CA COM parameters SNR_TX and eta_0 Baseline Proposal

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Thanks and Acknowledgements to Liav Ben Artsi, Marvell
for 3-D Modeling Contributions

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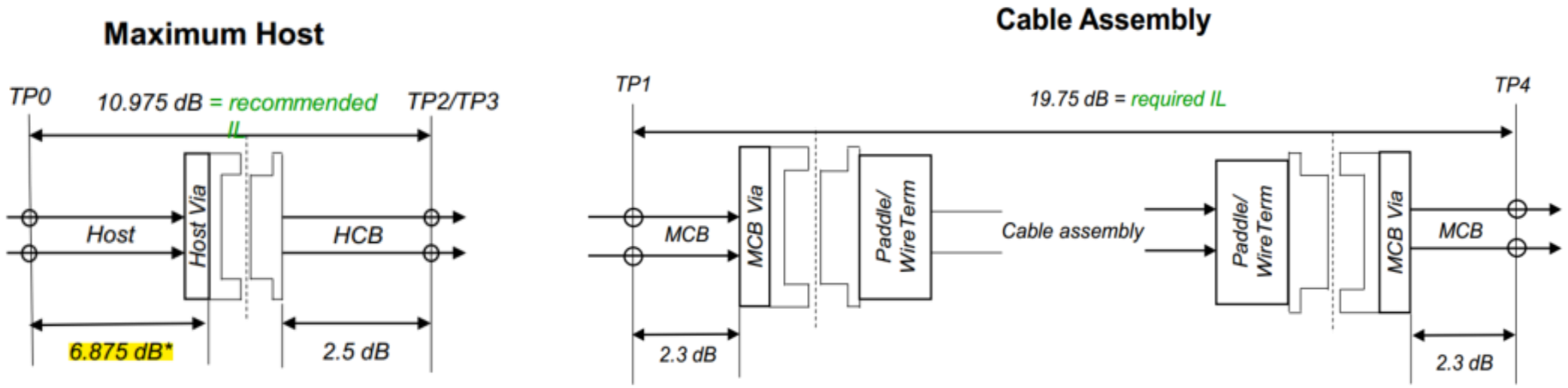
Indianapolis, IN, USA

Agenda

- ❑ CA so far and computation circuit review
- ❑ SNR_Tx experiment and recommendation
- ❑ Process to to determine SNR_Tx and eta_0
- ❑ CA COM spreadsheet template
- ❑ Channel Key
- ❑ Results
- ❑ Recommendation

Models use will match this proposal

- The maximum host loss is used to determine the PCB added for the CA COM computation

