C2M VEC thresholds

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Objective

- EVEC has been proposed in baseline sun_3ck_01b_1119. This contribution is to compare EVEC with traditional VEC and propose EVEC parameters.

- We also study the alternative approach proposed in sun_3ck_02_1119, which uses VEC with additional receiver noise.

EVEC

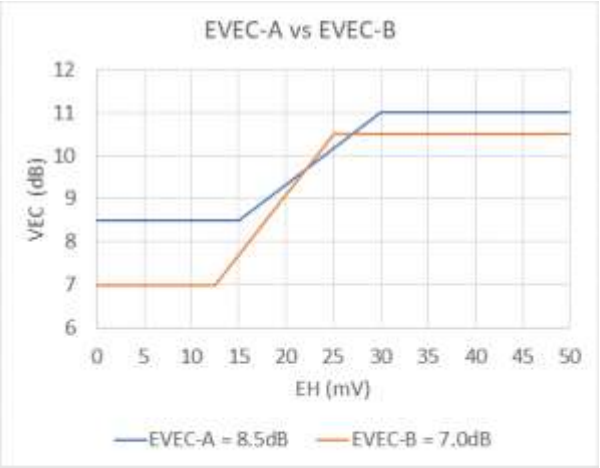
2 sets of EVEC parameters are analyzed:

EVEC parameter A: original EVEC proposal in sun_3ck_02_1119

$$\text{EVEC-A} = \begin{cases} VEC, & if\ EH < 15\ mV \\ VEC - 0.1667 * (EH - 15)\ dB, & if\ EH\ is\ between\ 15\ and\ 30\ mV \\ VEC - 2.5\ dB, & if\ EH > 30\ mV \end{cases}$$

EVEC parameter B: revised EVEC proposal in wu_3ck_02_0120

$$\text{EVEC-B} = \begin{cases} VEC, & if\ EH < 12.5\ mV \\ VEC - 0.28 * (EH - 12.5)\ dB, & if\ EH\ is\ between\ 12.5\ and\ 25\ mV \\ VEC - 3.5\ dB, & if\ EH > 25\ mV \end{cases}$$



Simulation Conditions

- Total 2146 test cases (Base 783 cases, additional 1363 cases)
  - 74 IEEE802.3ck C2M channels (Base 27 channels, additional 47 channels)
  - 29 cases of Tx PKG zp ([5:0.5:10 11:20 22:2:36] mm, same as wu_3ck_01a_1119)
  - 1 case of Rx PKG zp (0mm for TP1a, 6mm for whole link)
- COM parameters (details in back up slides)
  - Same as sun_3ck_02_1119 (slides 19,20) except eta_0 for ECOM and VECx30
  - COM 2.76

<table>
<tr><td>Label</td><td>TP1a</td><td>TPx15</td><td>TPx30</td><td>Whole Link</td><td>WLx15</td><td>WLx30</td></tr>
<tr><td>Measured value</td><td>EH/VEC/EVEC-[AB]</td><td>VECx15</td><td>VECx30</td><td>COM</td><td>ECOMx15</td><td>ECOMx30</td></tr>
<tr><td>Pass/fail criteria of whole link</td><td>COM, ECOMx15, or ECOMx30</td><td>ECOMx15</td><td>ECOMx30</td><td>3dB COM</td><td>adjusted (to same pass rate as 3dB COM)</td><td>adjusted (to same pass rate as 3dB COM)</td></tr>
<tr><td>eta_0 (V^2/GHz)</td><td>0.82E-8</td><td>12.3E-8</td><td>24.6E-8</td><td>0.82E-8</td><td>12.3E-8</td><td>24.6E-8</td></tr>
<tr><td>Rx package zp</td><td colspan="3">0mm</td><td colspan="3">6mm</td></tr>
<tr><td>TX FIR</td><td colspan="3">3 pre, 1 post
optimized for each case</td><td colspan="3">Coefficients fixed to
the optimization result of TP1a</td></tr>
<tr><td>CTLE</td><td colspan="3">2 zero, 3 poles
optimized for each case</td><td colspan="3">2 zero, 3 poles
optimized for each case</td></tr>
<tr><td>DFE</td><td colspan="3">4 tap (bmax1=0.5, bmax[2-4]=0.2)
optimized for each case</td><td colspan="3">4 tap (bmax1=0.5, bmax[2-4]=0.2)
optimized for each case</td></tr>
</table>

Base Short Channel Set

ID	Channel Description	IL (dB)	ERL22 (dB)	ICN (mV)	ILD (dB)
1	lim_3ck_adhoc_01_073119\2inch	5.67	11.41~12.16	3.52	0.16
2	lim_3ck_adhoc_01_073119\3inch	6.94	12.43~13.12	3.05	0.15
3	lim_3ck_adhoc_01_073119\4inch	8.22	13.30~13.81	2.65	0.14
4	lim_3ck_adhoc_01_073119\9inch	14.55	15.97~16.17	1.34	0.13
5	akinwale_3ck_adhoc_01a_08282019\2inch	7.15	13.76~14.63	5.54	0.36
6	akinwale_3ck_adhoc_01a_08282019\3inch	8.37	14.84~15.58	5.24	0.36
7	akinwale_3ck_adhoc_01a_08282019\4inch	9.70	15.70~16.34	5.01	0.36

- Same channels as sun_3ck_02_1119, slide 5.

Base Long Channel Set

ID	Channel Description	Vote in May	IL (dB)	ERL22 (dB)	ICN (mV)	ILD (dB)
8	mellitz_3ck_01_0518_C2M\9dB	Pass	8.95	15.00~15.79	2.10	0.10
9	mellitz_3ck_01_0518_C2M\10dB	Fail	9.96	11.11~11.51	4.27	0.48
10	mellitz_3ck_01_0518_C2M\11dB	Pass	11.16	15.93~16.35	1.75	0.09
11	mellitz_3ck_01_0518_C2M\12dB	Fail	12.18	12.72~13.07	3.75	0.46
12	mellitz_3ck_01_0518_C2M\13dB	Pass	13.12	16.84~17.12	1.50	0.09
13	mellitz_3ck_01_0518_C2M\14dB	Fail	13.87	14.26~14.52	2.98	0.47
14	tracy_3ck_02a_1119\5inch host\TX5	TBD	7.84	14.47~15.26	1.53	0.12
15	tracy_3ck_02a_1119\5inch host\TX6	TBD	8.54	15.04~15.77	1.90	0.13
16	tracy_3ck_02a_1119\10inch host\TX5	TBD	13.57	16.22~16.48	0.86	0.12
17	tracy_3ck_02a_1119\10inch host\TX6	TBD	14.28	17.13~17.43	1.01	0.14
18	lim_3ck_01_0319_QDD_new_pad\ch1	Pass	14.40	22.03~22.62	0.73	0.20
19	lim_3ck_01_0319_QDD_new_pad\ch2	Pass	14.60	21.28~21.80	0.76	0.19
20	lim_3ck_01_0319_QDD_legacy_pad\ch3	Pass	14.69	17.90~18.23	0.72	0.20
21	llim_3ck_01_0319_QDD_legacy_pad\ch4	Pass	14.84	17.56~17.84	0.81	0.18
22	llim_3ck_01_0319_QDD_new_pad\ch5	TBD	14.77	21.71~22.29	1.34	0.16
23	llim_3ck_01_0319_QDD_legacy_pad\ch6	Pass	15.02	17.82~18.14	1.47	0.17
24	ito_3ck_01_1118\QSFP \bottom normal\	Pass	15.10	11.32~11.42	1.14	0.18
25	ito_3ck_01_1118\QSFP \bottom worst\	TBD	15.58	11.10~11.19	1.09	0.32
26	ito_3ck_01_1118\QSFP \top normal\	Pass	14.53	11.41~11.51	1.19	0.18
27	ito_3ck_01_1118\QSFP \top worst\	TBD	14.49	11.13~11.21	1.14	0.31

- Based on channels in sun_3ck_02_1119, slide 4.
- Channels 14 thru 17 are replaced with updated channels.

Additional Channel Set

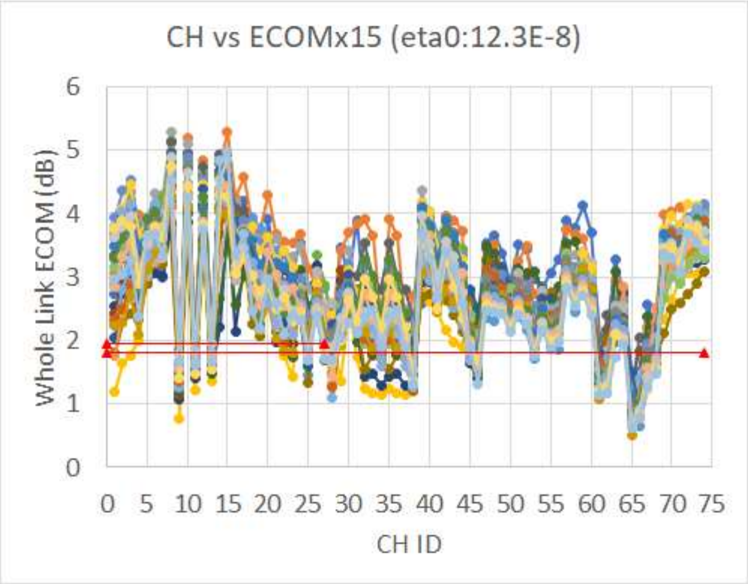
ID	Channel Description	IL (dB)	ERL22 (dB)	ICN (mV)	ILD (dB)
28-29	tracy_100GEL_02_0118\long_barrel_via\TX{5,6}	16.08~16.48	13.48~13.85	0.86~0.86	0.28~0.37
30-31	tracy_100GEL_06_0118\Microvia\RX{6,5}	14.57~14.59	14.43~15.84	0.79~0.89	0.21~0.23
32~34	lim_100GEL_02_0318\{10,12,14}dB	10.03~13.96	11.48~12.70	2.34~2.93	0.13~0.13
35~38	lim_3ck_01_0718\{10,12,14,16}dB	10.03~15.90	11.48~12.90	2.15~2.93	0.13~0.13
39~41	lim_3ck_01_0918_QDD_new_pairs\{12,14,16}dB	12.19~15.96	12.35~13.06	2.38~3.09	0.12~0.13
42~44	lim_3ck_01_0918_QDD_legacy_pairs\{12,14,16}dB	12.75~15.83	12.67~13.21	1.98~2.52	0.11~0.11
45~48	ito_3ck_01_1118\CFP2\{bottom,top}{normal,worst}	14.66~15.10	8.51~10.45	0.91~1.10	0.16~0.26
49~52	ito_3ck_01_1118\CFP8\{bottom,top}{normal,worst}	15.07~15.81	9.07~10.34	0.79~0.96	0.16~0.22
53~56	ito_3ck_01_1118\DSFP\{bottom,top}{normal,worst}	14.71~16.50	7.84~9.50	0.25~0.30	0.24~0.28
57~60	ito_3ck_01_1118\OSFP\{bottom,top}{normal,worst}	14.08~14.42	9.79~10.29	0.59~0.78	0.15~0.23
61~68	ito_3ck_01_1118\QSFPDD\{legacy,additional}{bottom,top}{normal,worst}	14.36~15.86	10.69~11.95	1.21~4.74	0.18~0.50
69~71	akinwale_3ck_adhoc_01a_08282019_85ohm\{2,3,4}inch	7.27~10.14	10.54~12.94	4.97~5.50	0.36~0.37
72~74	akinwale_3ck_adhoc_01a_08282019_93ohm\{2,3,4}inch	7.36~10.03	12.28~14.93	4.99~5.53	0.35~0.36

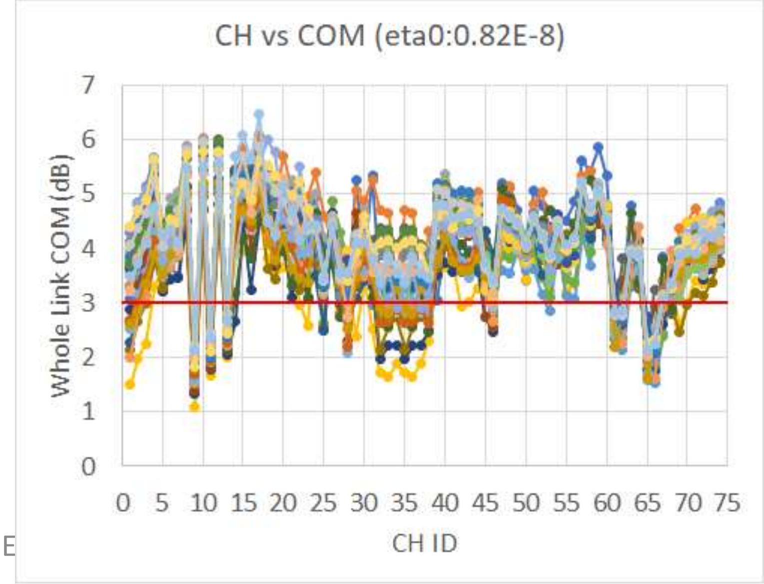
- This is a new set of channels to study statistics of larger set.

