Revisit TP1a EH and VEC based on New Test Method in IEEE 802.3ck D1p4

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For IEEE 802.3ck Ad-Hoc

Supporters

Outlines

- Background
- Channel & Analysis
- Impact from New Test Method in D1p4
- TP1a vs Whole-Link Correlation
- Summary & Proposals

Background

- New test method of C2M TP1a EH/VEC had been adopted in 802.3ck D1p4
  - Proposed in healey_3ck_02_1020
  - EH/VEC specs in D1p4 are not valid any more
- Run COM analysis based on new method in D1p4 to derive new EH/VEC specs
  - Adopt similar analysis as wu_3ck_01a_1119
- Proposals for Table 120G-1
  - VEC = 12 dB for TP1a
  - EH = 8 mV for TP1a
  - M1 (samples_for_C2M) = 100

Channel and Analysis

- Channel (crosstalk included) and reference receiver
  - Whole-link & TP1a analysis for total nineteen IEEE C2M host-to-module channels
    - Sweep host package trace length, z_p1(TX)
      - z_p1(TX) = [5:0.5:10 11:1:20 22:2:36]
    - Total 19 * 29 = 551 CH+PKG test cases
- COM parameter settings [details in appendix]
  - COM 3.1
  - Whole link: TX Device/PKG + H2M Channels + RX PKG/Device

C_d	[1.2e-4 0.85e-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)	[x x ; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[2 8 ; 0 0]	mm	[test cases]
z_p (FEXT)	[x x ; 1.8 1.8]	mm	[test cases]
z_p (RX)	[2 8 ; 0 0]	mm	[test cases]
C_p	[0.87e-4 0.65e-4]	nF	[TX RX]

  - TP1a: TX Device/PKG + H2M Channels
    - Set ‘zero’ to related RX PKG & on-die settings

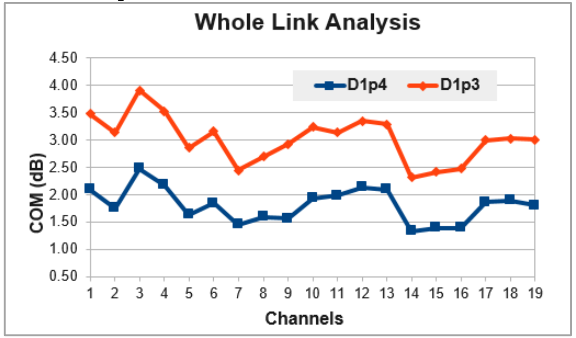
Impacts to COM, EH & VEC from New Test Method Adopted by D1p4 – D1p3 vs. D1p4

- Considerations of the following parameter changes from D1p3 to D1p4
  - EH/VEC methodology: T_O = 25 → 50 mUI
  - New parameters: samples_for_C2M (Samples/UI for C2M) = 100
- Observations
  - EH & VEC does degrade based on new method
  - EH & VEC values are sensitive to ‘samples_for_C2M’, shall consider values larger than 32

Whole Link Analysis – COM Impact

			COM (dB)	D1p4	D1p3
lim_3ck_01a_0319	lim_3ck_01_0319_c2m.zip	Tx7_L10	112G_16dB_(QSFPDD+module card)_TX7_L10	2.09	3.48
		Tx7_L23	112G_16dB_(QSFPDD+module card)_TX7_L23	1.75	3.13
		Tx3_L10	112G_16dB_(QSFPDD+module card)_TX3_L10	2.47	3.90
		Tx3_L23	112G_16dB_(QSFPDD+module card)_TX3_L23	2.17	3.52
		Tx7_Asic	112G_16dB_(QSFPDD+module card)_TX7_Asic	1.63	2.85
		Tx3_Asic	112G_16dB_(QSFPDD+module card)_TX3_Asic	1.85	3.15
lim_3ck_adhoc_01_073119	lim_3ck_adhoc_02_073119.zip	Ch5a_2"	Channel5a_Smaller_Pad_2inch_trace	1.45	2.44
		Ch5b_3"	Channel5b_Smaller_Pad_3inch_trace	1.59	2.69
		Ch5c_4"	Channel5c_Smaller_Pad_4inch_trace	1.57	2.92
		Ch5d_9"	Channel5d_Smaller_Pad_9inch_trace	1.93	3.24
akinwale_3ck_adhoc_01a_08282019	akinwale_3ck_C2M_channels_TP0a_100ohms_08222019.zip	2''100Ohm	C2M_2p0in_100Ohm_thru1.s4p	1.99	3.14
		3''100Ohm	C2M_3p0in_100Ohm_thru1.s4p	2.13	3.34
		4''100Ohm	C2M_4p0in_100Ohm_thru1.s4p	2.09	3.28
	akinwale_3ck_C2M_channels_TP0a_85ohms_08222019.zip	2''85Ohm	C2M_2p0in_85Ohm_thru1.s4p	1.33	2.31
		3''85Ohm	C2M_3p0in_85Ohm_thru1.s4p	1.39	2.41
		4''85Ohm	C2M_4p0in_85Ohm_thru1.s4p	1.39	2.47
	akinwale_3ck_C2M_channels_TP0a_95Ohms_08222019.zip	2''95Ohm	C2M_2p0in_95Ohm_thru1.s4p	1.86	2.99
		3''95Ohm	C2M_3p0in_95Ohm_thru1.s4p	1.89	3.03
		4''95Ohm	C2M_4p0in_95Ohm_thru1.s4p	1.80	3.00
			AVG Diff (D1p3 as basis)	-1.21	

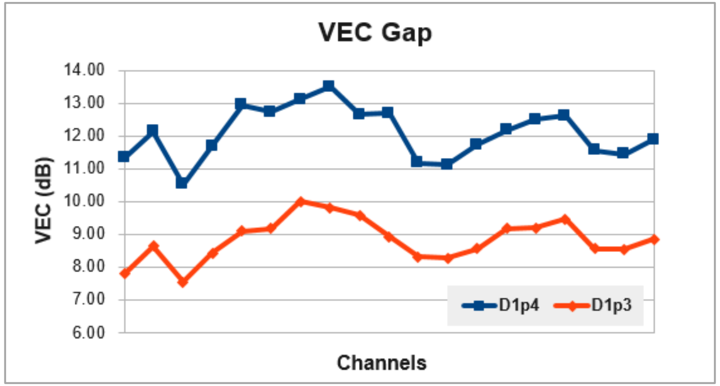
Modified COM threshold = 3 – 1.2 = 1.8dB