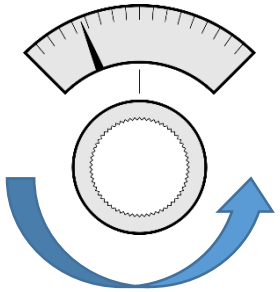


Note: The 6.875 dB includes via allowances for BGA and connector footprint

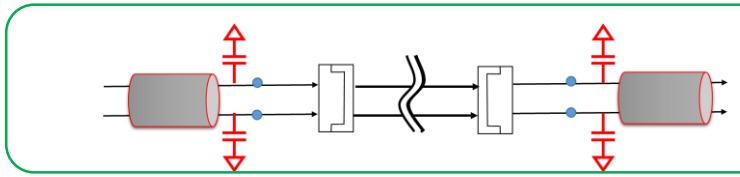
Method overview

Adjust SNR_TX and eta_0 match to a reference COM which has via crosstalk

SNR_TX

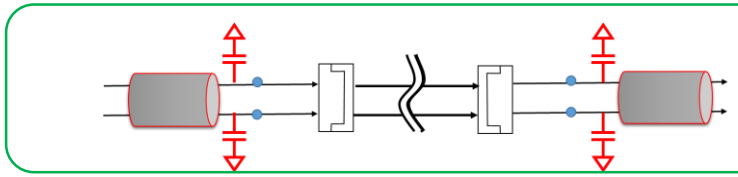


Via thru Tx victim model



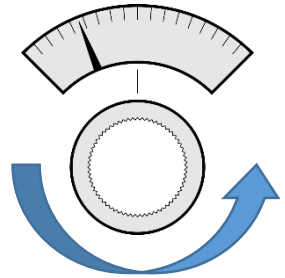
Via thru Rx victim model

Via thru Tx victim model

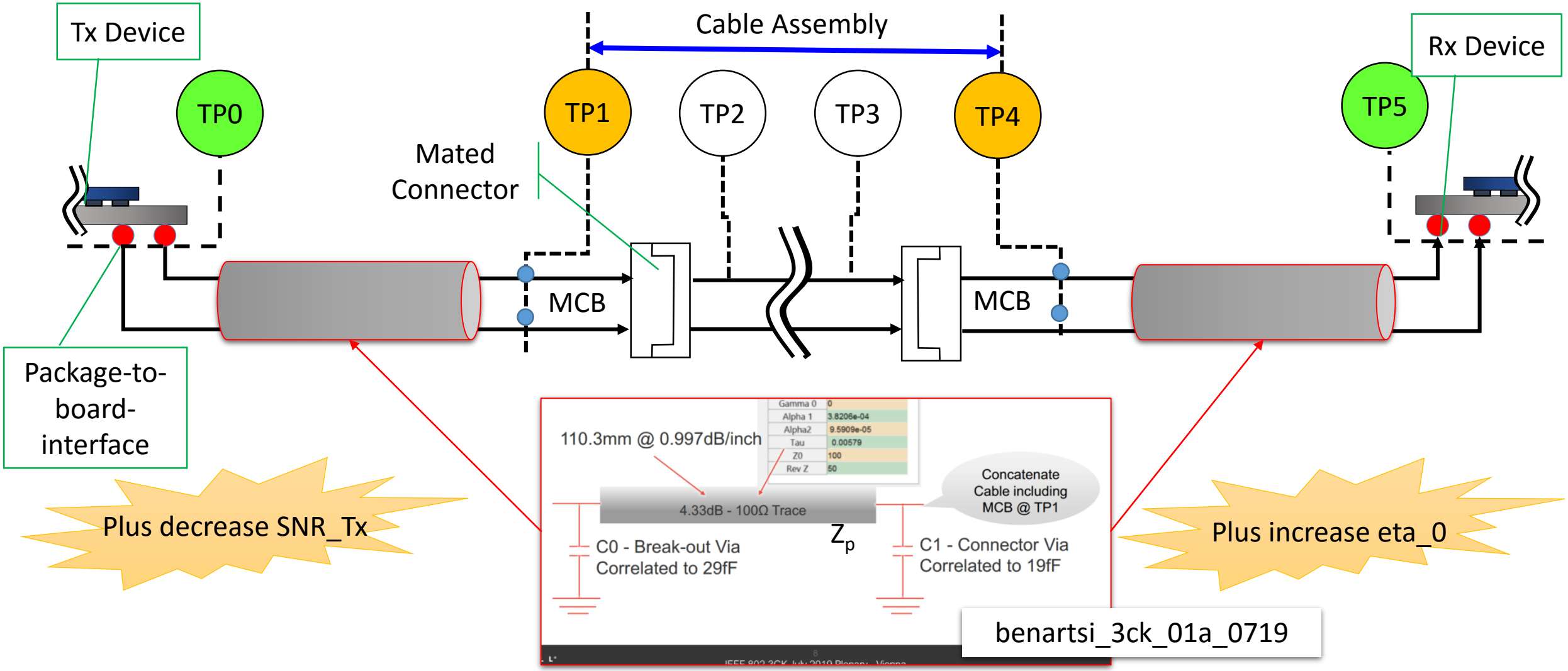


Via thru Rx victim model

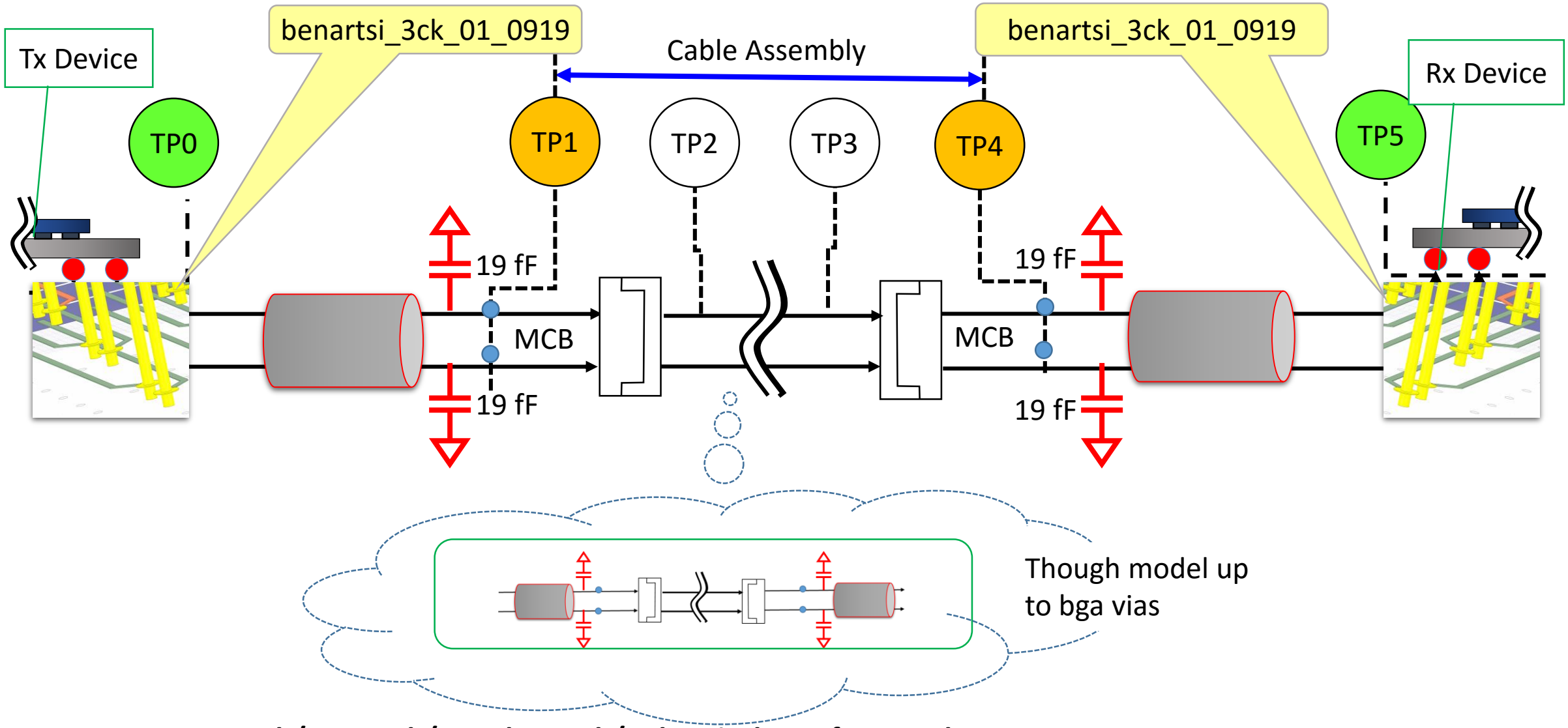
eta_0