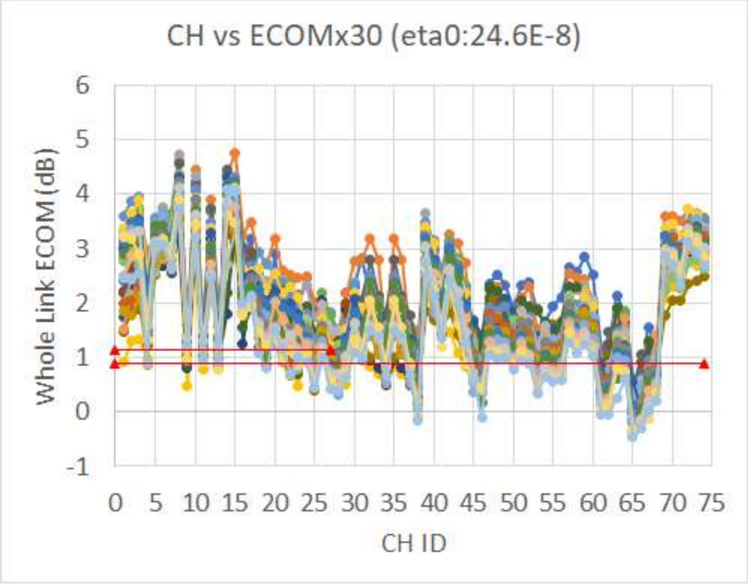
Whole Link COM and ECOM

- ECOM pass/fail criteria was adjusted for each channel set to get exactly same pass/fail count as COM 3dB

Channel set	Base 27	All 74
Channel ID	1-27	1-74
Population sample count (w/ 29 Tx zp cases)	783	2146
COM/ECOM pass rate (pass count)	85.44% (669)	84.90% (1822)
COM/ECOM fail rate (fail count)	14.56% (114)	15.10% (324)
COM pass/fail criteria (eta0:0.82E-8)	3dB	3dB
ECOMx15 pass/fail criteria (eta0:12.3E-8)	1.95dB	1.82dB
ECOMx30 pass/fail criteria (eta0:24.3E-8)	1.129dB	0.88dB

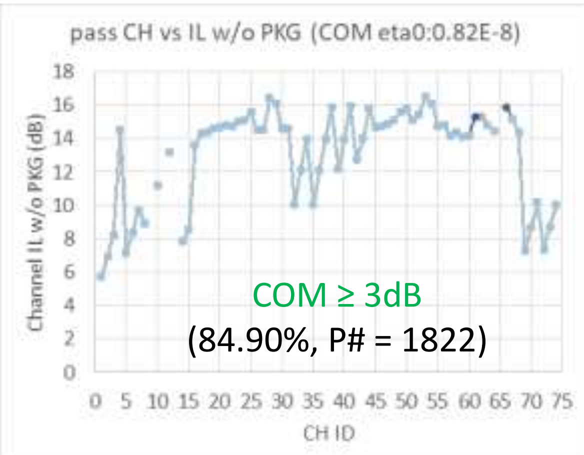


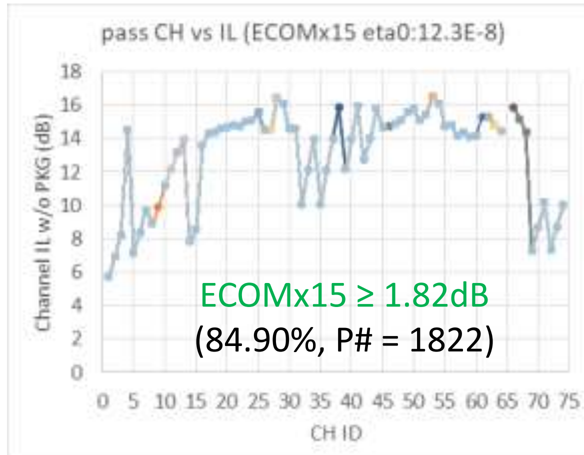


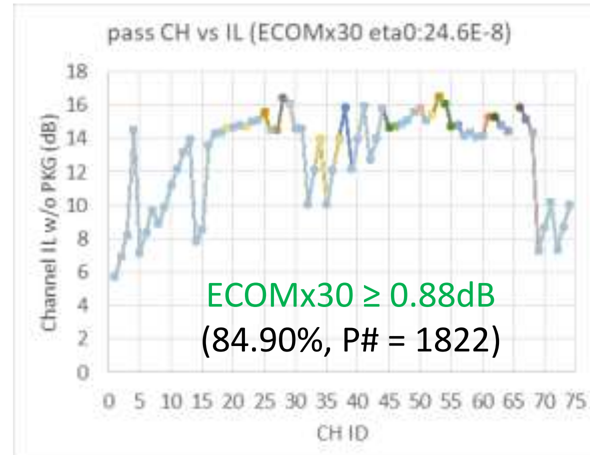


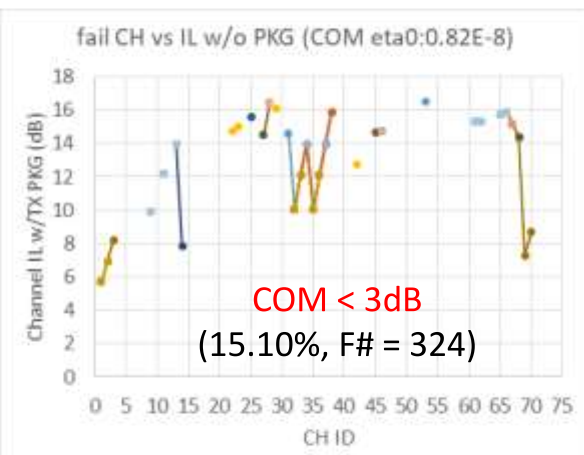
(E)COM Pass/Fail CH # vs Channel IL w/o PKG

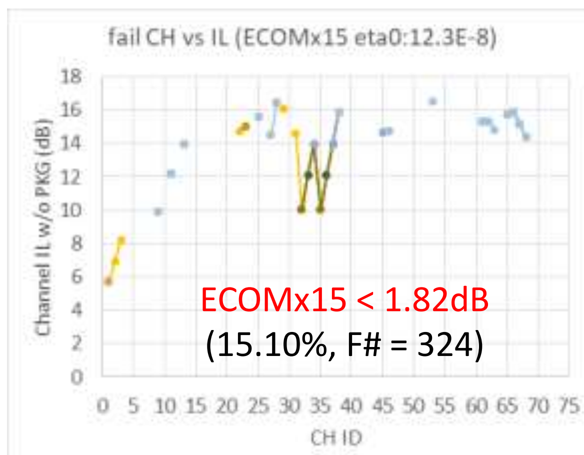
- Failing cases (324 out of 2146 cases) are shifted to high-loss channels as eta0 increases

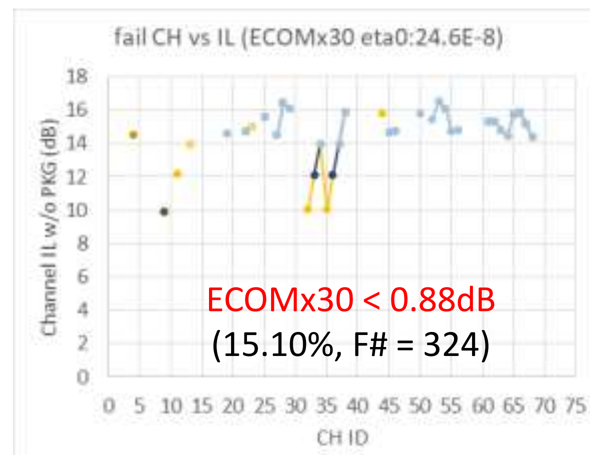






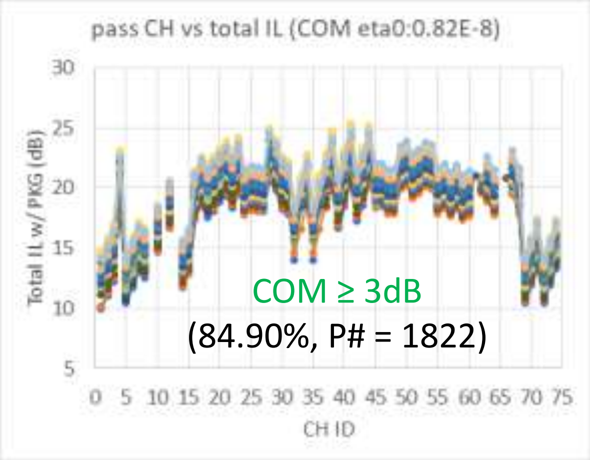


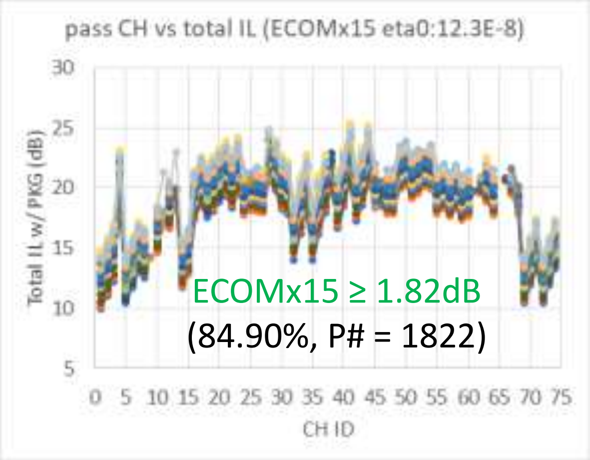


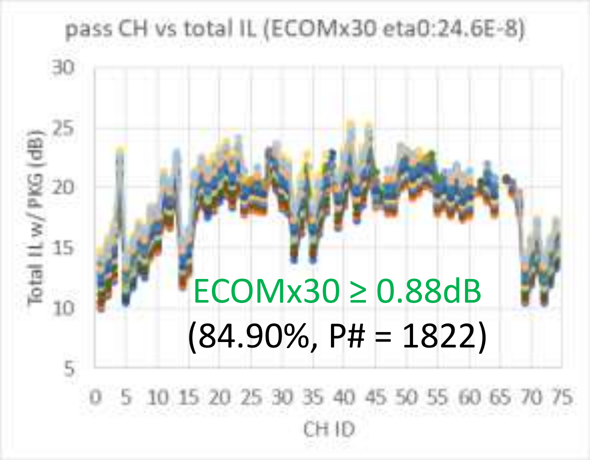


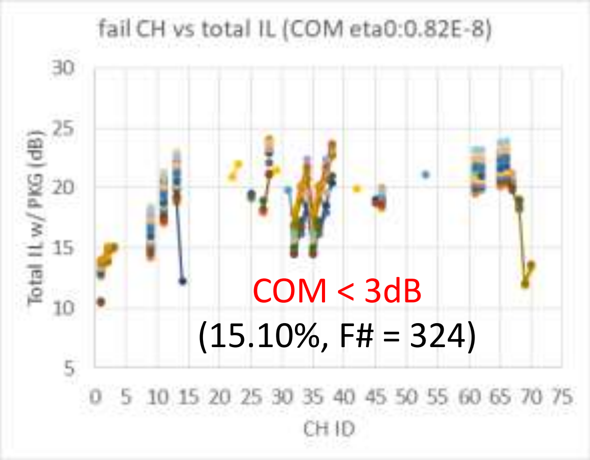
(E)COM Pass/Fail CH # vs Total IL w/ Tx & Rx PKG

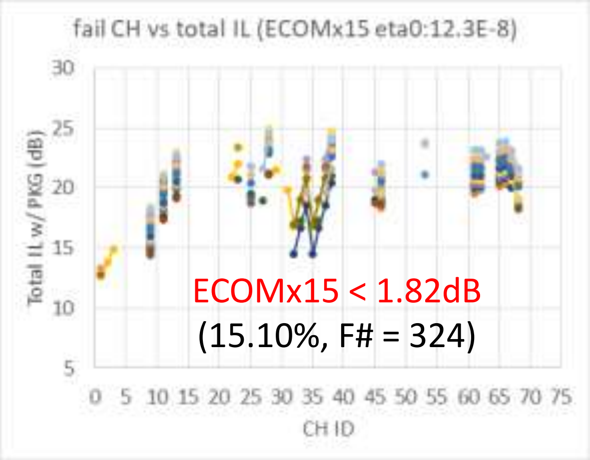
- Plotting total insertion loss including Tx package (5~36mm) and Rx package (6mm)

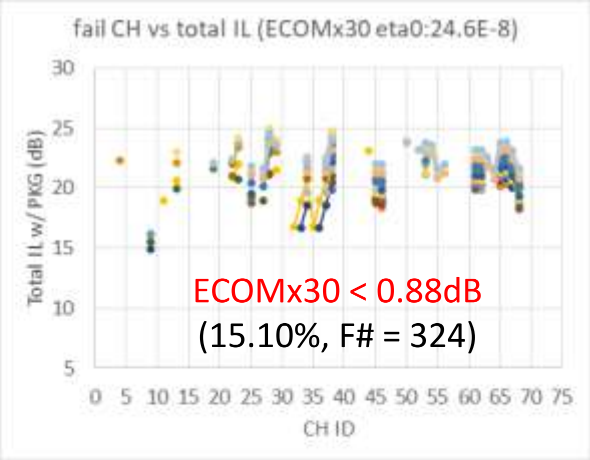






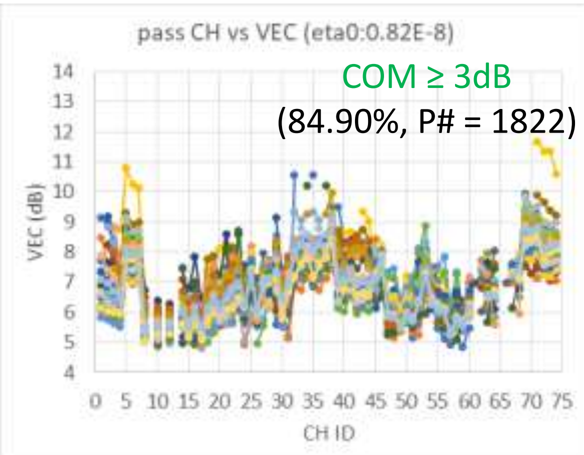


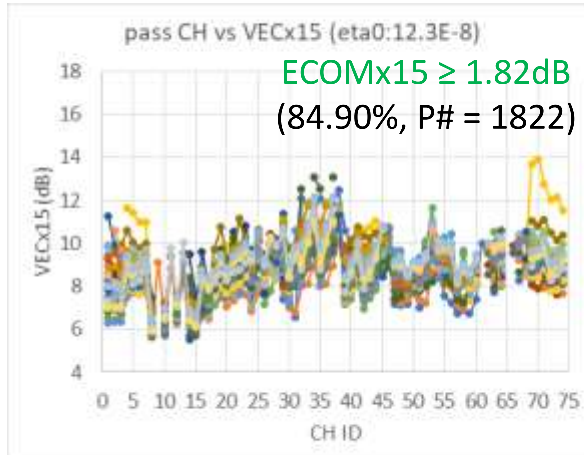


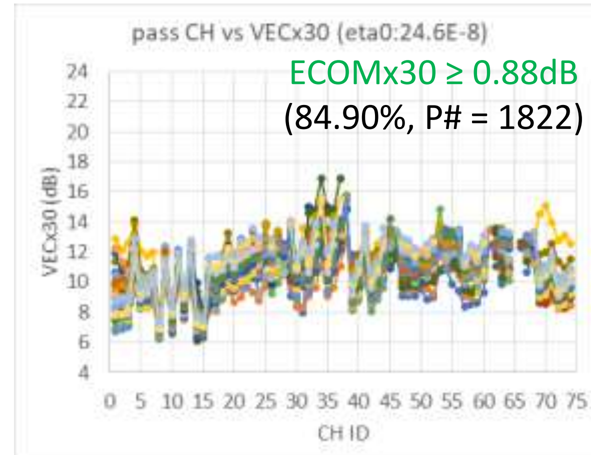


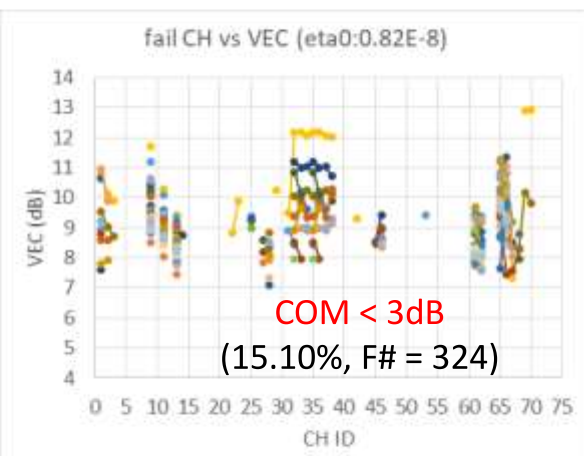
(E)COM Pass/Fail CH # vs VEC/VECx15/VECx30