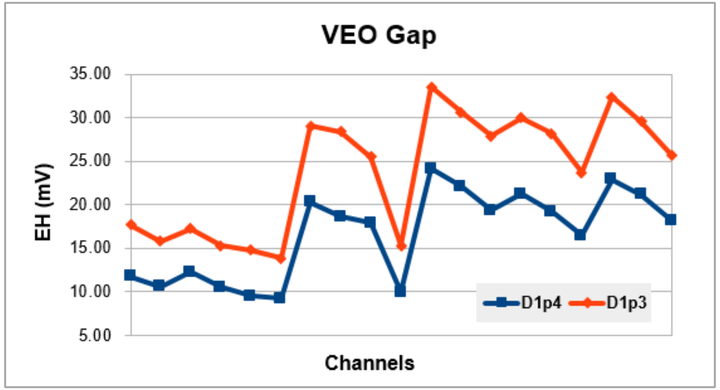


- Since we had considered more impairments to derive COM, EH & VEC,
  - Set 3 dB as COM threshold is no longer valid
  - Take into account of COM impact from new method in D1p4, COM threshold shall be set as **1.8** dB for the following analysis

TP1a Analysis – Impact to VEC & VEO (EH)

				VEC (dB)		EH (mv)	
				D1p4	D1p3	D1p4	D1p3
lim_3ck_01a_0319	lim_3ck_01_0319_c2m.zip	Tx7_L10	112G_16dB_(QSFPDD+module card)_TX7_L10	11.32	7.79	11.76	17.65
		Tx7_L23	112G_16dB_(QSFPDD+module card)_TX7_L23	12.13	8.64	10.56	15.78
		Tx3_L10	112G_16dB_(QSFPDD+module card)_TX3_L10	10.51	7.54	12.24	17.23
		Tx3_L23	112G_16dB_(QSFPDD+module card)_TX3_L23	11.69	8.42	10.49	15.30
		Tx7_Asic	112G_16dB_(QSFPDD+module card)_TX7_Asic	12.93	9.10	9.51	14.78
		Tx3_Asic	112G_16dB_(QSFPDD+module card)_TX3_Asic	12.73	9.18	9.20	13.85
lim_3ck_adhoc_01_	073119 lim_3ck_adhoc_02_073119.zip	Ch5a_2"	Channel5a_Smaller_Pad_2inch_trace	13.12	10.00	20.30	29.06
		Ch5b_3"	Channel5b_Smaller_Pad_3inch_trace	13.48	9.81	18.60	28.40
		Ch5c_4"	Channel5c_Smaller_Pad_4inch_trace	12.64	9.58	17.91	25.47
		Ch5d_9"	Channel5d_Smaller_Pad_9inch_trace	12.69	8.92	9.93	15.32
akinwale_3ck_adhoc_01a_08282019	akinwale_3ck_C2M_channels_TP0a_100ohms_08222019.zip	2''100Ohm	C2M_2p0in_100Ohm_thru1.s4p	11.17	8.31	24.09	33.49
		3''100Ohm	C2M_3p0in_100Ohm_thru1.s4p	11.12	8.27	22.07	30.62
		4''100Ohm	C2M_4p0in_100Ohm_thru1.s4p	11.73	8.57	19.35	27.86
	akinwale_3ck_C2M_channels_TP0a_85ohms_08222019.zip	2''85Ohm	C2M_2p0in_85Ohm_thru1.s4p	12.17	9.17	21.21	29.96
		3''85Ohm	C2M_3p0in_85Ohm_thru1.s4p	12.50	9.19	19.22	28.14
		4''85Ohm	C2M_4p0in_85Ohm_thru1.s4p	12.60	9.46	16.48	23.66
	akinwale_3ck_C2M_channels_TP0a_95Ohms_08222019.zip	2''95Ohm	C2M_2p0in_95Ohm_thru1.s4p	11.55	8.56	22.91	32.33
		3''95Ohm	C2M_3p0in_95Ohm_thru1.s4p	11.44	8.54	21.14	29.54
		4''95Ohm	C2M_4p0in_95Ohm_thru1.s4p	11.88	8.85	18.15	25.72
			Diff (D1p3 as basis)	3.24		-7.32	



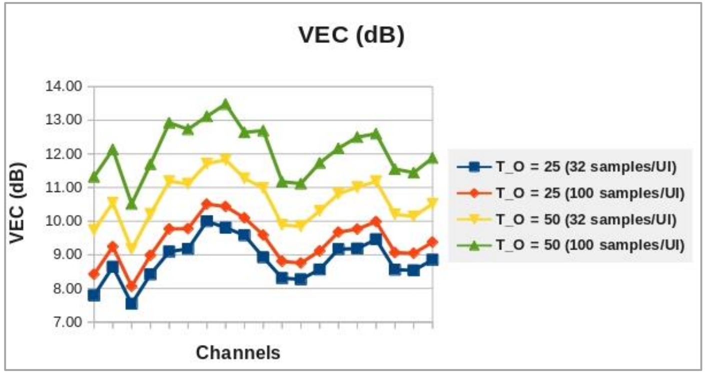


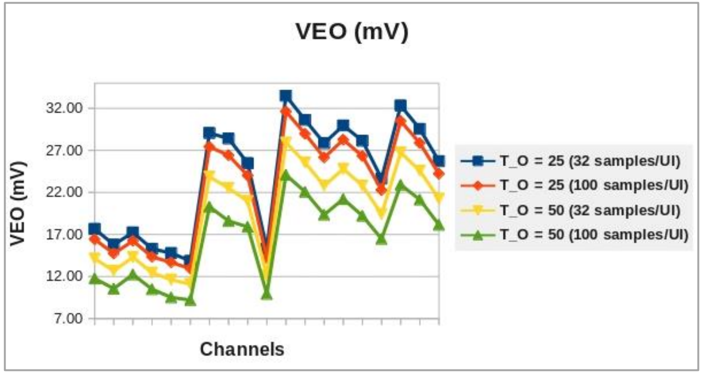
Time Interval and Samples for C2M

- Time interval for eye analysis
  - D1p3: 25 mUI
  - D1p4: 50 mUI
- Samples/UI for C2M (take it as M1)
  - M1 = [32 100]
  - VEC & EH difference is **1.46 dB** & **-2.97 mV** among M1 = 32 & 100 under T_O = 50 mUI
- We need to specify M1 clearly
  - Propose to set M1 = 100