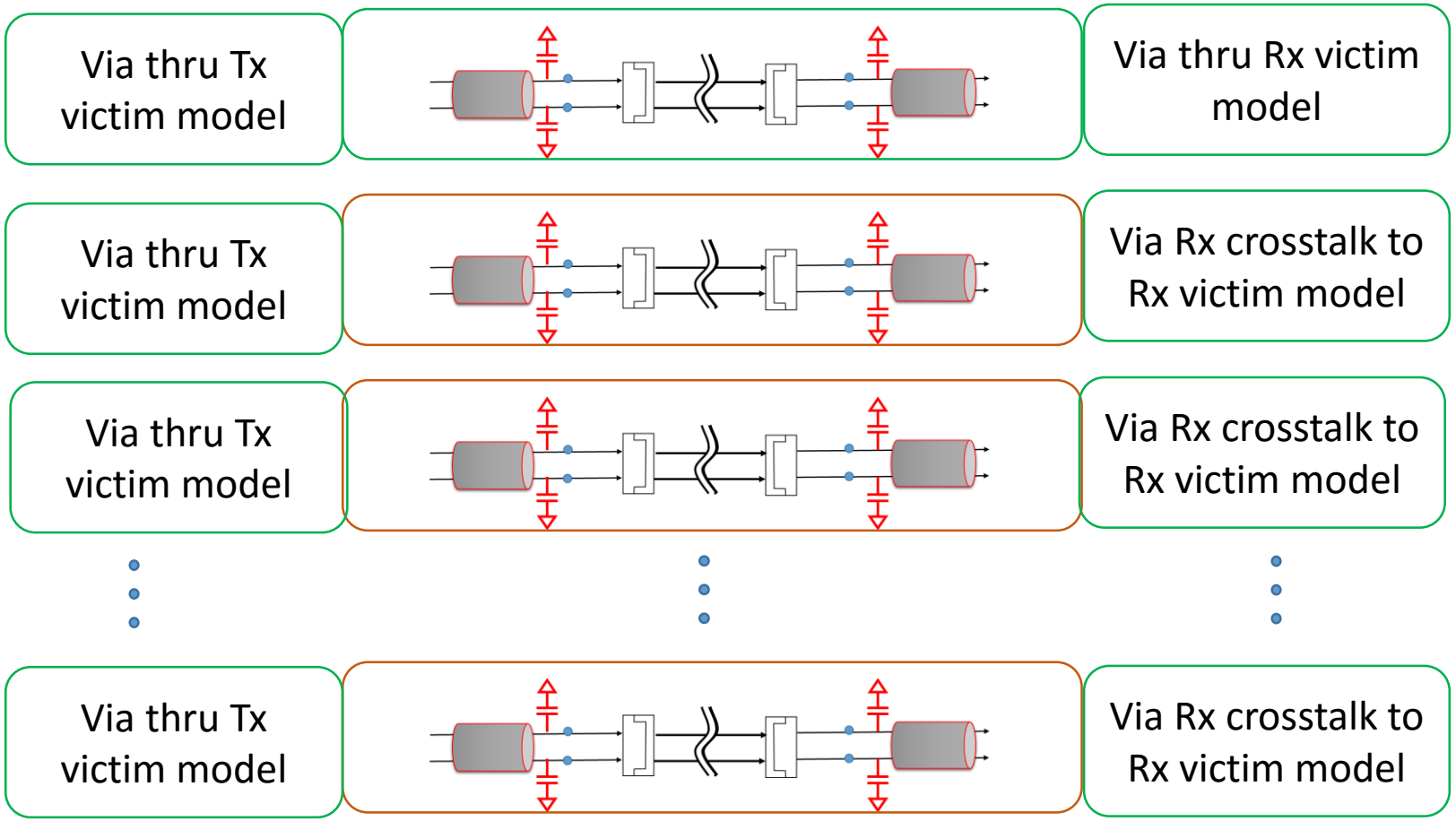
Review of COM for CA Proposal



Models used are from a CA, added boards, and vias



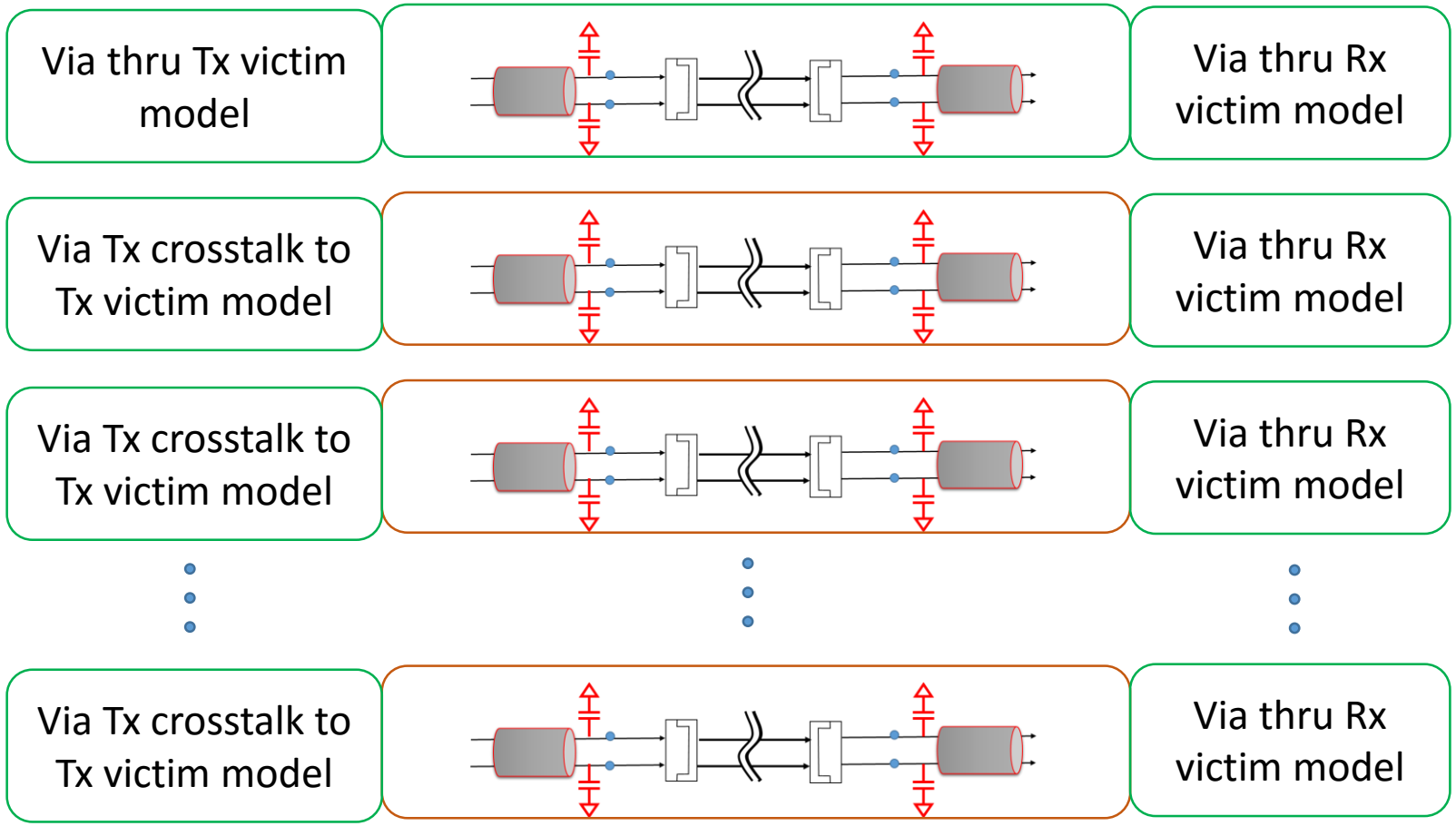
Process to finding eta_0 equivalent to via crosstalk



Tp0-Tp5 with crosstalk

- Build Tp0-Tp5 with and without Rx via crosstalk
  - Only use through files for CA , Tx vias. and Rx vias
- Baseline target is COM with Rx via crosstalk
  - KR spreadsheet in backup slides was used
- For the no crosstalk channel determine the value of eta_0 where COM matches the target