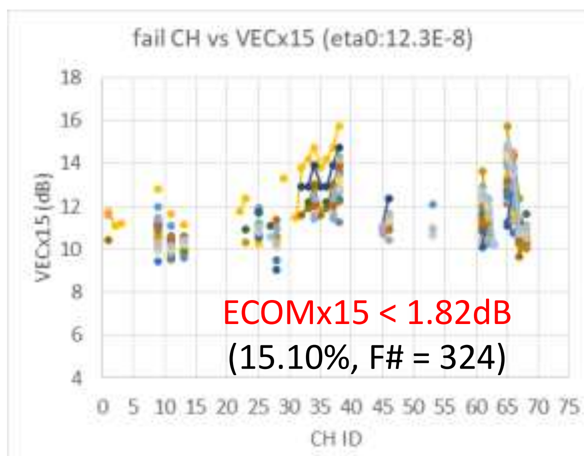
- VEC is measured with eta0=0.82E-8, 12.3E-8, or 24.6E-8
- Pass/fail distinction is by whole-link simulation with the same amount of eta0

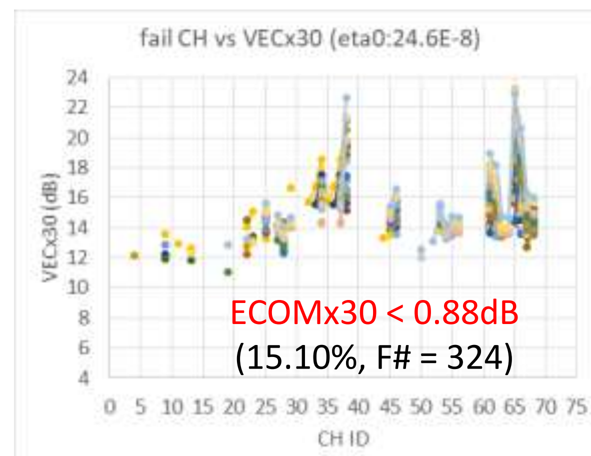






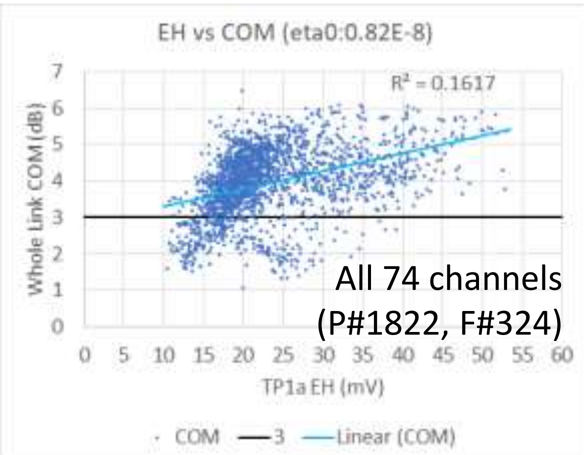


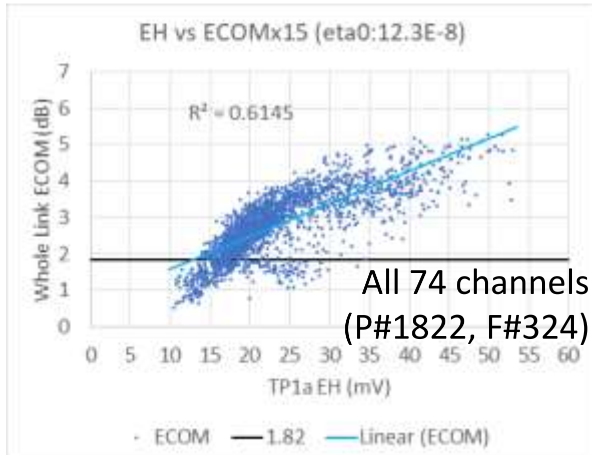


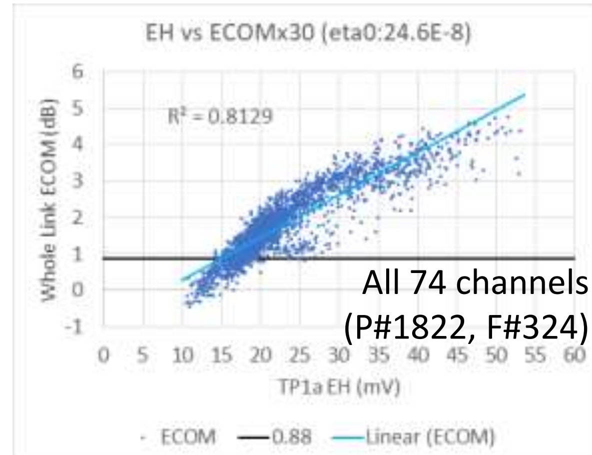


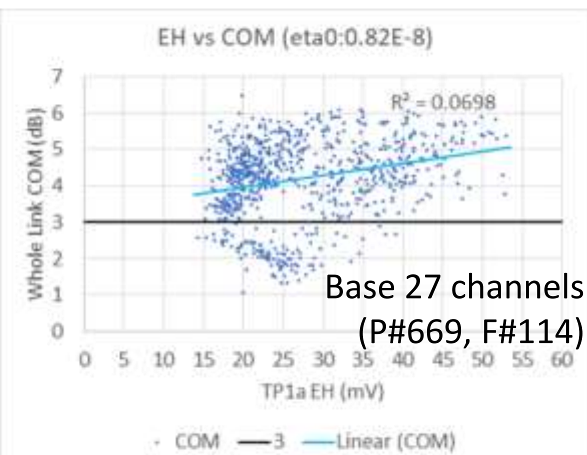
EH vs COM/ECOM

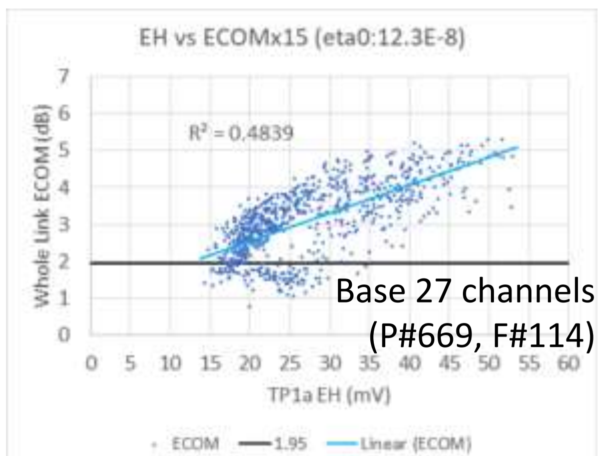
- COM shows little correlation with EH as indicated by very small R^2 value < 0.2.
- ECOM shows better correlation with EH as indicated by higher R^2 value.

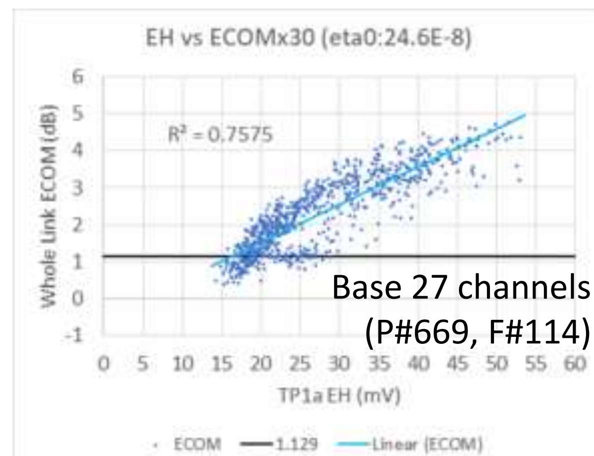






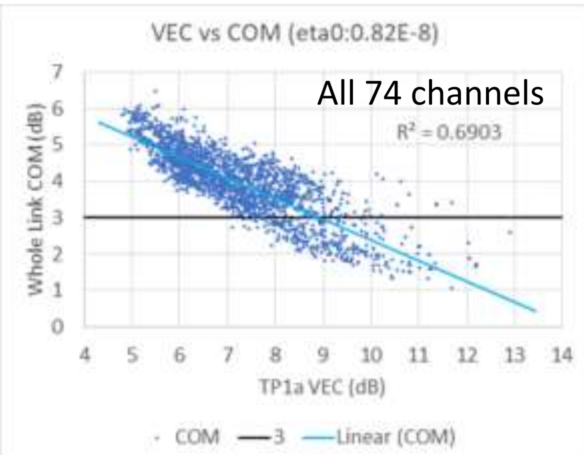


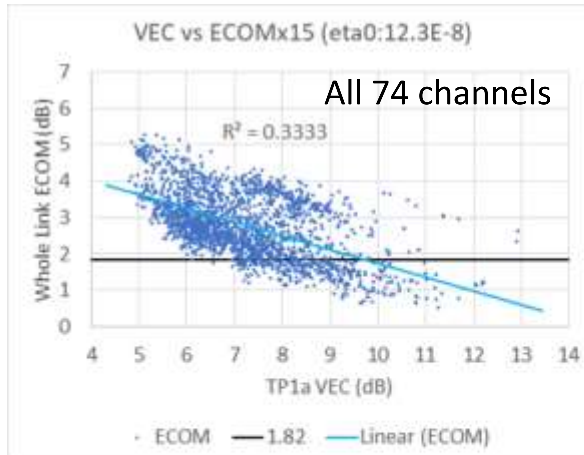


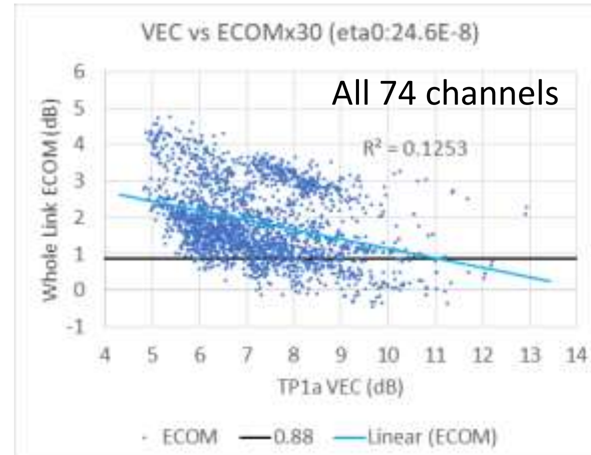


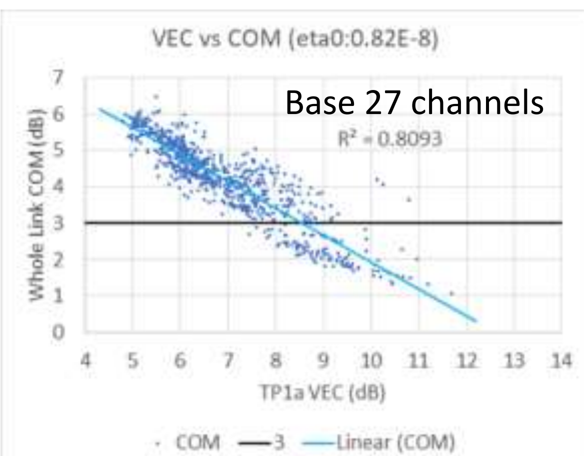
VEC vs COM/ECOM

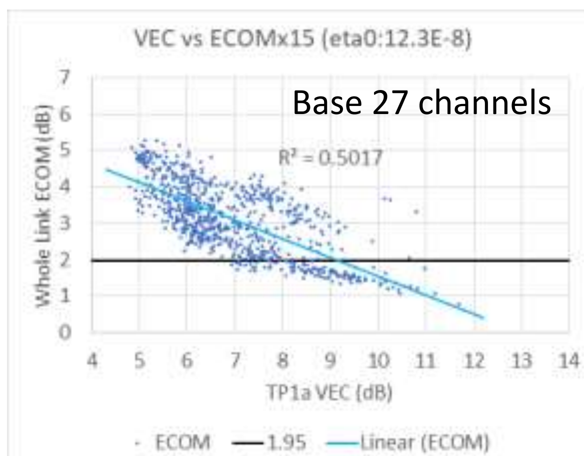
- VEC shows weaker correlation with ECOM as eta0 increases as indicated by lower R^2 value.