T_O (mUI)	25	25	50	50
Samples/UI	32	100	32	100
112G_16dB_(QSFPDD+module card)_TX7_L10	7.79	8.42	9.73	11.32
112G_16dB_(QSFPDD+module card)_TX7_L23	8.64	9.24	10.55	12.13
112G_16dB_(QSFPDD+module card)_TX3_L10	7.54	8.06	9.17	10.51
112G_16dB_(QSFPDD+module card)_TX3_L23	8.42	8.98	10.21	11.69
112G_16dB_(QSFPDD+module card)_TX7_Asic	9.10	9.77	11.18	12.93
112G_16dB_(QSFPDD+module card)_TX3_Asic	9.18	9.78	11.11	12.73
Channel5a_Smaller_Pad_2inch_trace	10.00	10.51	11.71	13.12
Channel5b_Smaller_Pad_3inch_trace	9.81	10.43	11.82	13.48
Channel5c_Smaller_Pad_4inch_trace	9.58	10.10	11.27	12.64
Channel5d_Smaller_Pad_9inch_trace	8.92	9.59	10.98	12.69
C2M_2p0in_100Ohm_thru1.s4p	8.31	8.81	9.89	11.17
C2M_3p0in_100Ohm_thru1.s4p	8.27	8.76	9.85	11.12
C2M_4p0in_100Ohm_thru1.s4p	8.57	9.12	10.31	11.73
C2M_2p0in_85Ohm_thru1.s4p	9.17	9.68	10.81	12.17
C2M_3p0in_85Ohm_thru1.s4p	9.19	9.76	11.01	12.50
C2M_4p0in_85Ohm_thru1.s4p	9.46	9.99	11.18	12.60
C2M_2p0in_95Ohm_thru1.s4p	8.56	9.07	10.20	11.55
C2M_3p0in_95Ohm_thru1.s4p	8.54	9.05	10.14	11.44
C2M_4p0in_95Ohm_thru1.s4p	8.85	9.37	10.52	11.88
VEC Avg	8.84	9.39	10.61	12.07

T_O (mUI)	25	25	50	50
Samples/UI	32	100	32	100
112G_16dB_(QSFPDD+module card)_TX7_L10	17.65	16.42	14.12	11.76
112G_16dB_(QSFPDD+module card)_TX7_L23	15.78	14.73	12.67	10.56
112G_16dB_(QSFPDD+module card)_TX3_L10	17.23	16.24	14.30	12.24
112G_16dB_(QSFPDD+module card)_TX3_L23	15.30	14.33	12.44	10.49
112G_16dB_(QSFPDD+module card)_TX7_Asic	14.78	13.68	11.62	9.51
112G_16dB_(QSFPDD+module card)_TX3_Asic	13.85	12.93	11.09	9.20
Channel5a_Smaller_Pad_2inch_trace	29.06	27.42	23.87	20.30
Channel5b_Smaller_Pad_3inch_trace	28.40	26.42	22.51	18.60
Channel5c_Smaller_Pad_4inch_trace	25.47	24.00	20.97	17.91
Channel5d_Smaller_Pad_9inch_trace	15.32	14.19	12.09	9.93
C2M_2p0in_100Ohm_thru1.s4p	33.49	31.63	27.92	24.09
C2M_3p0in_100Ohm_thru1.s4p	30.62	28.96	25.55	22.07
C2M_4p0in_100Ohm_thru1.s4p	27.86	26.14	22.79	19.35
C2M_2p0in_85Ohm_thru1.s4p	29.96	28.26	24.79	21.21
C2M_3p0in_85Ohm_thru1.s4p	28.14	26.33	22.81	19.22
C2M_4p0in_85Ohm_thru1.s4p	23.66	22.26	19.40	16.48
C2M_2p0in_95Ohm_thru1.s4p	32.33	30.49	26.75	22.91
C2M_3p0in_95Ohm_thru1.s4p	29.54	27.87	24.57	21.14
C2M_4p0in_95Ohm_thru1.s4p	25.72	24.22	21.24	18.15
VEO Avg	23.90	22.45	19.55	16.58





Summary of Impacts from New Test Method

- Difference of COM, VEC, & EH (D1p4 – D1p3)

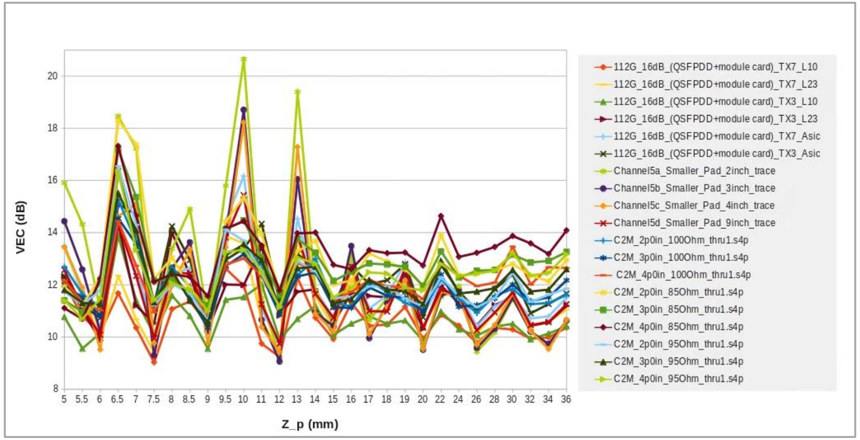
Item	Difference
COM	-1.21 dB
VEC	3.24 dB
EH	-7.32 mV

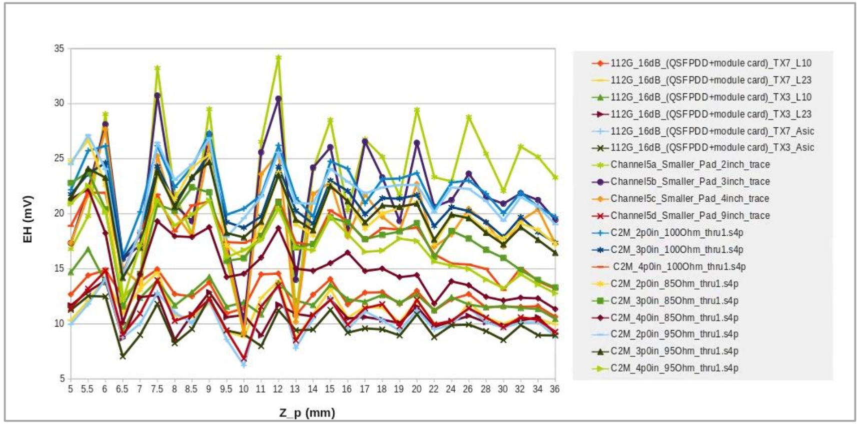
- Difference of VEC & EH by different Samples/UI for C2M (100 – 32)