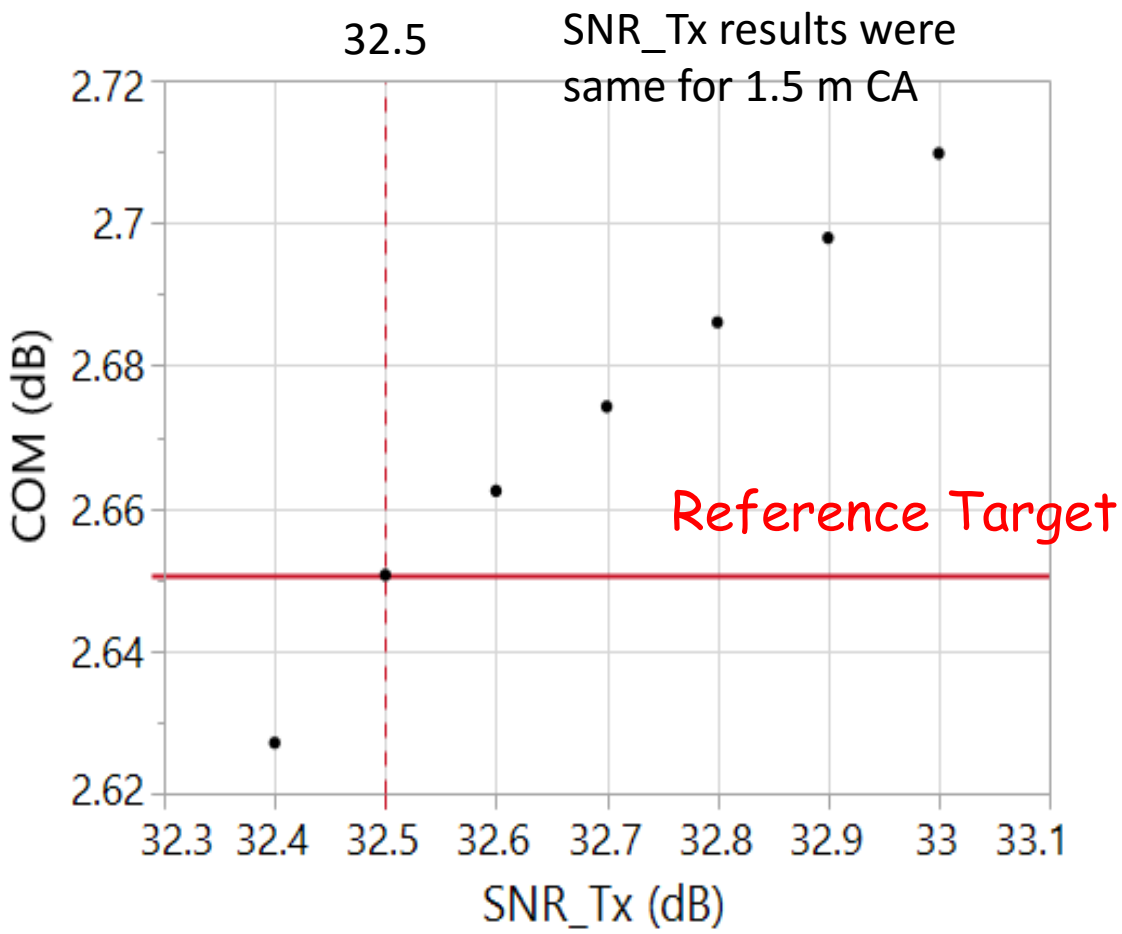
Process to finding SNR_TX equivalent to via crosstalk