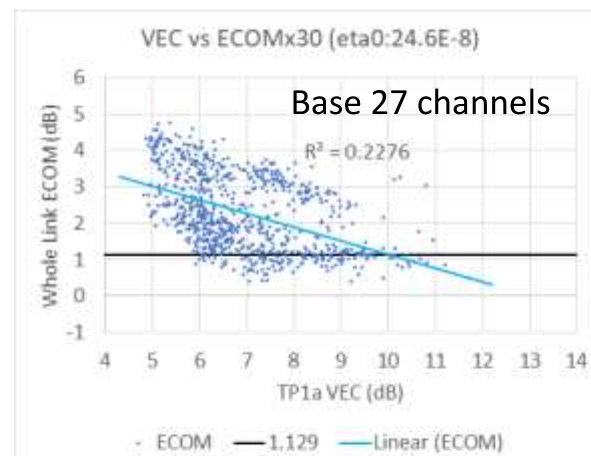






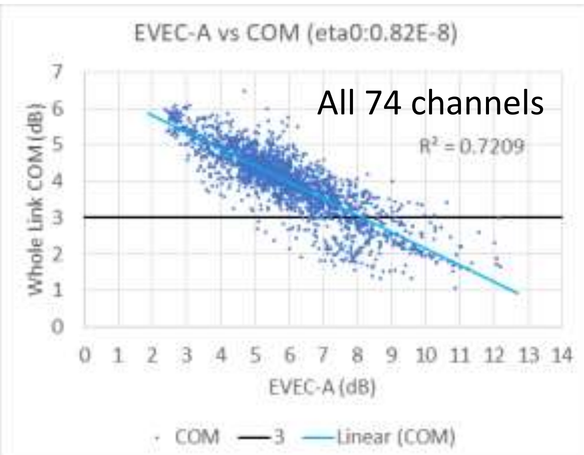


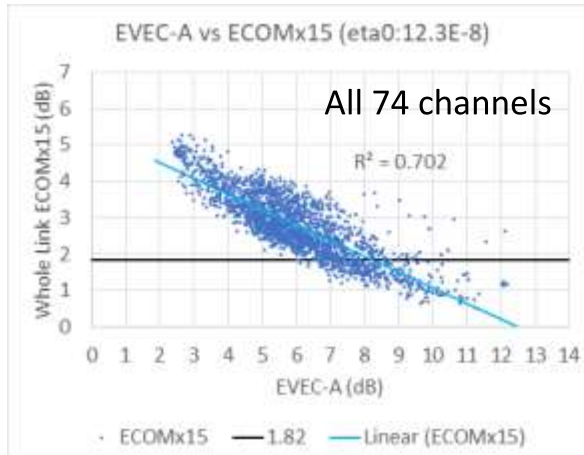


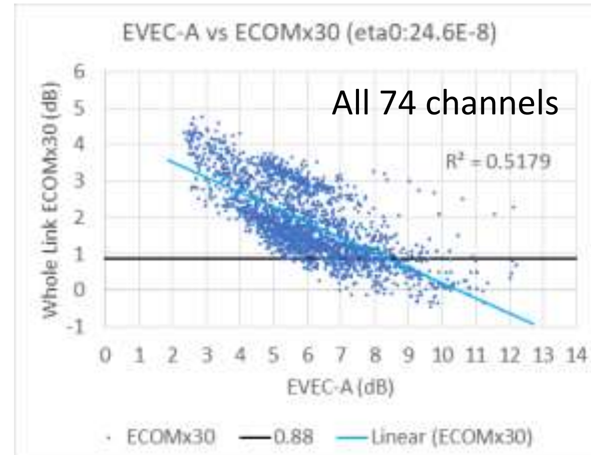


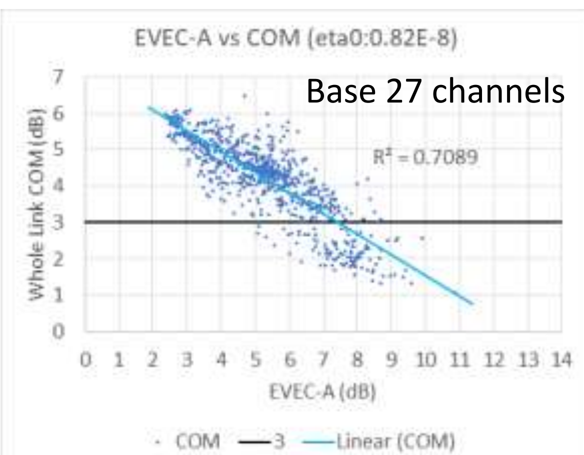
EVEC-A vs COM/ECOM

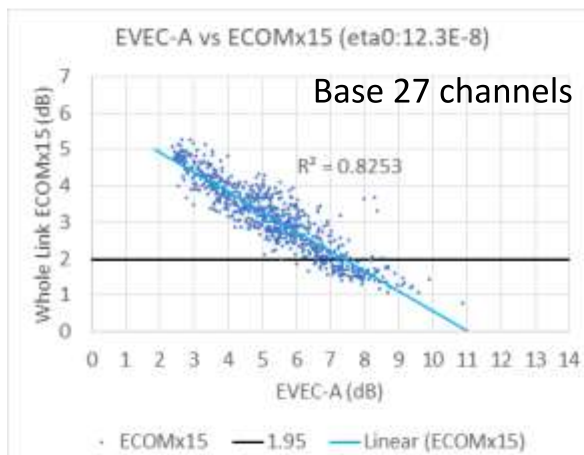
- EVEC-A shows better correlation with ECOM than VEC as indicated by higher R^2 value.

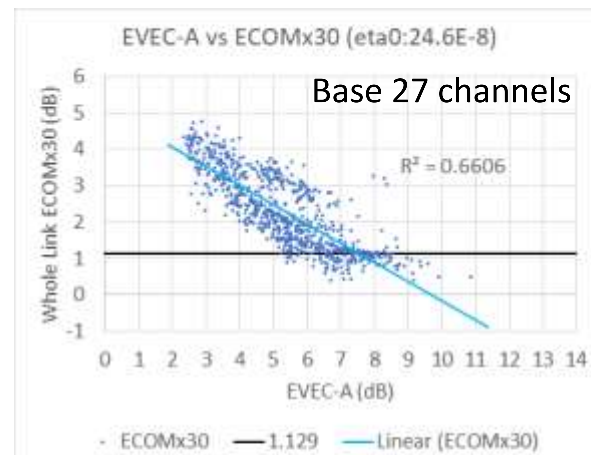






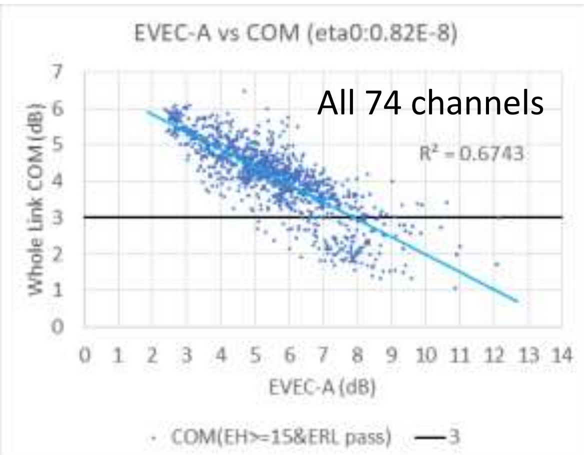


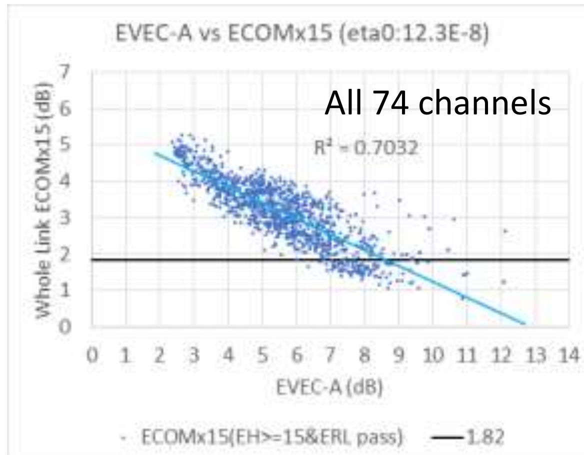


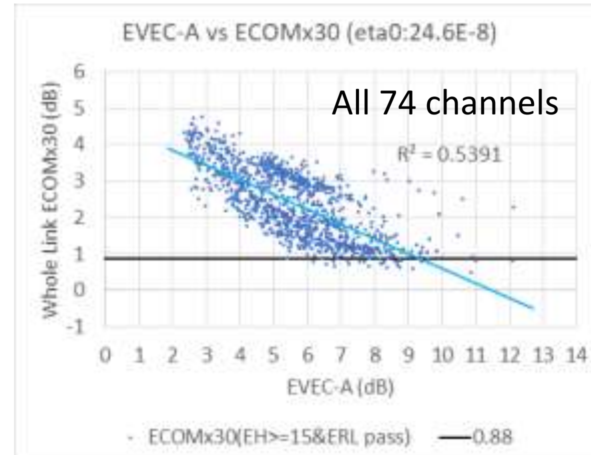


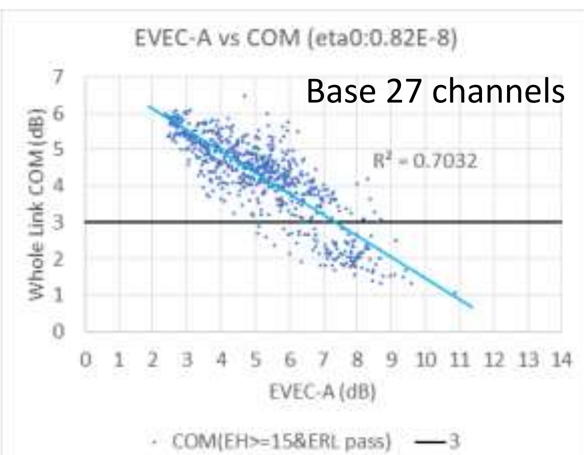
EVEC-A vs COM/ECOM (ERL&EH pass only)

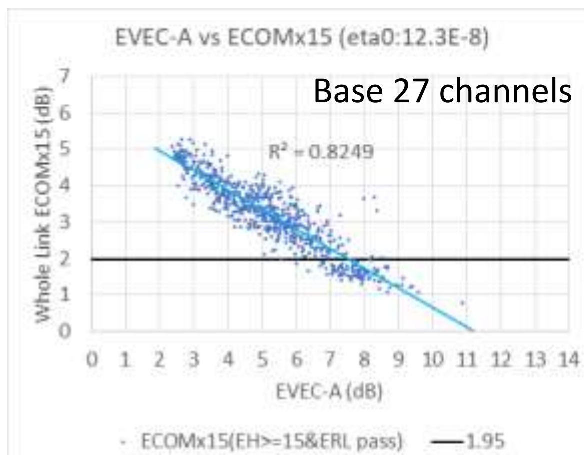
- Analyzed EVEC-A only for those cases which pass ERL and EH, ignoring bad cases.
  - EH pass condition: EH ≥ 15mV
  - ERL pass condition: ERL22 ≥ (pmax/vf < 0.375 ? 14dB : 11dB)

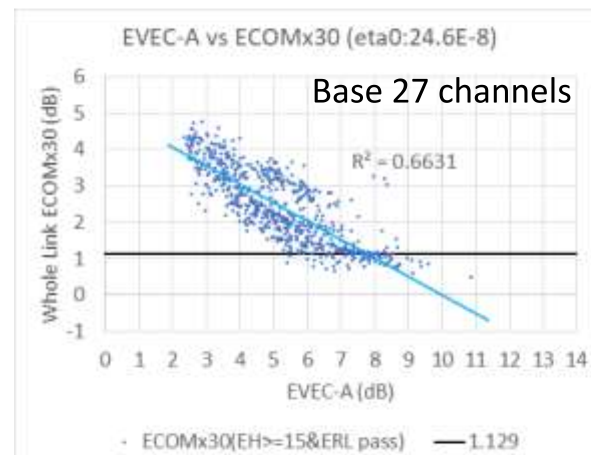






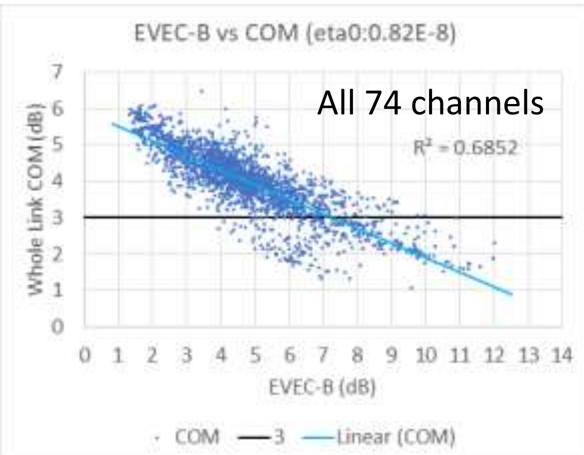


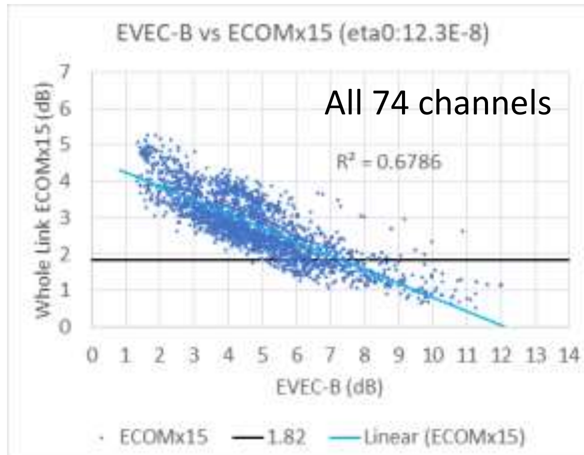


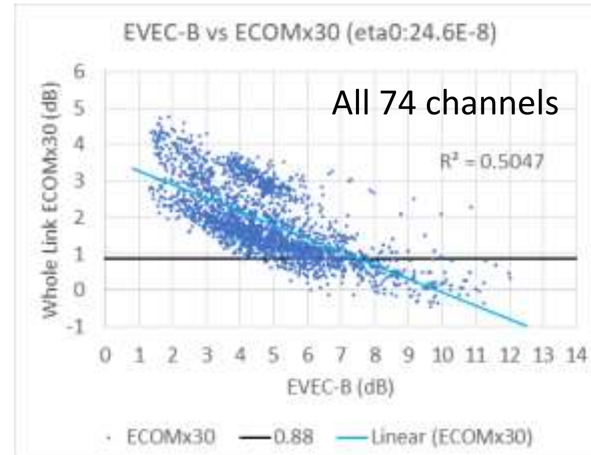


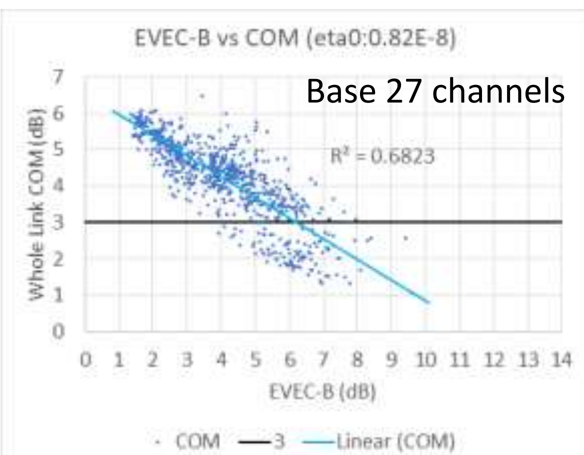
EVEC-B vs COM/ECOM

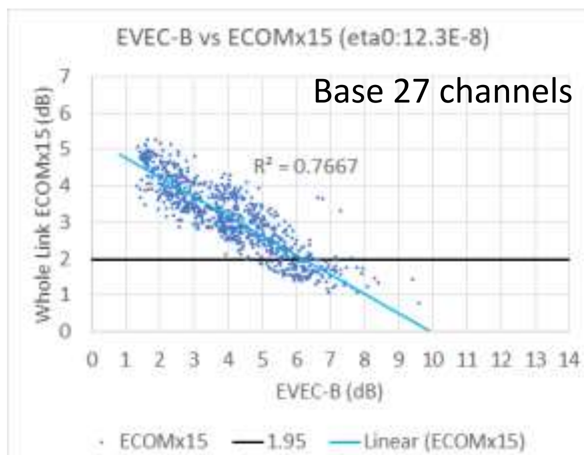
- EVEC-B shows slightly weaker correlation with ECOM than EVEC-A as indicated by lower R^2 value.