Item	Difference
VEC	1.46 dB
EH	-2.97 mV

TP1a Analysis Observation

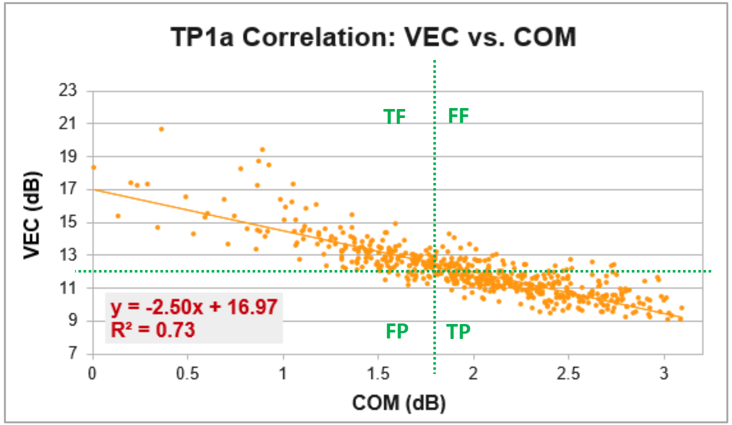
- Based on M1 = 100
- VEC/EH performance variations are higher in short channels, comparing to long ones
- EH values of short and long channels are separated into two obvious groups
  - We need to set EH (min) spec carefully to avoid falsely failing good short channels
- Solutions: do the correlation to COM

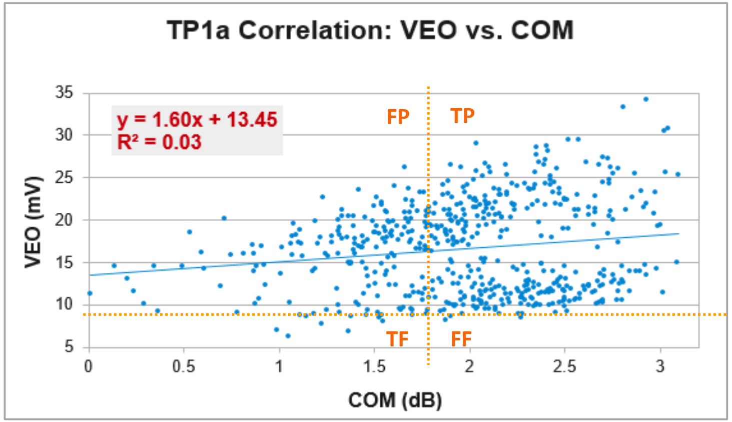




EH/VEC vs. COM Correlation – Check Correlation

- Take COM >= **1.8** dB as pass indicator
- Correlation of COM and VEC/VEO
  - VEC (dB) is kind of correlated to COM in whole link analysis, while EH (mV) doesn't
  - VEC: $R^2 = 0.73$
  - VEO (EH): $R^2 = 0.03$
- Which is better indicators? VEC vs. EH
  - VEC is a very good indicator for DUT performance
  - EH is NOT strongly correlated to COM, especially for short channels
- Too high of EH threshold risks over-kill good DUT



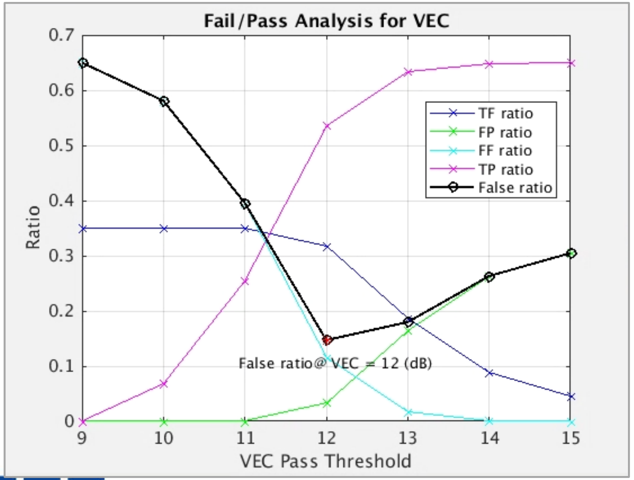


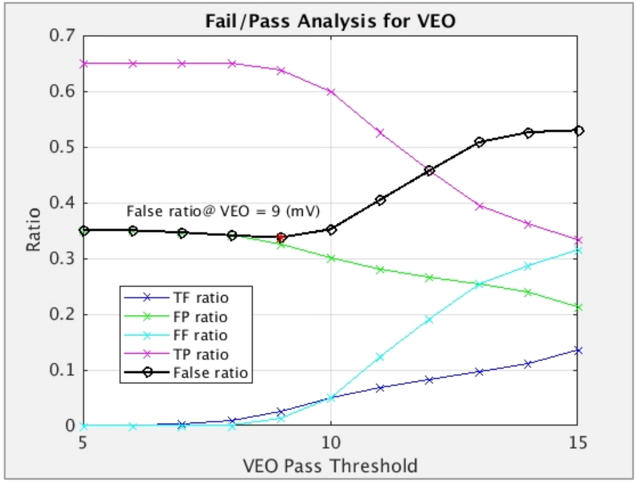
Pass/Fail Analysis – Take False Ratio as Criterion

- Definitions of True/False-Pass/Fail

	VEC <= pass threshold (VEO >= pass threshold)	VEC > pass threshold (VEO < pass threshold)
COM >= **1.8** dB	True-Pass (TP)	False-Fail (FF)
COM < **1.8** dB	False-Pass (FP)	True-Fail (TF)