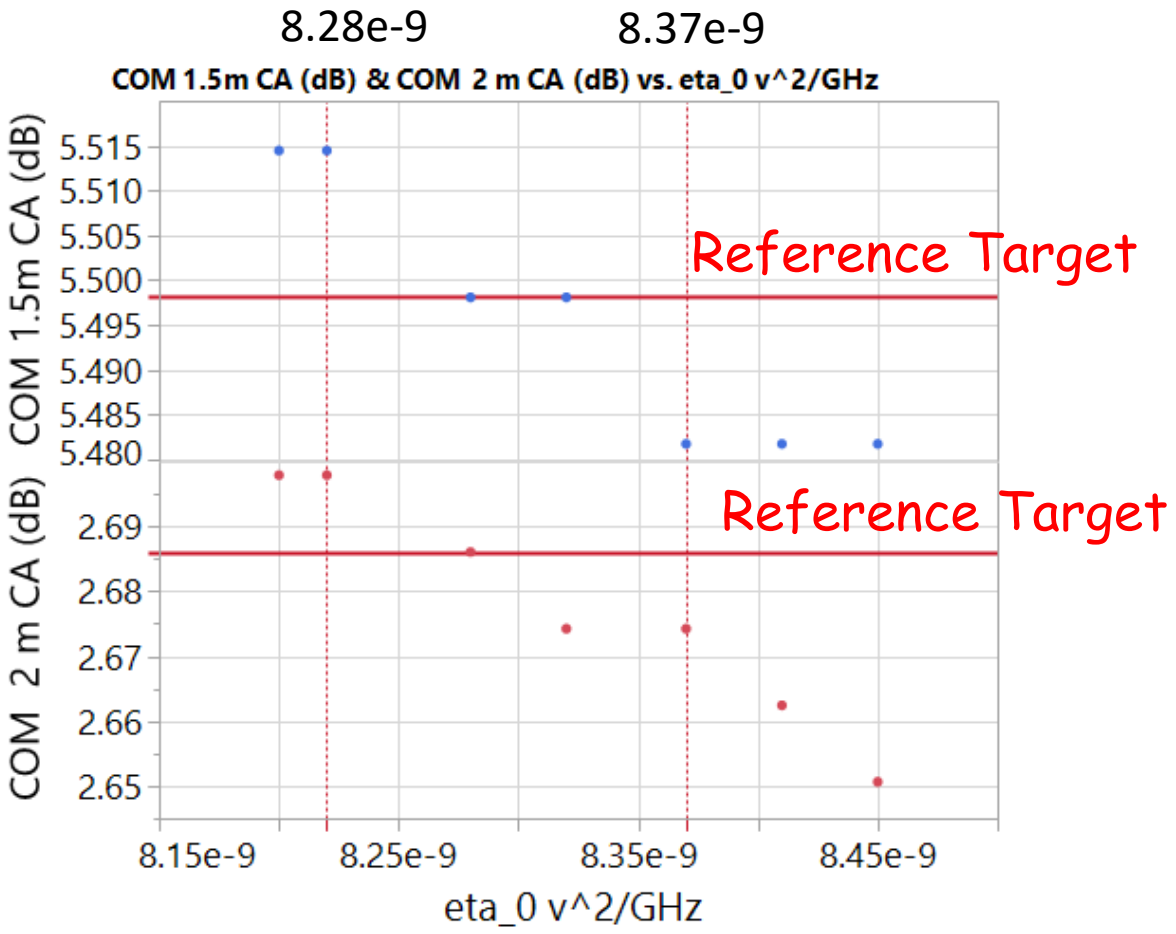


- Build Tp0-Tp5 with and without Tx via crosstalk
  - Only use through files for CA , Tx vias. and Rx vias
- Baseline target is COM with Tx via crosstalk
  - KR spreadsheet in backup slides was used
- For the no crosstalk channel determine the value of SNR_TX where COM matches the target

Results are found my matching to reference target

(but only 1 Tx via and Rx via model was evaluated)





Results for eta_0 are more dependent in the channel

COM CA Host Noise Parameter Baseline Recommendation

- SNR_TX ≤ 32.5 dB
- eta_0 ≥ 8.37E-09 v^2/GHz

Backup

KR COM configuration example

Table 93A-1 parameters			
Parameter	**Setting**	**Units**	**Information**
f_b	53.125	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[1.2e-4 1.2e-4]	nF	[TX RX]
L_s	[0.12, 0.12]	nH	[TX RX]
C_b	[0.3e-4 0.3e-4]	nF	[TX RX]
z_p select	[1 2]		[test cases to run]
z_p (TX)	[12 31; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[12 29; 1.8 1.8]	mm	[test cases]
z_p (FEXT)	[12 31; 1.8 1.8]	mm	[test cases]
z_p (RX)	[12 29; 1.8 1.8]	mm	[test cases]
C_p	[0.87e-4 0.87e-4]	nF	[TX RX]
R_0	50	Ohm	
R_d	[50 50]	Ohm	[TX RX]
A_v	0.415	V	vp/vf=.694
A_fe	0.415	V	vp/vf=.694
A_ne	0.608	V	
L	4		
M	32		
filter and Eq			
f_r	0.75	*fb	
c(0)	0.54		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.12]		[min:step:max]
c(-3)	[-0.06:0.02: 0]		[min:step:max]
c(1)	[-0.2:0.05:0]		[min:step:max]
N_b	12	UI	
b_max(1)	0.85		
b_max(2..N_b)	0.2		
g_DC	[-20:1:0]	dB	[min:step:max]
f_z	21.25	GHz	
f_p1	21.25	GHz	
f_p2	53.125	GHz	
g_DC_HP	[-6:1:0]		[min:step:max]