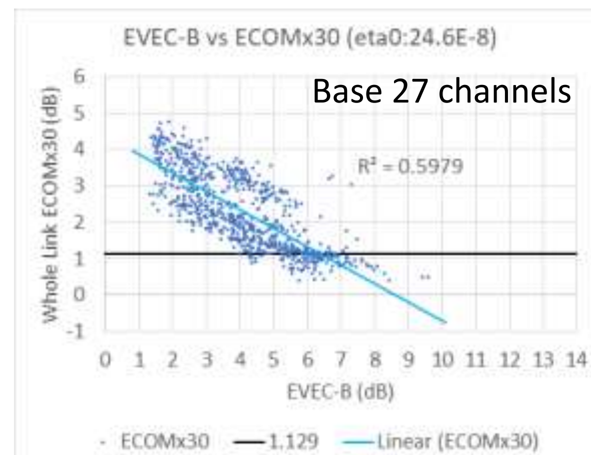






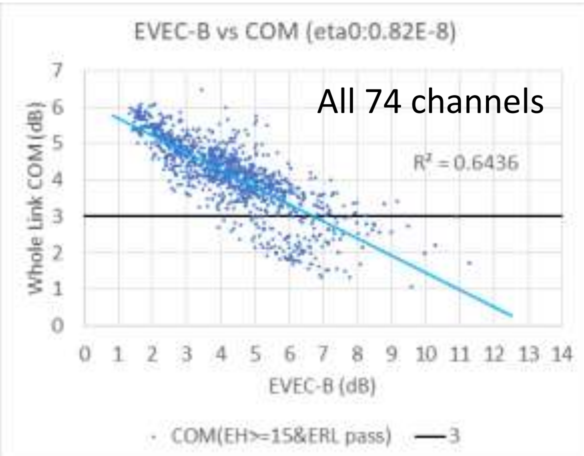


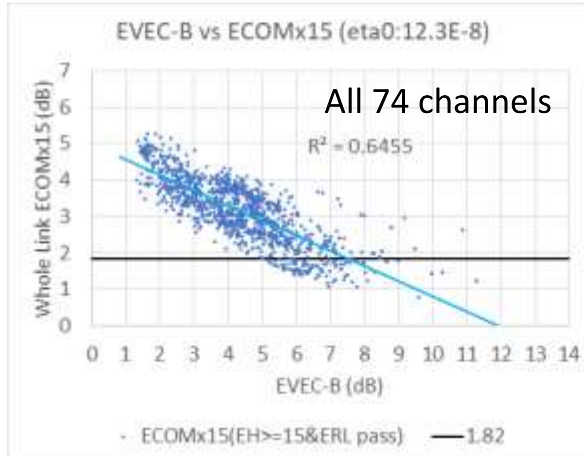


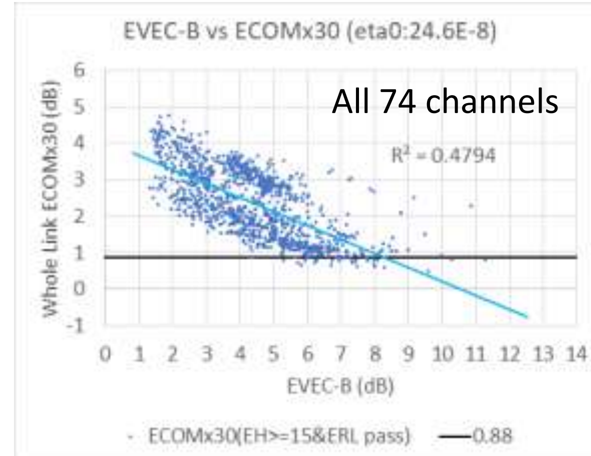


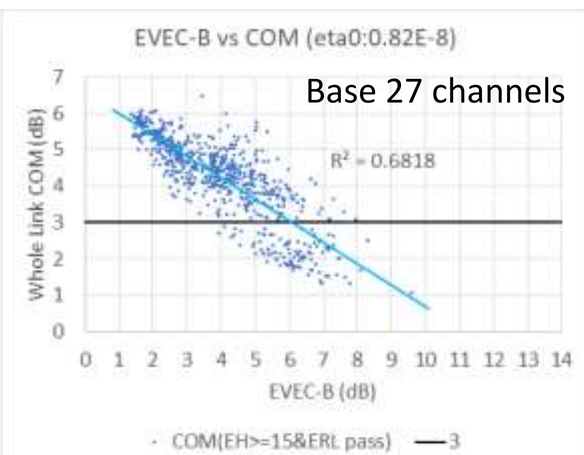
EVEC-B vs COM/ECOM (ERL&EH pass only)

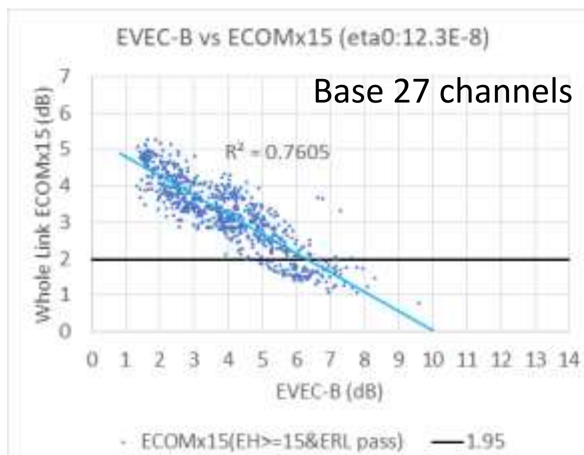
- Analyzed EVEC-B only for those cases which pass ERL and EH, ignoring bad cases.
- Same trend as the analysis for all cases.

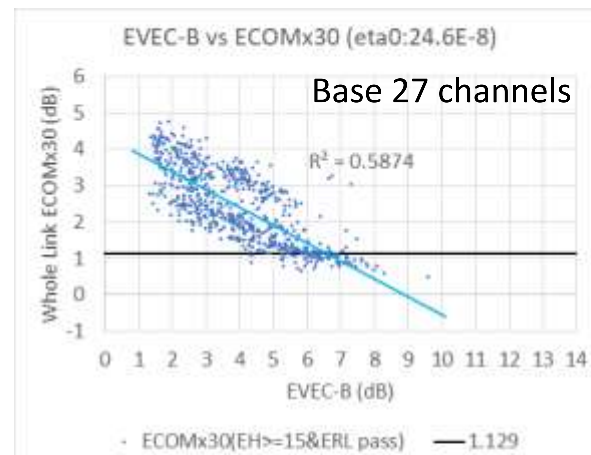






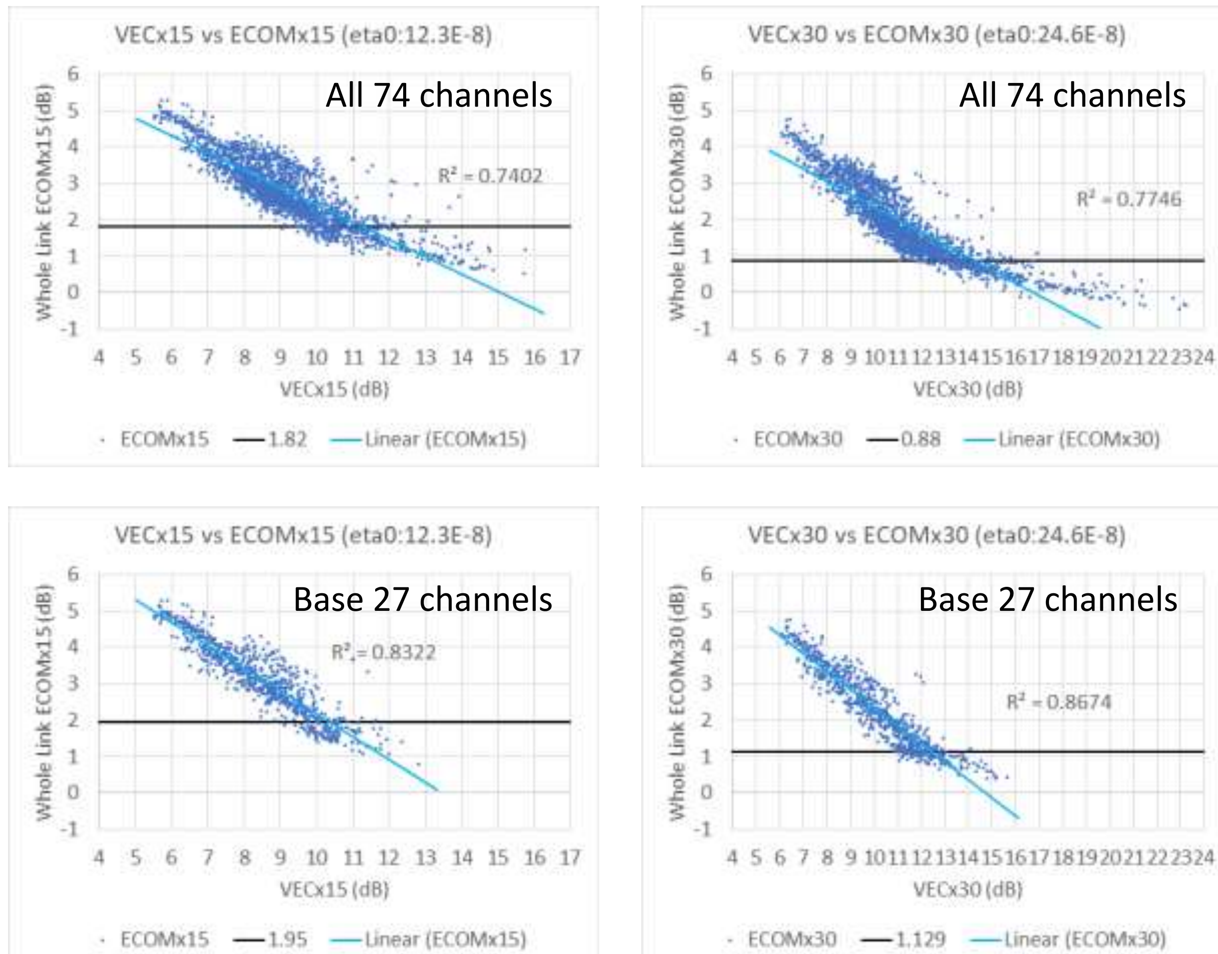






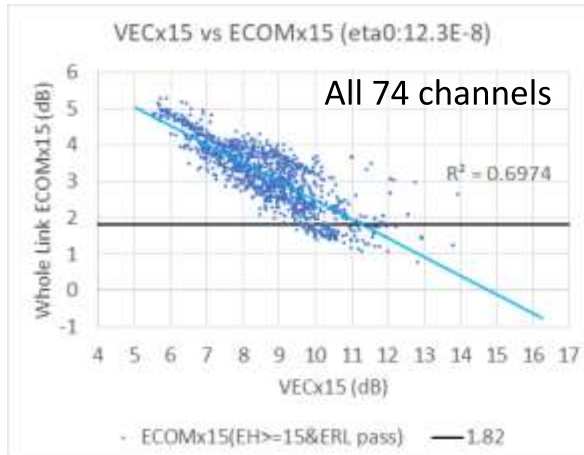
VECx15/x30 vs ECOM

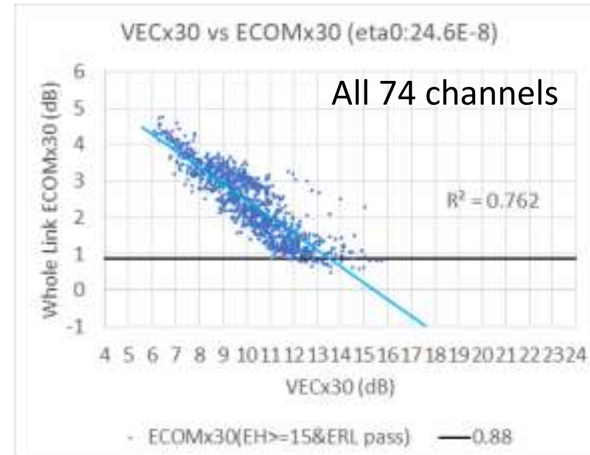
- VECx15 and VECx30 show good correlation with ECOMx15 and ECOMx30, respectively.

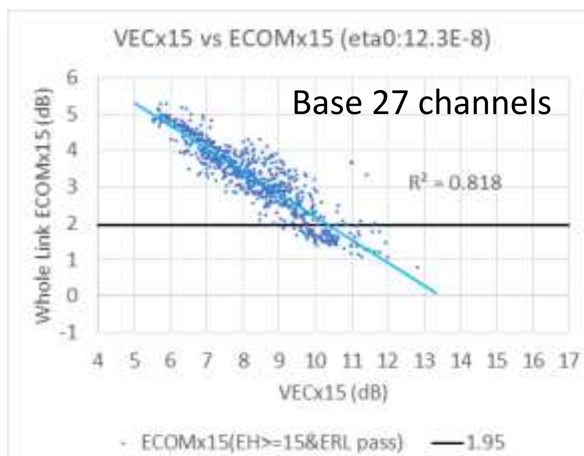


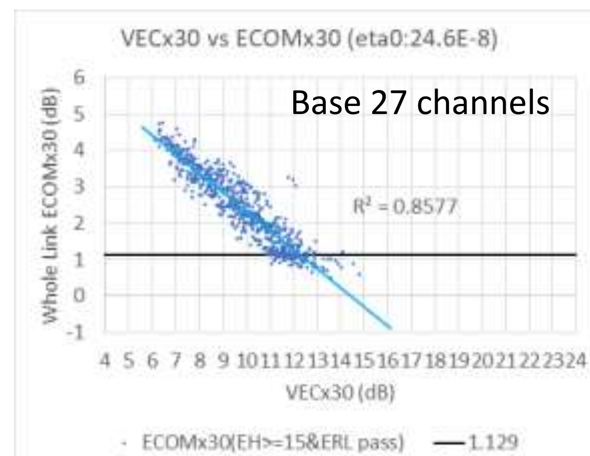
VECx15/x30 vs ECOM (ERL&EH pass only)

- Analyzed VECx15/VECx30 only for those cases which pass ERL and EH, ignoreing bad cases.
- Same trend as the analysis for all cases.









EVEC-A vs EVEC-B vs VECx15/x30 (Summary)

- EVEC-A shows slightly better correlation with (E)COM than EVEC-B as indicated by higher R^2 value.
- VECx15/x30 show better correlation with ECOM than EVEC-A and B as indicated by higher R^2 value.