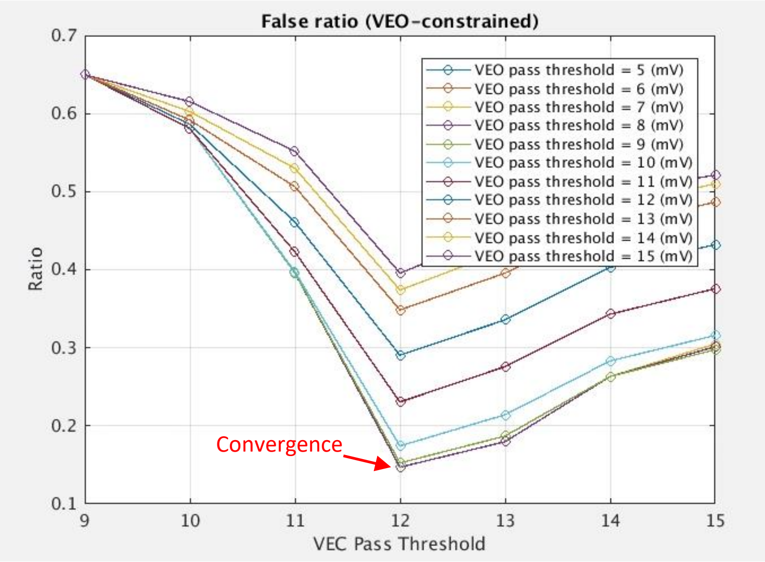
- Take COM >= **1.8** dB as pass indicator
- Find VEC & EH thresholds to minimize False ratio = FP + FF ratios
  - VEC = 12 dB with 14.70% False ratio
  - EH = 9 mV with 33.76% False ratio → quite high, not a good indicator for performance
- Next: Combine two of them





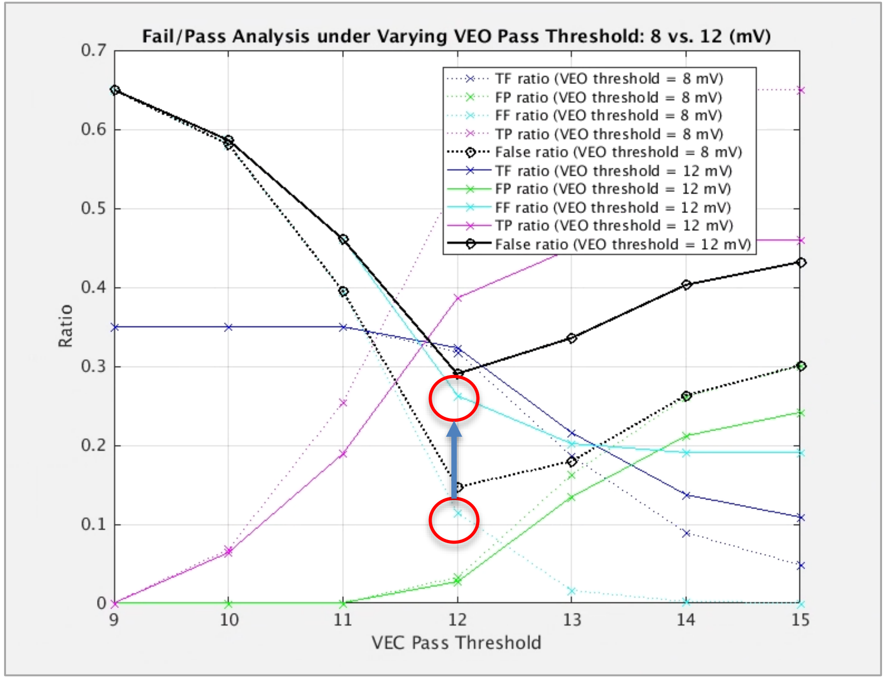
Joint Correlation of VEC/VEO

- VEO-constrained VEC is adopted to conjunctively combine separate pass/fail decisions
  - The procedure adopted in D1p4
  - Filtering samples that didn't meet VEO requirement → [5:15] mV
- Optimal false ratio converges at (with False ratio = 14.7%)
  - VEC pass threshold = 12 dB
  - VEO pass threshold = 8 mV
- Q: is EH (min) = 8 mV too small the value?



Increasing EH (min) doesn't Help, but Hurt

- Increasing EH (min) from 8 mV to 12 mV, for example
  - Actually over-kill good DUT (~15% False-Fail ratio increase)
  - No benefits to drop false-passed bad DUT (nearly the same False-Pass ratio)
- The major indicator shall be VEC (max) & keep EH (min) low enough to avoid over-kill good Host DUT
- Analysis also shows -7.32 mV EH decrease due to new method in D1p4
  - EH (min) = 15 mV as old method



Summary & Proposals

- New TP1a test method impacts VEC & EH & we need new thresholds in D1p5 to reflect that
  - Impact to VEC & EH = +3.24 dB & -7.32 mV
- Based on COM vs. VEC/EH correlation to derive the following new thresholds for D1p5

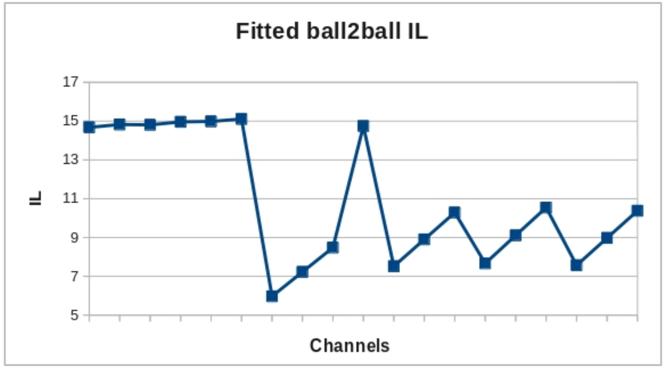
Spec	D1p4	D1p5
VEC	9 dB	12 dB
EH	15 mV	8 mV
M1, samples_for_C2M	N/A	100

