2.26	12.36	13.79	3.88	2.71
	C2M_PCB_100ohms_15dB_202208016_v2.s4p	15	0.53	0.98	1.79	2.04	12.59	14.61	4.27	3.09
		31	0.53	0.98	1.79	2.04	12.59	14.61	4.03	2.86
	C2M_PCB_100ohms_16dB_202208016_v2.s4p	15	0.54	0.97	1.40	1.70	12.99	16.25	3.92	2.76
		31	0.54	0.97	1.40	1.70	12.99	16.25	3.63	2.46
	C2M_PCB_100ohms_17dB_202208016_v2.s4p	15	0.55	0.97	1.23	1.56	13.16	17.07	3.58	2.42
		31	0.55	0.97	1.23	1.56	13.16	17.07	3.24	2.08
	C2M_PCB_100ohms_18dB_202208016_v2.s4p	15	0.56	0.97	1.08	1.45	13.29	17.88	3.68	2.51
		31	0.56	0.97	1.08	1.45	13.29	17.88	3.35	2.17
	C2M_PCB_100ohms_19dB_202208016_v2.s4p	15	0.57	0.96	0.94	1.35	13.42	18.70	3.22	2.07
		31	0.57	0.96	0.94	1.35	13.42	18.70	2.88	1.71
	C2M_PCB_100ohms_20dB_202208016_v2.s4p	15	0.58	0.96	0.83	1.27	13.54	19.51	3.29	2.13
		31	0.58	0.96	0.83	1.27	13.54	19.51	2.83	1.66
	C2M_PCB_100ohms_21dB_202208016_v2.s4p	15	0.61	0.96	0.63	1.15	13.74	21.12	2.67	1.50
		31	0.61	0.96	0.63	1.15	13.74	21.12	2.07	0.90
	C2M_PCB_100ohms_22dB_202208016_v2.s4p	15	0.62	0.96	0.55	1.11	13.82	21.92	2.52	1.35
		31	0.62	0.96	0.55	1.11	13.82	21.92	1.94	0.76
	C2M_PCB_100ohms_23dB_202208016_v2.s4p	15	0.63	0.96	0.48	1.08	13.90	22.72	2.10	0.93
		31	0.63	0.96	0.48	1.08	13.90	22.72	1.41	0.25
	C2M_PCB_100ohms_24dB_202208016_v2.s4p	15	0.64	0.96	0.42	1.05	13.97	23.52	1.49	0.34
		31	0.64	0.96	0.42	1.05	13.97	23.52	0.58	-0.56
	C2M_PCB_100ohms_25dB_202208016_v2.s4p	15	0.67	0.96	0.33	1.02	14.08	25.12	0.90	-0.26
		31	0.67	0.96	0.33	1.02	14.08	25.12	-0.08	-1.22
	C2M_PCB_100ohms_26dB_202208016_v2.s4p	15	0.68	0.96	0.30	1.01	14.14	25.92	0.22	-0.94
		31	0.68	0.96	0.30	1.01	14.14	25.92	-0.72	-1.87
	C2M_PCB_100ohms_27dB_202208016_v2.s4p	15	0.70	0.96	0.28	1.00	14.18	26.71	-0.32	-1.47
		31	0.70	0.96	0.28	1.00	14.18	26.71	-1.20	-2.35
	C2M_PCB_100ohms_28dB_202208016_v2.s4p	15	0.71	0.96	0.27	1.00	14.23	27.51	-0.80	-1.95
		31	0.71	0.96	0.27	1.00	14.23	27.51	-1.73	-2.87
	C2M_PCB_100ohms_29dB_202208016_v2.s4p	15	0.74	0.96	0.25	0.99	14.29	29.10	-1.74	-2.87
		31	0.74	0.96	0.25	0.99	14.29	29.10	-3.08	-4.20
	C2M_PCB_100ohms_30dB_202208016_v2.s4p	15	0.75	0.96	0.25	0.99	14.32	29.90	-2.31	-3.45
		31	0.75	0.96	0.25	0.99	14.32	29.90	-3.52	-4.65

Improved Channel Contribution (1)