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	1	logical
CSV_REPORT	1	logical
RESULT_DIR	.\results\100GEL_CR_{date}\	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	CR_eval_	
COM_CONTRIBUTION	0	logical
Operational		
COM Pass threshold	3	dB
ERL Pass threshold	10	dB
DER_0	1.00E-04	
T_r	6.16E-03	ns
FORCE_TR	1	logical

TDR and ERL options		
TDR	1	logical
ERL	1	logical
ERL_ONLY	0	logical
TR_TDR	0.01	ns
N	3000	
beta_x	2.3407E+09	
rho_x	0.16	
fixture delay time	[0 0]	[port1 port2]
TDR_W_TXPKG	0	
N_bx	12	UI
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	8.2E-09	V^2/GHz
SNR_TX	33	dB
R_LM	0.95	

Table 93A–3 parameters		
Parameter	**Setting**	**Units**
package_tl_gamma0_a1_a2	[0 0.0009909 0.0002772]	
package_tl_tau	6.141E-03	ns/mm
package_Z_c	[87.5 87.5 ; 92.5 92.5]	Ohm
benartsi_3ck_01_0119 & mellitz_3ck_01_0119		
Table 92–12 parameters		
Parameter	**Setting**	
board_tl_gamma0_a1_a2	*[0 3.8206e-04 9.5909e-05]*	
board_tl_tau	*5.790E-03*	ns/mm
board_Z_c	100	Ohm
z_bp (TX)	*110.3*	mm
z_bp (NEXT)	*110.3*	mm
z_bp (FEXT)	*110.3*	mm
z_bp (RX)	*110.3*	mm
C_0	[0.29e-4]	nF
C_1	[0.19e-4]	nF
Include PCB	**0**	**logical**

Floating Tap Control		
N_bg	3	0 1 2 or 3 groups
N_bf	3	taps per group
N_f	40	UI span for floating taps
bmaxg	0.2	max DFE value for floating taps

cable assemblies require this for each HCB

ICN parameters (v2.73)	
f_f	12.919
f_n	12.919
f_2	39.844
A_ft	0.600
A_nt	**0.600**
heck_3ck_03b_0319	**Adopted Mar 2019**
walker_3ck_01a_0719	**Adopted July 2019**
result of R_d=50	
benartsi_3ck_01a_0719	**no used for KR**
mellitz_3ck_03_0919	

CR/CA COM configuration example

Table 93A-1 parameters			
Parameter	**Setting**	**Units**	**Information**
f_b	53.125	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[1.2e-4 1.2e-4]	nF	[TX RX]
L_s	[0.12, 0.12]	nH	[TX RX]
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N_b	12	UI	
b_max(1)	0.85		
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g_DC	[-20:1:0]	dB	[min:step:max]
f_z	21.25	GHz	
f_p1	21.25	GHz	
f_p2	53.125	GHz	
g_DC_HP	[-6:1:0]		[min:step:max]
f_HP_PZ	0.6640625	GHz	

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	1	logical
CSV_REPORT	1	logical
RESULT_DIR	.\results\100GEL_CR_{date}\	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
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N	3000	
beta_x	2.3407E+09	
rho_x	0.16	
fixture delay time	[0 0]	[port1 port2]
TDR_W_TXPKG	0	
N_bx	12	UI
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	8.28E-09	V^2/GHz
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R_LM	0.95	

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board_Z_c	100	Ohm
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z_bp (NEXT)	*110.3*	mm
z_bp (FEXT)	*110.3*	mm
z_bp (RX)	*110.3*	mm
C_0	[0.29e-4]	nF
C_1	[0.19e-4]	nF
Include PCB	**1**	**logical**

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N_bg	3	0 1 2 or 3 groups
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heck_3ck_03b_0319	**Adopted Mar 2019**
walker_3ck_01a_0719	**Adopted July 2019**
result of R_d=50	
benartsi_3ck_01a_0719	**require COM 2.72 or later**
mellitz_3ck_03_0919	
mellitz_3ck_02_0919	