Thank You

C2M Host-to-Module Channels for Analysis

🔴 Short Channel
🔵 Long Channel

Contribution	Zip files	Channel	SxP Files	
lim_3ck_01a_0319	lim_3ck_01_0319_c2m.zip	Tx7_L10	112G_16dB_(QSFPDD+module card)_TX7_L10	🔵
		Tx7_L23	112G_16dB_(QSFPDD+module card)_TX7_L23	🔵
		Tx3_L10	112G_16dB_(QSFPDD+module card)_TX3_L10	🔵
		Tx3_L23	112G_16dB_(QSFPDD+module card)_TX3_L23	🔵
		Tx7_Asic	112G_16dB_(QSFPDD+module card)_TX7_Asic	🔵
		Tx3_Asic	112G_16dB_(QSFPDD+module card)_TX3_Asic	🔵
lim_3ck_adhoc_01_	073119 lim_3ck_adhoc_02_073119.zip	Ch5a_2"	Channel5a_Smaller_Pad_2inch_trace	🔴
		Ch5b_3"	Channel5b_Smaller_Pad_3inch_trace	🔴
		Ch5c_4"	Channel5c_Smaller_Pad_4inch_trace	🔴
		Ch5d_9"	Channel5d_Smaller_Pad_9inch_trace	🔵
akinwale_3ck_adhoc_01a_08282019	akinwale_3ck_C2M_channels_TP0a_100ohms_08222019.zip	2''100Ohm	C2M_2p0in_100Ohm_thru1.s4p	🔴
		3''100Ohm	C2M_3p0in_100Ohm_thru1.s4p	🔴
		4''100Ohm	C2M_4p0in_100Ohm_thru1.s4p	🔴
	akinwale_3ck_C2M_channels_TP0a_85ohms_08222019.zip	2''85Ohm	C2M_2p0in_85Ohm_thru1.s4p	🔴
		3''85Ohm	C2M_3p0in_85Ohm_thru1.s4p	🔴
		4''85Ohm	C2M_4p0in_85Ohm_thru1.s4p	🔴
	akinwale_3ck_C2M_channels_TP0a_93Ohms_08222019.zip	2''93Ohm	C2M_2p0in_93Ohm_thru1.s4p	🔴
		3''93Ohm	C2M_3p0in_93Ohm_thru1.s4p	🔴
		4"93Ohm	C2M_4p0in_93Ohm_thru1.s4p	🔴



COM Settings – Whole Link (for COM Value)

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 0.85e-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 16 ; 1.8 1.8]	mm	[test cases]	
z_p (NEXT)	[2 8 ; 0 0]	mm	[test cases]	
z_p (FEXT)	[12 16 ; 1.8 1.8]	mm	[test cases]	
z_p (RX)	[2 8 ; 0 0]	mm	[test cases]	
C_p	[0.87e-4 0.65e-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	Samp/UI		
samples_for_C2M	100	Samp/UI		
T_O	50	mUI		
AC_CM_RMS	0	V	[test cases]	[0.0235 0.0256]
filter and Eq				
f_r	0.75	*fb		
c(0)	0.54		min	
c(-1)	[-0.2:0.02:0]		[min:step:max]	
c(-2)	[0:0.02:0.1]		[min:step:max]	
c(-3)	[0]		[min:step:max]	
c(1)	[-0.1:0.02:0]		[min:step:max]	
N_b	4	UI		
b_max(1)	0.4		As/dffe1	
b_max(2..N_b)	[0.15 **0.10** **0.1**]		As/dfe2..N_b	
b_min(1)	0.1		As/dffe1	
b_min(2..N_b)	[-0.15 **- 0.05** **- 0.05**]		As/dfe2..N_b	
g_DC	[-13:1:-0]	dB	[min:step:max]	
f_z	12.58	GHz		
f_p1	20	GHz		
f_p2	28	GHz		
g_DC_HP	[-3:0.5:0]		[min:step:max]	
f_HP_PZ	1.328125	GHz		
G_Qual	[-2-9 ;-2-12; -4-12;-6-13]	dB	ranges	
G2_Qual	[0 -1 -2-3]	dB	ranges	

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	0	logical
CSV_REPORT	0	logical
RESULT_DIR	.\results\100GEL_C2M_host_{date	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	C2M_eval_	
COM_CONTRIBUTIO	0	logical
Local Search	2	
Operational		
VEC Pass threshold	9	db
EH_min	15	mV
ERL Pass threshold	7.3	dB
DER_0	0.00001	
T_r	0.0075	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]
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	4.10E-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 0.0009909 0.0002772]	
package_tl_tau	6.141E-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	40	GHz
A_ft	0.600	V
A_nt	0.600	V

new	
upodated for D1.4	

Floating Tap Control			
N_bg	0	0 1 2 or 3 groups	
N_bf	3	taps per group	
N_f	40	span for floating taps	
bmaxg	0.2	FE value for floating taps	
for TP4-->	[1.2e-4 0]	nF	[TX RX]
	[0.12 0]	nH	[TX RX]
	[0.3e-4 0]	nF	[TX RX]
	[1 2 3]		[test cases to run]
	[2 7 8]	mm	[test cases]
	[0 0 0]	mm	[test cases]
	[2 7 8]	mm	[test cases]
	[0 0 0]	mm	[test cases]
	[0 0.87e-4]	nF	[TX RX]

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

COM Settings – TP1a

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 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)	[12 16; 1.8 1.8]	mm	[test cases]	
z_p (NEXT)	[0 0 ; 0 0]	mm	[test cases]	
z_p (FEXT)	[12 16; 1.8 1.8]	mm	[test cases]	
z_p (RX)	[0 0 ; 0 0]	mm	[test cases]	
C_p	[0.87e-4 0]	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	Samp/UI		
samples_for_C2M	100	Samp/UI		
T_O	50	mUI		
AC_CM_RMS	0	V	[test cases]	[0.0235 0.0256]
filter and Eq				
f_r	0.75	*fb		
c(0)	0.54		min	
c(-1)	[-0.2:0.02:0]		[min:step:max]	
c(-2)	[0:0.02:0.1]		[min:step:max]	
c(-3)	[0]		[min:step:max]	
c(1)	[-0.1:0.02:0]		[min:step:max]	
N_b	4	UI		
b_max(1)	0.4		As/dffe1	
b_max(2..N_b)	[0.15 **0.10** **0.1**]		As/dfe2..N_b	
b_min(1)	0.1		As/dffe1	
b_min(2..N_b)	[-0.15 **- 0.05** **- 0.05**]		As/dfe2..N_b	
g_DC	[-13:1:-0]	dB	[min:step:max]	
f_z	12.58	GHz		
f_p1	20	GHz		
f_p2	28	GHz		
g_DC_HP	[-3:0.5:0]		[min:step:max]	
f_HP_PZ	1.328125	GHz		
G_Qual	[-2-9 ;-2-12; -4-12;-6-13]	dB	ranges	
G2_Qual	[0 -1 -2-3]	dB	ranges	