Conditions	eta_0	Channel set	EVEC-A		EVEC-B		VEC	VECx15/x30
All cases	COM	All 74 channels	R^2 = 0.7209	Rxy = -0.8490	R^2 = 0.6852	Rxy = -0.8278	R^2 = 0.6903	
		Base 27 channels	R^2 = 0.7089		R^2 = 0.6823		R^2 = 0.8093	
	ECOMx15	All 74 channels	R^2 = 0.7020	Rxy = -0.8378	R^2 = 0.6786	Rxy = -0.8238		R^2 = 0.7402
		Base 27 channels	R^2 = 0.8253		R^2 = 0.7667			R^2 = 0.8322
	ECOMx30	All 74 channels	R^2 = 0.5179	Rxy = - 0.7197	R^2 = 0.5047	Rxy = -0.7104		R^2 = 0.7746
		Base 27 channels	R^2 = 0.6606		R^2 = 0.5979			R^2 = 0.8674
Only ERL & EH passing cases	COM	All 74 channels	R^2 = 0.6743	Rxy = -0.8212	R^2 = 0.6436	Rxy = -0.8023		
		Base 27 channels	R^2 = 0.7032		R^2 = 0.6818			
	ECOMx15	All 74 channels	R^2 = 0.7032	Rxy = -0.8386	R^2 = 0.6455	Rxy = -0.8034		R^2 = 0.6974
		Base 27 channels	R^2 = 0.8249		R^2 = 0.7605			R^2 = 0.8180
	ECOMx30	All 74 channels	R^2 = 0.5391	Rxy = -0.7342	R^2 = 0.4794	Rxy = -0.6924		R^2 = 0.7620
		Base 27 channels	R^2 = 0.6631		R^2 = 0.5874			R^2 = 0.8577

Definition of False Pass/Fail Rate and Yield

- No count if EH (or ERL) fails, because it is rejected regardless of (E)VEC
- The qualifier of $\wedge\, (ERL\ pass)$ is optional
  - EH pass condition: EH ≥ 15mV
  - ERL pass condition: ERL22 ≥ (pmax/vf < 0.375 ? 14dB : 11dB)

- False Pass Rate

$$\frac{\#\ of\ \Big(\big((E)COM\ fail\big) \wedge (EH\ pass) \wedge (ERL\ pass) \wedge \big((E)VEC\ pass\big)\Big)}{\#\ of\big((EH\ pass) \wedge (ERL\ pass)\big)}$$

- False Fail Rate

$$\frac{\#\ of\ \Big(\big((E)COM\ pass\big) \wedge (EH\ pass) \wedge (ERL\ pass) \wedge \big((E)VEC\ fail\big)\Big)}{\#\ of\big((EH\ pass) \wedge (ERL\ pass)\big)}$$

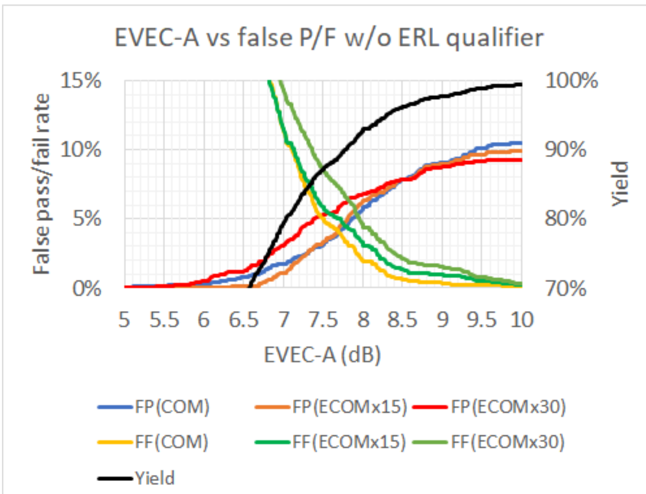
- Yield (=Pass Rate)

$$\frac{\#\ of\ \Big((EH\ pass) \wedge (ERL\ pass) \wedge \big((E)VEC\ pass\big)\Big)}{\#\ of\big((EH\ pass) \wedge (ERL\ pass)\big)}$$

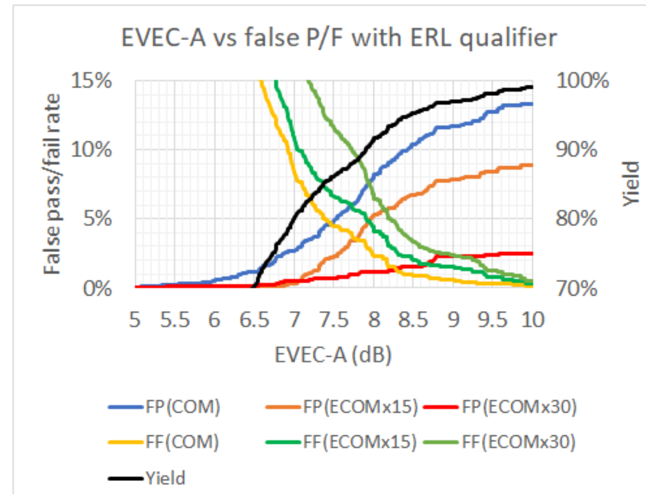
EVEC-A vs False Pass/Fail Rate and Yield

- 8.5dB threshold seems OK for EVEC-A

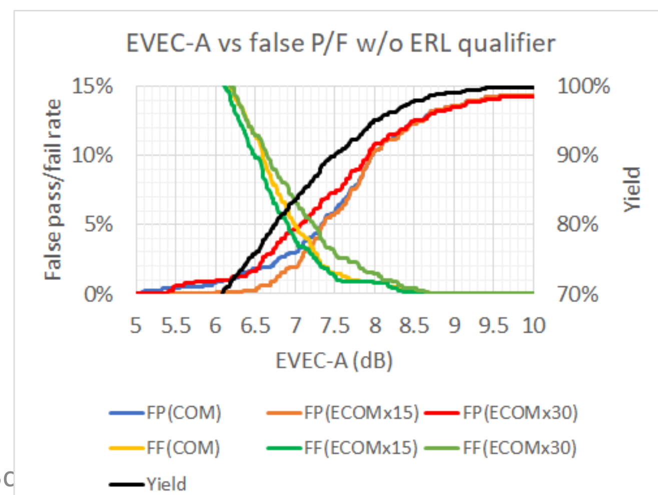
All 74 CHs
without
ERL qualifier



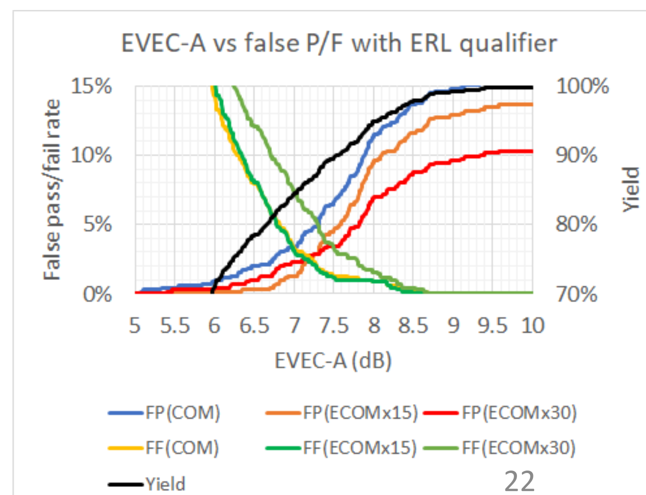
All 74 CHs
with
ERL qualifier



Base 27 CHs
without
ERL qualifier



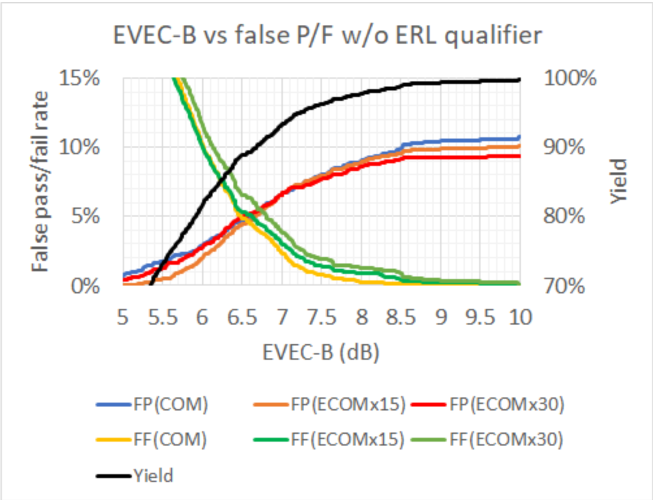
Base 27 CHs
with
ERL qualifier



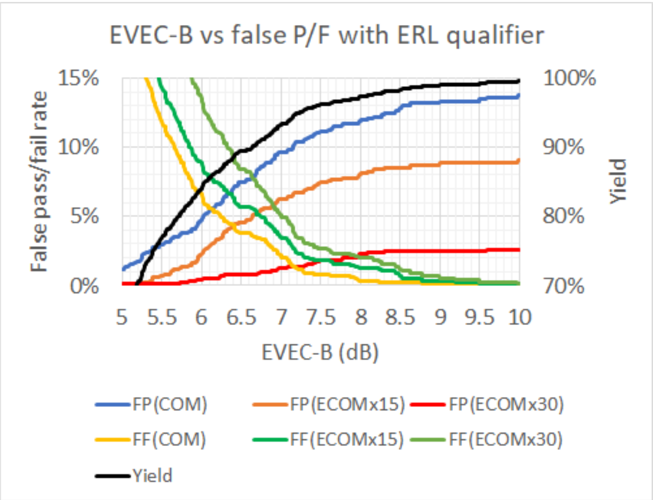
EVEC-B vs False Pass/Fail Rate and Yield

- 7.0dB threshold seems OK for EVEC-B
- Pass/fail rate are similar for EVEC parameter sets A and B.

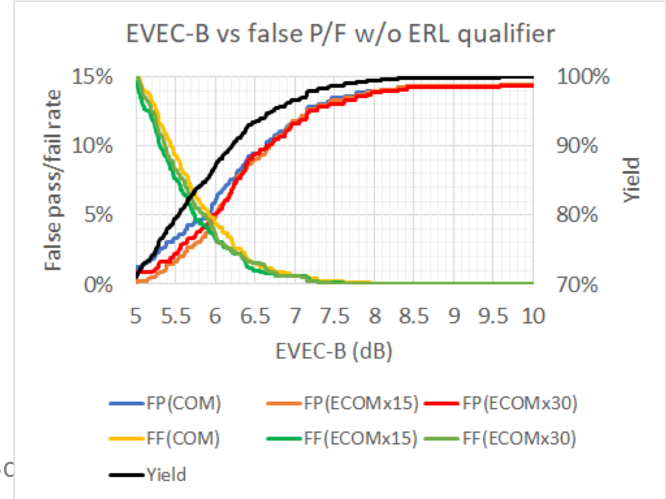
All 74 CHs without ERL qualifier



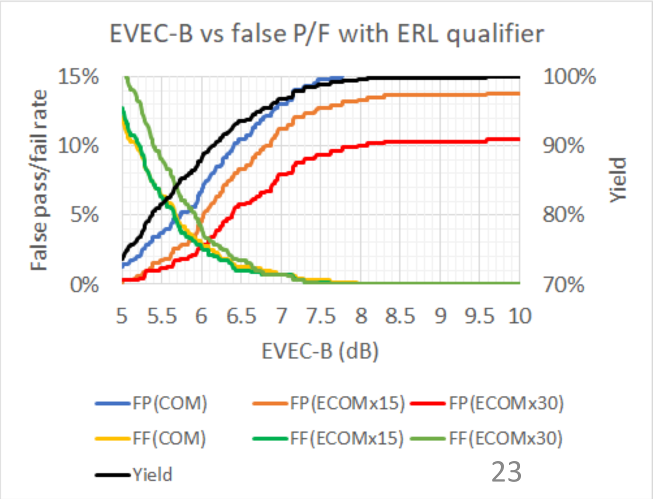
All 74 CHs with ERL qualifier



Base 27 CHs without ERL qualifier



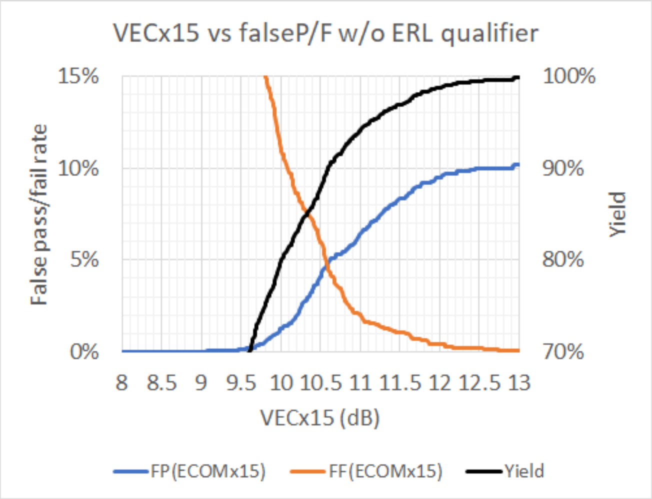
Base 27 CHs with ERL qualifier



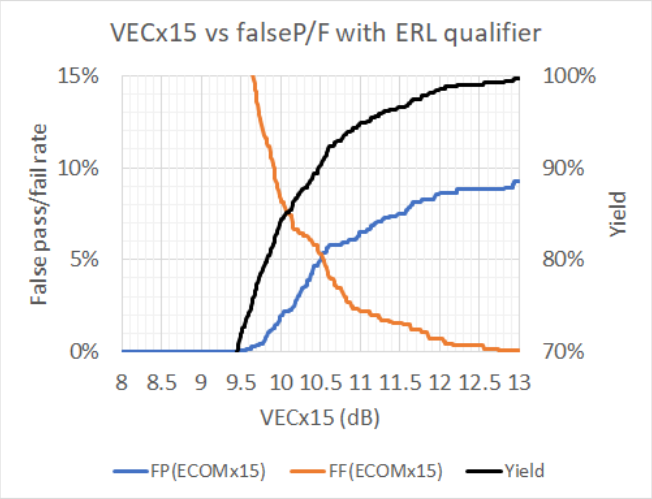
VECx15 vs False Pass/Fail Rate and Yield