Thru	FEXT	NEXT1	NEXT2
C2M_PCB_85ohms_10dB_202208016_v2.s4p	C2M_PCB_85ohms_10dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_10dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_10dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_11dB_202208016_v2.s4p	C2M_PCB_85ohms_11dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_11dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_11dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_12dB_202208016_v2.s4p	C2M_PCB_85ohms_12dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_12dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_12dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_13dB_202208016_v2.s4p	C2M_PCB_85ohms_13dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_13dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_13dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_14dB_202208016_v2.s4p	C2M_PCB_85ohms_14dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_14dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_14dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_15dB_202208016_v2.s4p	C2M_PCB_85ohms_15dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_15dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_15dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_16dB_202208016_v2.s4p	C2M_PCB_85ohms_16dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_16dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_16dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_17dB_202208016_v2.s4p	C2M_PCB_85ohms_17dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_17dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_17dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_18dB_202208016_v2.s4p	C2M_PCB_85ohms_18dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_18dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_18dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_19dB_202208016_v2.s4p	C2M_PCB_85ohms_19dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_19dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_19dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_20dB_202208016_v2.s4p	C2M_PCB_85ohms_20dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_20dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_20dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_21dB_202208016_v2.s4p	C2M_PCB_85ohms_21dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_21dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_21dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_22dB_202208016_v2.s4p	C2M_PCB_85ohms_22dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_22dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_22dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_23dB_202208016_v2.s4p	C2M_PCB_85ohms_23dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_23dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_23dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_24dB_202208016_v2.s4p	C2M_PCB_85ohms_24dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_24dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_24dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_25dB_202208016_v2.s4p	C2M_PCB_85ohms_25dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_25dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_25dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_26dB_202208016_v2.s4p	C2M_PCB_85ohms_26dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_26dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_26dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_27dB_202208016_v2.s4p	C2M_PCB_85ohms_27dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_27dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_27dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_28dB_202208016_v2.s4p	C2M_PCB_85ohms_28dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_28dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_28dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_29dB_202208016_v2.s4p	C2M_PCB_85ohms_29dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_29dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_29dB_202208016_v2_NEXT2.s4p
C2M_PCB_85ohms_30dB_202208016_v2.s4p	C2M_PCB_85ohms_30dB_202208016_v2_FEXT1.s4p	C2M_PCB_85ohms_30dB_202208016_v2_NEXT1.s4p	C2M_PCB_85ohms_30dB_202208016_v2_NEXT2.s4p

Improved Channel Contribution (2)

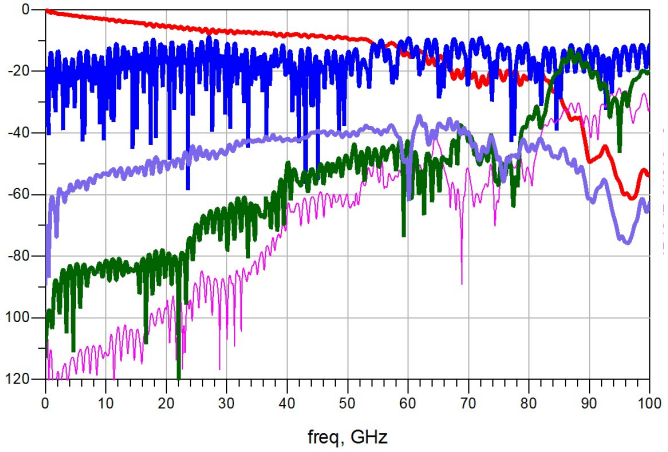
Thru	FEXT	NEXT1	NEXT2
C2M_PCB_93ohms_10dB_202208016_v2.s4p	C2M_PCB_93ohms_10dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_10dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_10dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_11dB_202208016_v2.s4p	C2M_PCB_93ohms_11dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_11dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_11dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_12dB_202208016_v2.s4p	C2M_PCB_93ohms_12dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_12dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_12dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_13dB_202208016_v2.s4p	C2M_PCB_93ohms_13dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_13dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_13dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_14dB_202208016_v2.s4p	C2M_PCB_93ohms_14dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_14dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_14dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_15dB_202208016_v2.s4p	C2M_PCB_93ohms_15dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_15dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_15dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_16dB_202208016_v2.s4p	C2M_PCB_93ohms_16dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_16dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_16dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_17dB_202208016_v2.s4p	C2M_PCB_93ohms_17dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_17dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_17dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_18dB_202208016_v2.s4p	C2M_PCB_93ohms_18dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_18dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_18dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_19dB_202208016_v2.s4p	C2M_PCB_93ohms_19dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_19dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_19dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_20dB_202208016_v2.s4p	C2M_PCB_93ohms_20dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_20dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_20dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_21dB_202208016_v2.s4p	C2M_PCB_93ohms_21dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_21dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_21dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_22dB_202208016_v2.s4p	C2M_PCB_93ohms_22dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_22dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_22dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_23dB_202208016_v2.s4p	C2M_PCB_93ohms_23dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_23dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_23dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_24dB_202208016_v2.s4p	C2M_PCB_93ohms_24dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_24dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_24dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_25dB_202208016_v2.s4p	C2M_PCB_93ohms_25dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_25dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_25dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_26dB_202208016_v2.s4p	C2M_PCB_93ohms_26dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_26dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_26dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_27dB_202208016_v2.s4p	C2M_PCB_93ohms_27dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_27dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_27dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_28dB_202208016_v2.s4p	C2M_PCB_93ohms_28dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_28dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_28dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_29dB_202208016_v2.s4p	C2M_PCB_93ohms_29dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_29dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_29dB_202208016_v2_NEXT2.s4p
C2M_PCB_93ohms_30dB_202208016_v2.s4p	C2M_PCB_93ohms_30dB_202208016_v2_FEXT1.s4p	C2M_PCB_93ohms_30dB_202208016_v2_NEXT1.s4p	C2M_PCB_93ohms_30dB_202208016_v2_NEXT2.s4p