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	0	logical
CSV_REPORT	0	logical
RESULT_DIR	.\results\100GEL_C2M_host_{date	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	C2M_eval_	
COM_CONTRIBUTIO	0	logical
Local Search	2	
Operational		
VEC Pass threshold	9	db
EH_min	15	mV
ERL Pass threshold	7.3	dB
DER_0	0.00001	
T_r	0.0075	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]
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	4.10E-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 0.0009909 0.0002772]	
package_tl_tau	6.141E-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	40	GHz
A_ft	0.600	V
A_nt	0.600	V

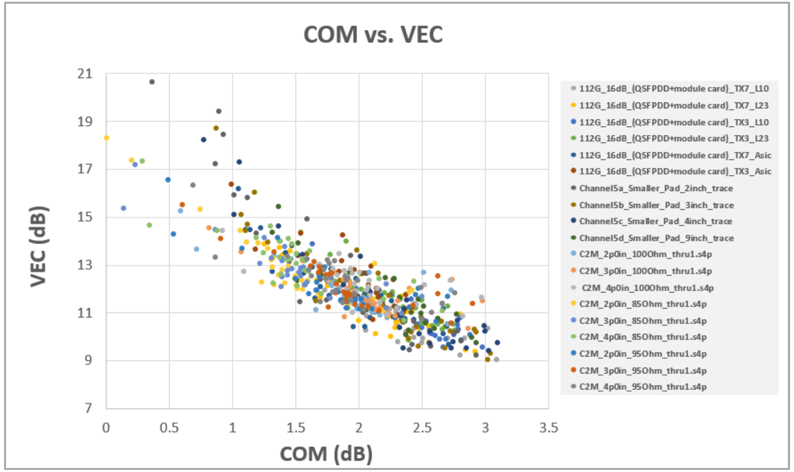
new
upodated for D1.4

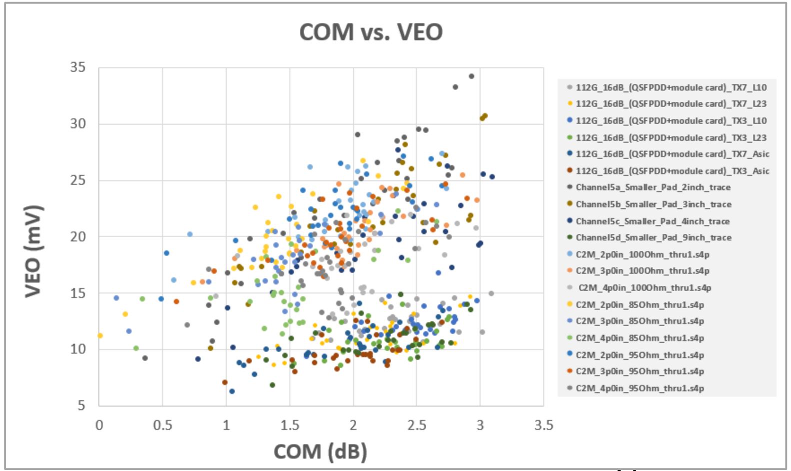
Floating Tap Control			
N_bg	0	0 1 2 or 3 groups	
N_bf	3	taps per group	
N_f	40	span for floating taps	
bmaxg	0.2	FE value for floating taps	
for TP4-->	[1.2e-4 0]	nF	[TX RX]
	[0.12 0]	nH	[TX RX]
	[0.3e-4 0]	nF	[TX RX]
	[1 2 3]		[test cases to run]
	[2 7 8]	mm	[test cases]
	[0 0 0]	mm	[test cases]
	[2 7 8]	mm	[test cases]
	[0 0 0]	mm	[test cases]
	[0 0.87e-4]	nF	[TX RX]

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

TP1a vs. Whole Link Correlation

- VEC (dB) is kind of correlated to COM in whole link analysis, while the correlation among EH (mV) & COM is less significant



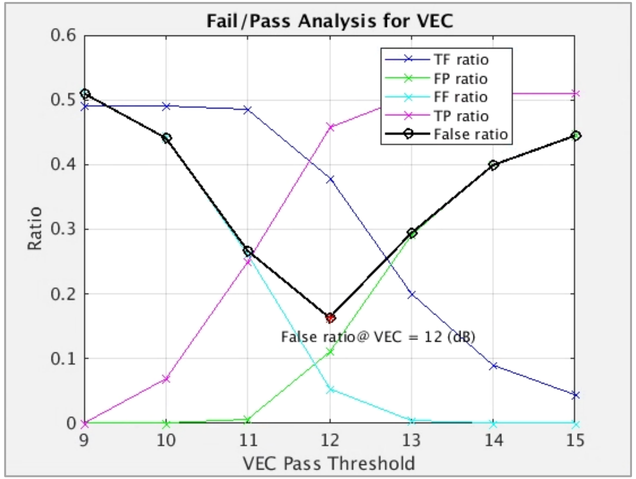


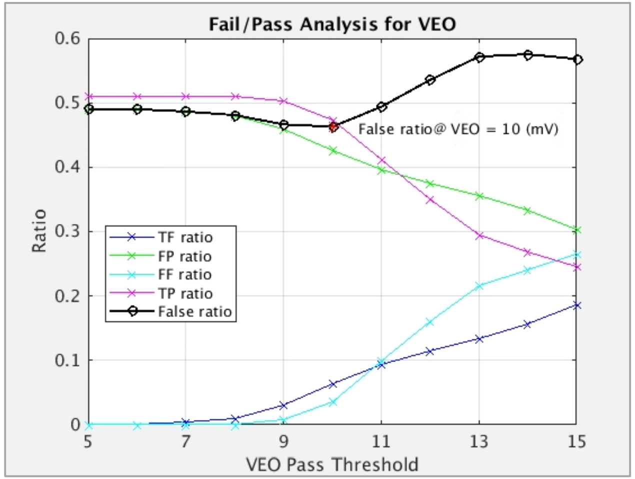
Pass/Fail Analysis – Take False ratio as criterion

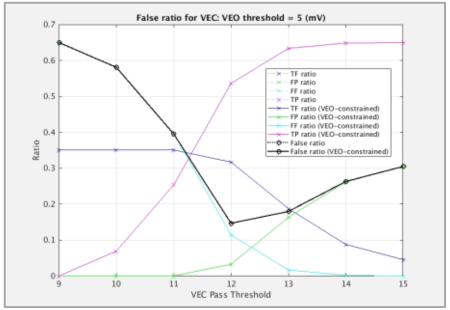
- Definition of True/False-Pass/Fail

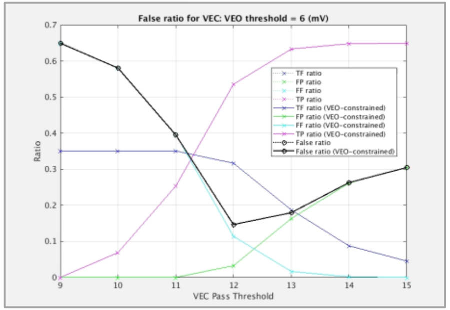
	VEC <= pass threshold (VEO >= pass threshold)	VEC > pass threshold (VEO < pass threshold)
COM >= **2** dB	True-Pass (TP)	False-Fail (FF)
COM < **2** dB	False-Pass (FP)	True-Fail (TF)