- 10.5dB threshold seems OK for VECx15

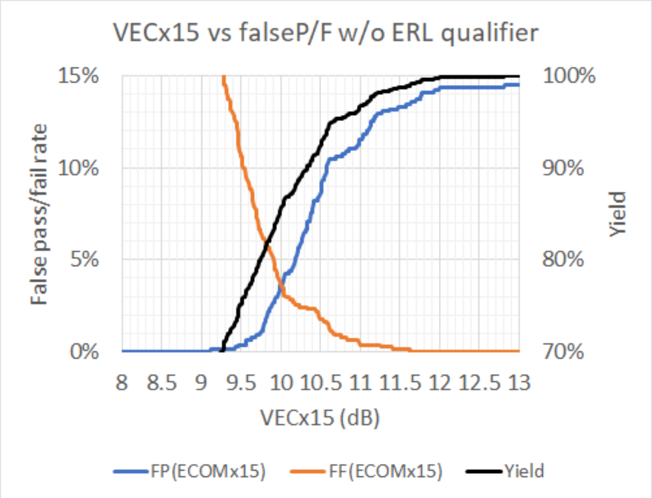
All 74 CHs without ERL qualifier



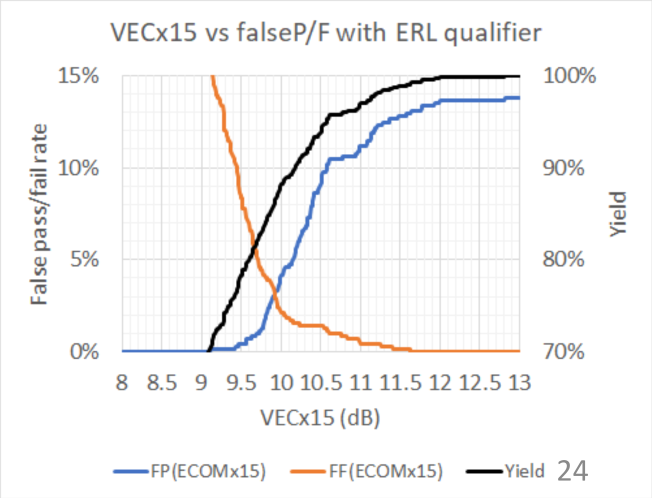
All 74 CHs with ERL qualifier



Base 27 CHs without ERL qualifier



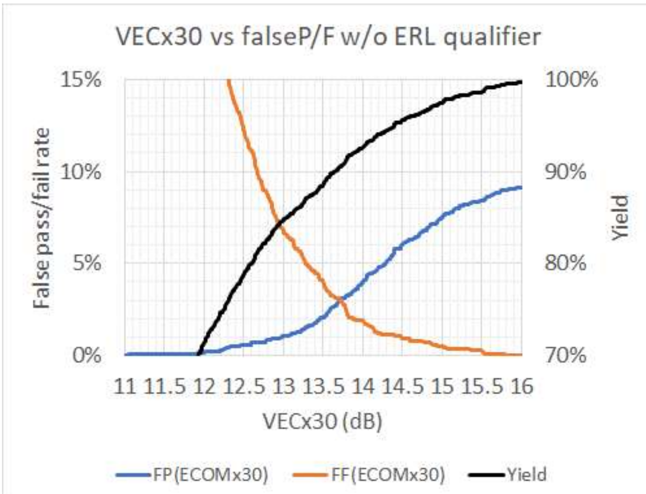
Base 27 CHs with ERL qualifier



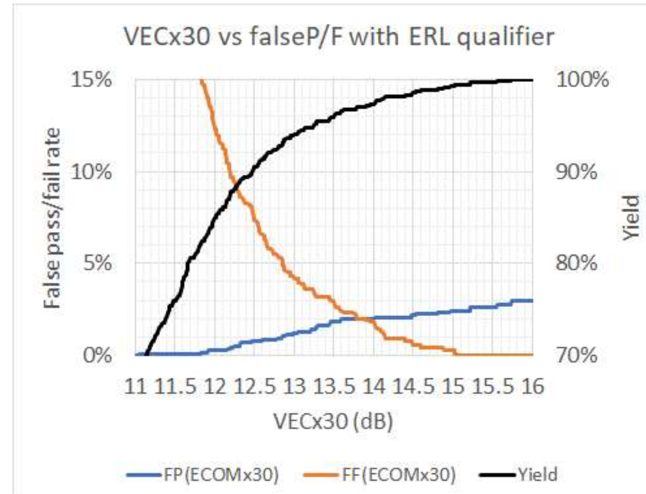
VECx30 vs False Pass/Fail Rate and Yield

- 13.5dB threshold seems OK for VECx30

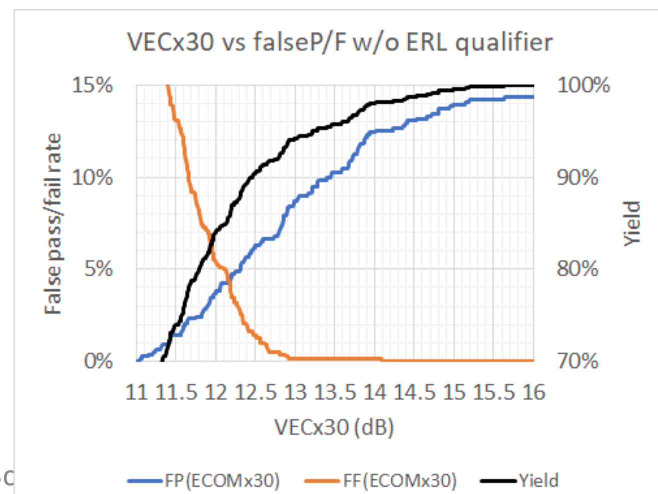
All 74 CHs
without
ERL qualifier



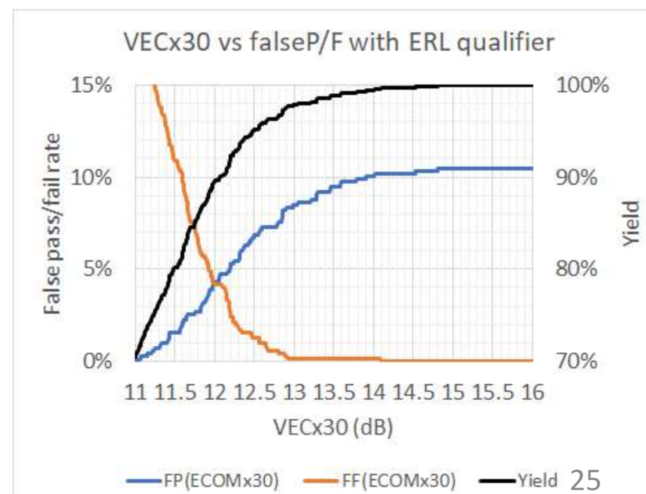
All 74 CHs
with
ERL qualifier



Base 27 CHs
without
ERL qualifier



Base 27 CHs
with
ERL qualifier



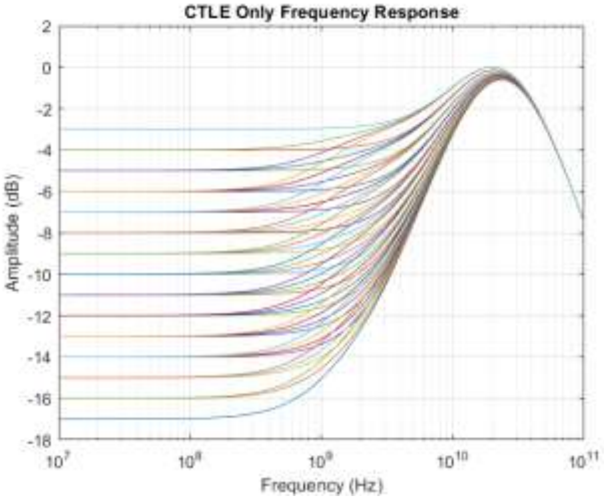
Summary

- EVEC shows better correlation to COM than VEC when noise is considered.
- EVEC parameter sets A and B have similar pass/fail rate. A shows slightly better correlation with ECOM. Possible thresholds:
  - 8.5dB threshold for EVEC-A.
  - 7.0dB threshold for EVEC-B.

- An alternative way is to add noise in VEC measurement if we can agree on noise level. VECx15/x30 show good correlation to ECOM. Possible threshold:
  - 10.5dB if we choose eta0=12.3e-8V^2/GHz.
  - 13.5dB if we choose eta0=24.6e-8V^2/GHz.

Backup Slides

CTLE



CTLE and Noise Filter for Reference Receiver		
g_{DC}	[-14:1:-3]	dB
f_z	12.58	GHz
f_{p1}	20	GHz
f_{p2}	28	GHz
g_{DC2}	[-3:1:0]	dB
f_{LF}	1.328125	GHz

TP1a COM Spread Sheet

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]		[test cases to run]
z_p (TX)	[13 30; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[0 0; 0 0]	mm	[test cases]
z_p (FEXT)	[13 30; 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	[45, 50]	Ohm	[TX RX]
A_v	0.391	V	vp/vf=.694
A_fe	0.391	V	vp/vf=.694
A_ne	0.489	V	
L	4		
M	32		
filter and Eq			
f_r	0.75	*fb	
c(0)	0.6		min
c(-1)	[-0.3:0.02:0]		[min:step:max]
c(-2)	[0:.02:0.1]		[min:step:max]
c(-3)	[-0.04:.02:0.0]		[min:step:max]
c(1)	[-0.1:0.05:0]		[min:step:max]
N_b	4	UI	
b_max(1)	0.5		
b_max(2..N_b)	0.2		
g_DC	[-14:1:-3]	dB	[min:step:max]
f_z	12.58	GHz	
f_p1	20	GHz	
f_p2	28	GHz	
g_DC_HP	[-3:1:0]		[min:step:max]
f_HP_PZ	1.328125	GHz	
ffe_pre_tap_len	0	UI	
ffe_post_tap_len	0	UI	
ffe_tap_step_size	0		
ffe_main_cursor_min	0.7		
ffe_pre_tap1_max	0.3		
ffe_post_tap1_max	0.3		
ffe_tapn_max	0.125		
ffe_backoff	0		
Floating Tap Control			
N_bg	0		0 1 2 or 3 groups
N_bf	0		taps per group
N_f	40		UI span for floating taps
bmaxg	0.05		max DFE value for floating taps

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	1	logical
CSV_REPORT	1	logical
RESULT_DIR	.\TestCaseFloatingBank\	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	C2M TP1a	
COM_CONTRIBUTION	0	logical
Operational		
COM Pass threshold	3	dB
ERL Pass threshold	10.5	dB
DER_0	1.00E-05	
T_r	6.16E-03	ns
FORCE_TR	1	logical
Include PCB	0	logical
TDR and ERL options		
TDR	1	logical
ERL	1	logical
ERL_ONLY	0	logical
TR_TDR	0.01	ns
N	400	
TDR_Butterworth	1	logical
beta_x	2.40E+9	
rho_x	0.30	
fixture delay time	0	enter sec
TDR_W_TXPKG	1	
N_bx	4	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	8.20E-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
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	90	Ohm
z_bp (TX)	119	mm
z_bp (NEXT)	119	mm
z_bp (FEXT)	119	mm
z_bp (RX)	119	mm

Whole-link COM Spread Sheet

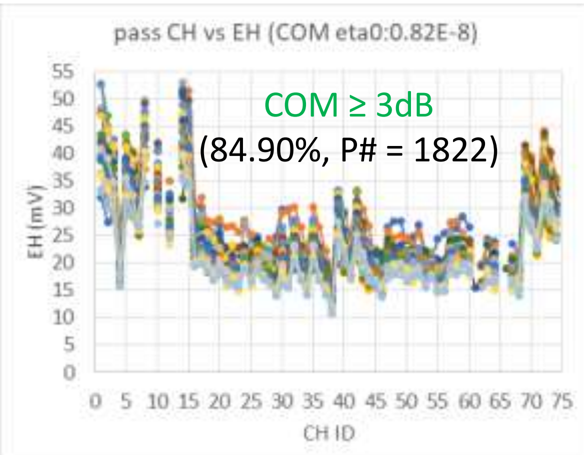
Table 93A-1 parameters			
Parameter	Setting	Units	Information
f_b	53.125	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[1.2e-4 , 0.85e-4]	nF	[TX RX]
L_s	[0.12, 0.12]	nH	[TX RX]
C_b	[0.3e-4 0.3e-4]	nF	[TX RX]
z_p select	[1]		[test cases to run]
z_p (TX)	[13 30; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[6 2; 0 0]	mm	[test cases]
z_p (FEXT)	[13 30; 1.8 1.8]	mm	[test cases]
z_p (RX)	[6 2; 0 0]	mm	[test cases]
C_p	[0.87e-4 0.75e-4]	nF	[TX RX]
R_0	50	Ohm	
R_d	[45, 50]	Ohm	[TX RX]
A_v	0.391	V	vp/vf=.694
A_fe	0.391	V	vp/vf=.694
A_ne	0.489	V	
L	4		
M	32		
filter and Eq			
f_r	0.75	*fb	
c(0)	0.6		min
c(-1)	[-0.3:0.02:0]		[min:step:max]
c(-2)	[0:.02:0.1]		[min:step:max]
c(-3)	[-0.04:.02:0.0]		[min:step:max]
c(1)	[-0.1:0.05:0]		[min:step:max]
N_b	4	UI	
b_max(1)	0.5		
b_max(2..N_b)	0.2		
g_DC	[-14:1:-3]	dB	[min:step:max]
f_z	12.58	GHz	
f_p1	20	GHz	
f_p2	28	GHz	
g_DC_HP	[-3:1:0]		[min:step:max]
f_HP_PZ	1.328125	GHz	
ffe_pre_tap_len	0	UI	
ffe_post_tap_len	0	UI	
ffe_tap_step_size	0		
ffe_main_cursor_min	0.7		
ffe_pre_tap1_max	0.3		
ffe_post_tap1_max	0.3		
ffe_tapn_max	0.125		
ffe_backoff	0		
Floating Tap Control			
N_bg	0		0 1 2 or 3 groups
N_bf	4		taps per group
N_f	40		UI span for floating taps
bmaxg	0.05		max DFE value for floating taps

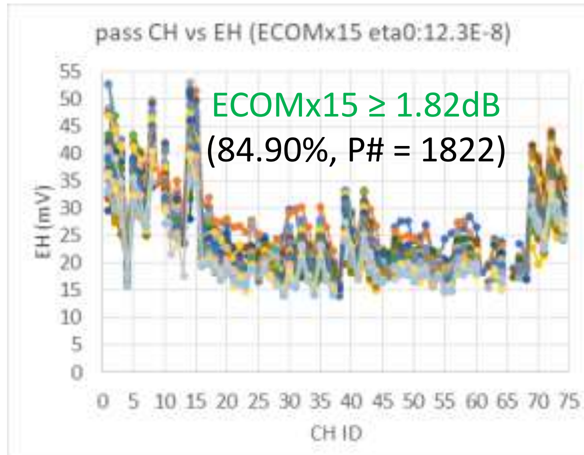
I/O control		
DIAGNOSTICS	0	logical
DISPLAY_WINDOW	0	logical
CSV_REPORT	1	logical
RESULT_DIR	.\TestCaseFloatingBank\	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	C2M end-to-end	
COM_CONTRIBUTION	0	logical
Operational		
COM Pass threshold	3	dB
ERL Pass threshold	10.5	dB
DER_0	1.00E-05	
T_r	6.16E-03	ns
FORCE_TR	1	logical
Include PCB	0	logical
TDR and ERL options		
TDR	1	logical
ERL	1	logical
ERL_ONLY	0	logical
TR_TDR	0.01	ns
N	400	
TDR_Butterworth	1	logical
beta_x	2.40E+9	
rho_x	0.30	
fixture delay time	0	enter sec
TDR_W_TXPKG	1	
N_bx	4	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	8.20E-09	V^2/GHz
SNR_TX	33	dB
R_LM	0.95	