Improved Channel Contribution (2)

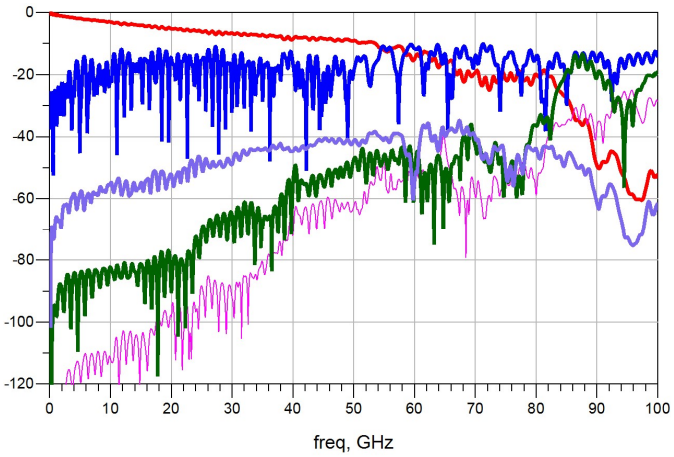
Thru	FEXT	NEXT1	NEXT2
C2M_PCB_100ohms_10dB_202208016_v2.s4p	C2M_PCB_100ohms_10dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_10dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_10dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_11dB_202208016_v2.s4p	C2M_PCB_100ohms_11dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_11dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_11dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_12dB_202208016_v2.s4p	C2M_PCB_100ohms_12dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_12dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_12dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_13dB_202208016_v2.s4p	C2M_PCB_100ohms_13dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_13dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_13dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_14dB_202208016_v2.s4p	C2M_PCB_100ohms_14dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_14dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_14dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_15dB_202208016_v2.s4p	C2M_PCB_100ohms_15dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_15dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_15dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_16dB_202208016_v2.s4p	C2M_PCB_100ohms_16dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_16dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_16dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_17dB_202208016_v2.s4p	C2M_PCB_100ohms_17dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_17dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_17dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_18dB_202208016_v2.s4p	C2M_PCB_100ohms_18dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_18dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_18dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_19dB_202208016_v2.s4p	C2M_PCB_100ohms_19dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_19dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_19dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_20dB_202208016_v2.s4p	C2M_PCB_100ohms_20dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_20dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_20dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_21dB_202208016_v2.s4p	C2M_PCB_100ohms_21dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_21dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_21dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_22dB_202208016_v2.s4p	C2M_PCB_100ohms_22dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_22dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_22dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_23dB_202208016_v2.s4p	C2M_PCB_100ohms_23dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_23dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_23dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_24dB_202208016_v2.s4p	C2M_PCB_100ohms_24dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_24dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_24dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_25dB_202208016_v2.s4p	C2M_PCB_100ohms_25dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_25dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_25dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_26dB_202208016_v2.s4p	C2M_PCB_100ohms_26dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_26dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_26dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_27dB_202208016_v2.s4p	C2M_PCB_100ohms_27dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_27dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_27dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_28dB_202208016_v2.s4p	C2M_PCB_100ohms_28dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_28dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_28dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_29dB_202208016_v2.s4p	C2M_PCB_100ohms_29dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_29dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_29dB_202208016_v2_NEXT2.s4p
C2M_PCB_100ohms_30dB_202208016_v2.s4p	C2M_PCB_100ohms_30dB_202208016_v2_FEXT1.s4p	C2M_PCB_100ohms_30dB_202208016_v2_NEXT1.s4p	C2M_PCB_100ohms_30dB_202208016_v2_NEXT2.s4p

Improved Channel Characteristics (10dB)

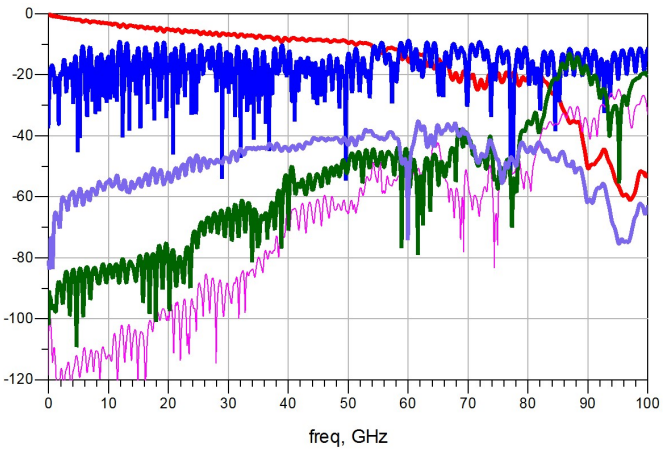
85 Ohms



93 Ohms



100 Ohms



Insertion Loss
Return Loss
NEXT1
NEXT2
FEXT1