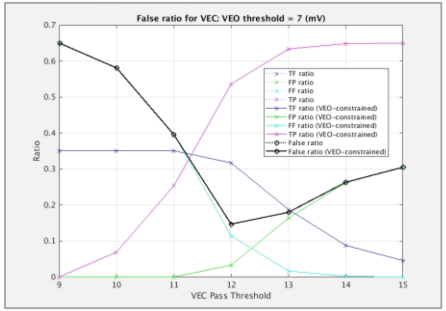
- Take COM >= **2** dB as pass indicator
- Find VEC & EH thresholds to minimize False ratio = FP + FF ratios
  - VEC = 12 dB with 16.33% False ratio
  - EH = 10 mV with 46.28% False ratio → quite high

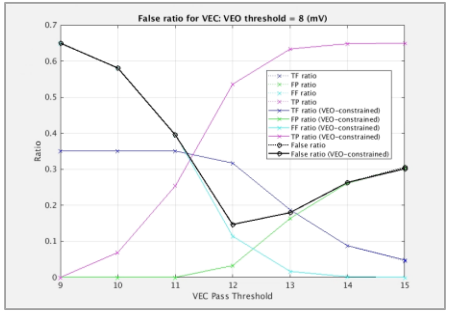


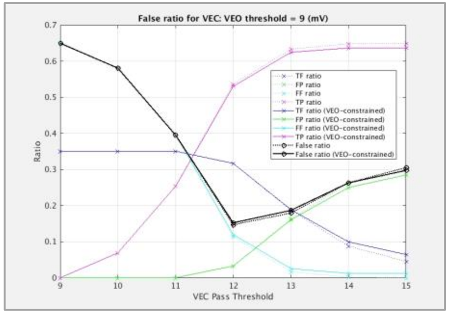


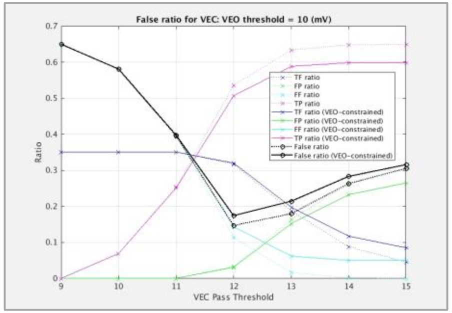

False ratio for VEC: VEO threshold = 5 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold

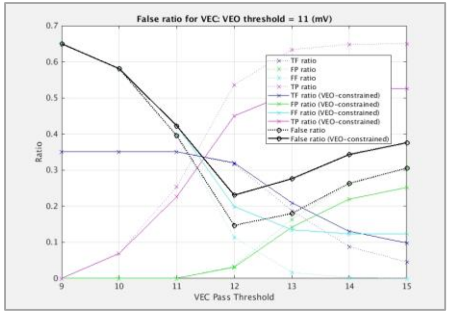

False ratio for VEC: VEO threshold = 6 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold

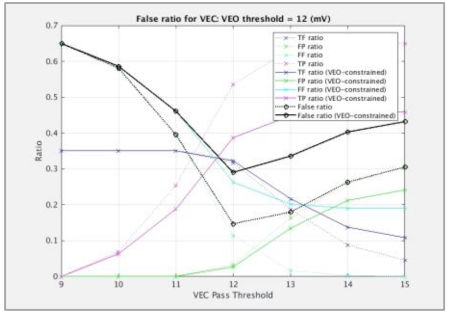

False ratio for VEC: VEO threshold = 7 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold

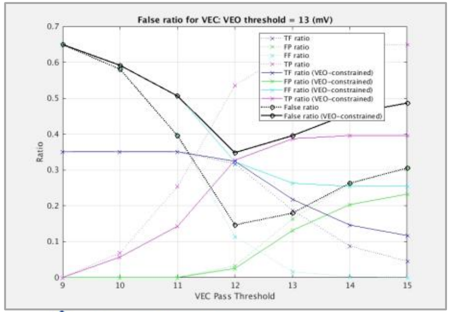

False ratio for VEC: VEO threshold = 8 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold

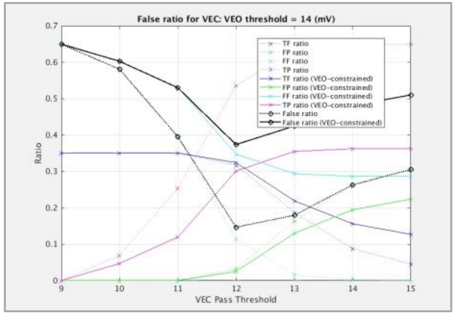

False ratio for VEC: VEO threshold = 9 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold

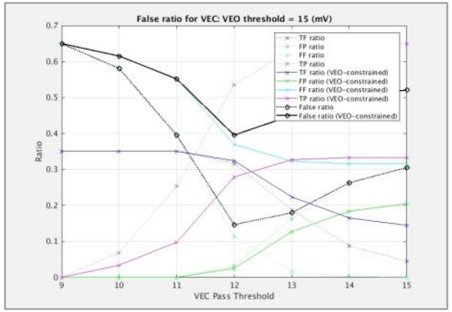

False ratio for VEC: VEO threshold = 10 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold


False ratio for VEC: VEO threshold = 11 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold


False ratio for VEC: VEO threshold = 12 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold


False ratio for VEC: VEO threshold = 13 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold


False ratio for VEC: VEO threshold = 14 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold


False ratio for VEC: VEO threshold = 15 (mV)
TF ratio
FP ratio
FF ratio
TP ratio
TF ratio (VEO-constrained)
FP ratio (VEO-constrained)
FF ratio (VEO-constrained)
TP ratio (VEO-constrained)
False ratio
False ratio (VEO-constrained)
Ratio
VEC Pass Threshold