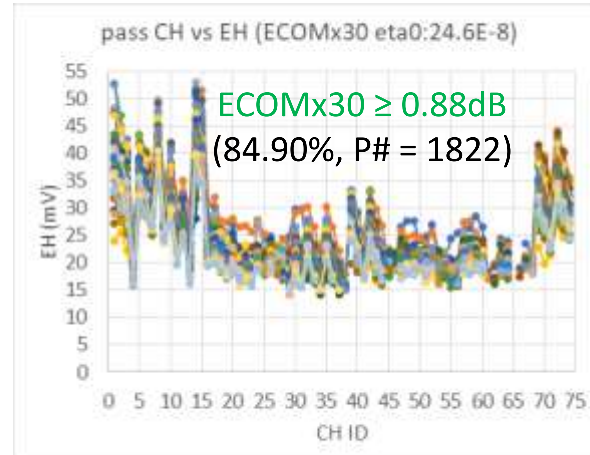
Table 93A–3 parameters		
Parameter	Setting	Units
package_tl_gamma0_a1_a2	[0 0.0009909 0.0002772]	
package_tl_tau	6.141E-03	ns/mm
package_Z_c	[87.5 87.5 ; 92.5 92.5]	Ohm
Table 92–12 parameters		
Parameter	Setting	
board_tl_gamma0_a1_a2	[0 3.8206e-04 9.5909e-05]	
board_tl_tau	5.790E-03	ns/mm
board_Z_c	90	Ohm
z_bp (TX)	119	mm
z_bp (NEXT)	119	mm
z_bp (FEXT)	119	mm
z_bp (RX)	119	mm

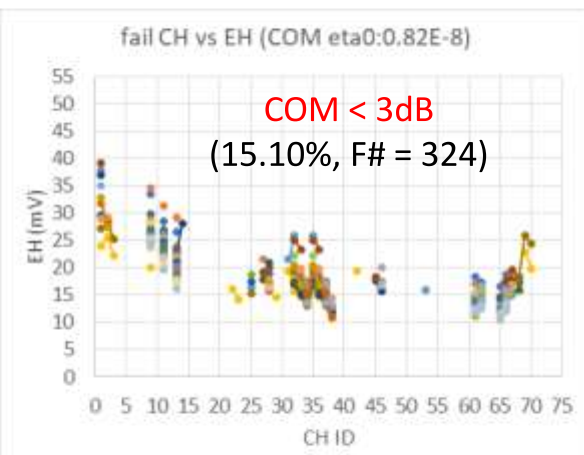
(E)COM Pass/Fail CH # vs EH at TP1a

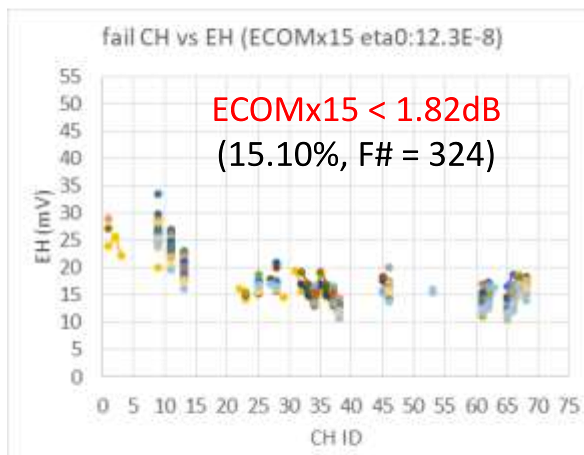
- Failing channels are shifted to smaller EH value as eta0 increases

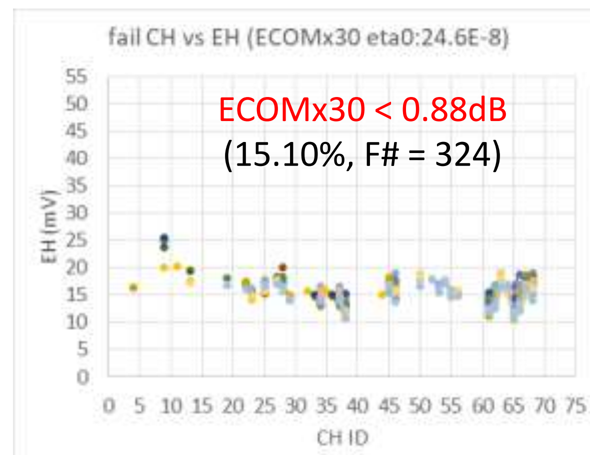






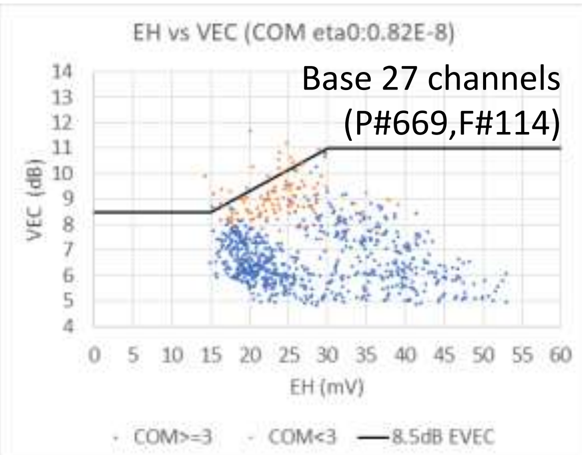


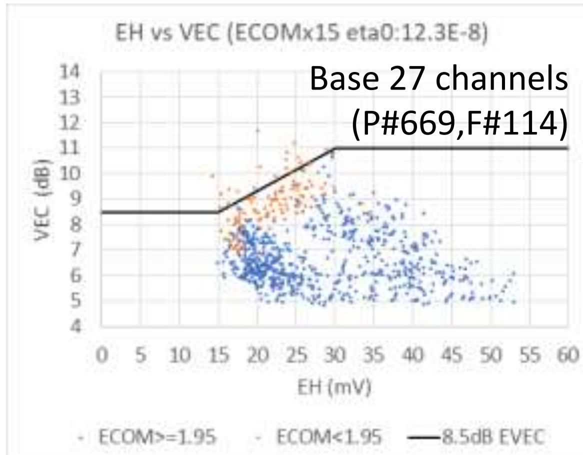


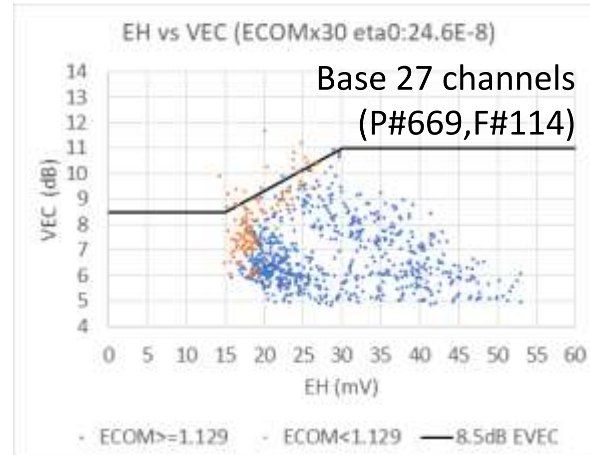


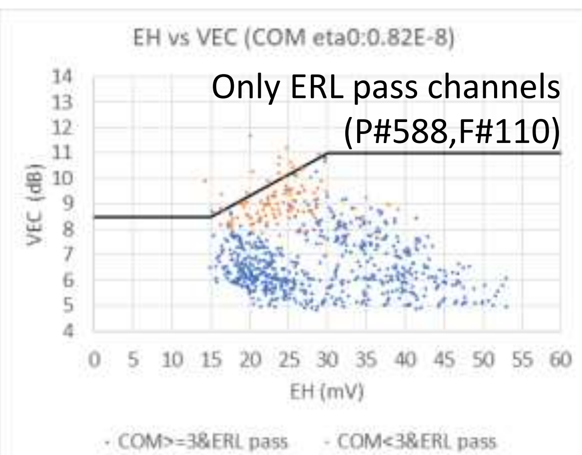
EH vs VEC with (E)COM & ERL pass/fail (Base 27 CHs)

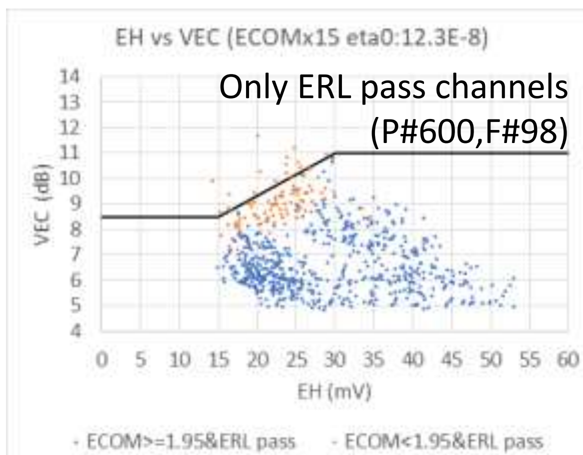
- VEC shows weak correlation with EH
- ECOM (in particular ECOMx30) faling cases are concentrated at low EH values

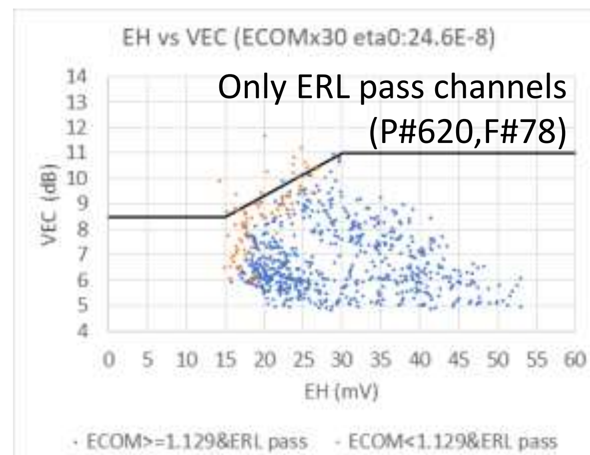








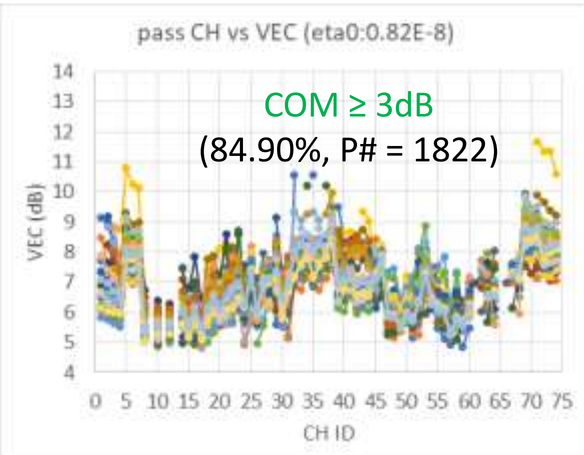


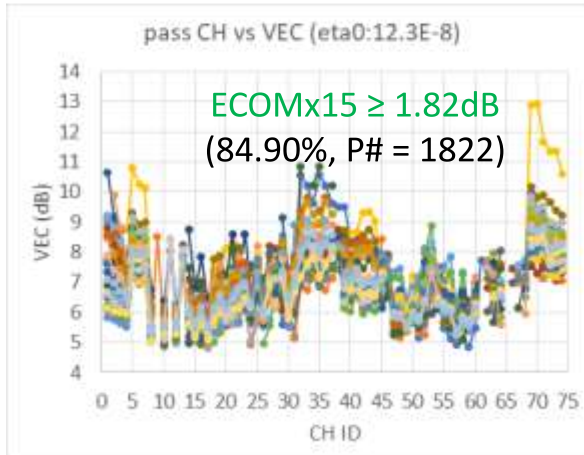


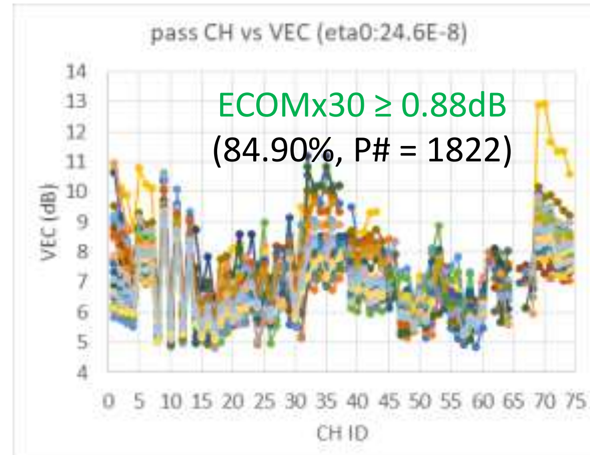
ERL pass/fail threshold = (pmax/vf < 0.375 ? 14dB : 11dB))

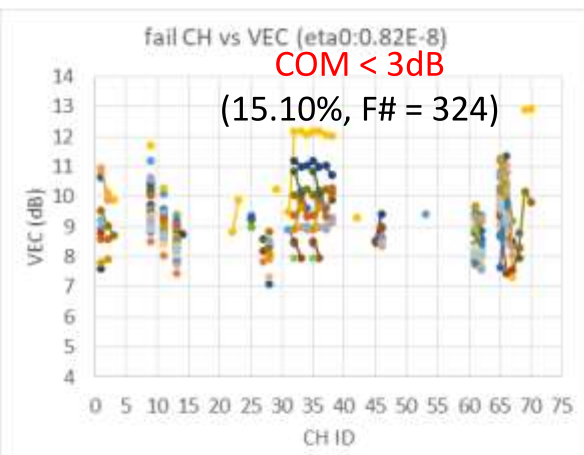
(E)COM Pass/Fail CH # vs VEC

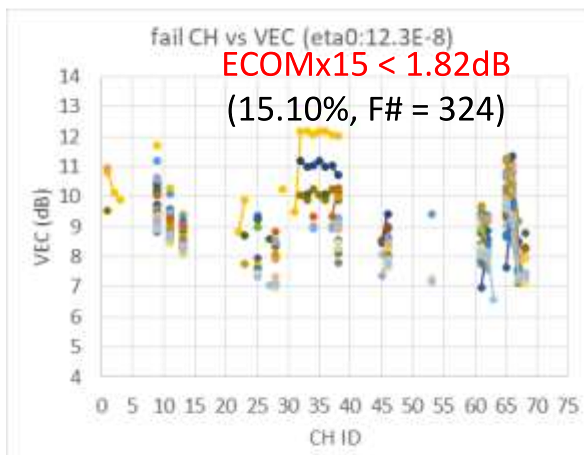
- VEC is measured with eta0=0.82E-8
- Pass/fail distinction is by whole-link simulation with eta0=0.82E-8, 12.3E-8, or 24.6E-8

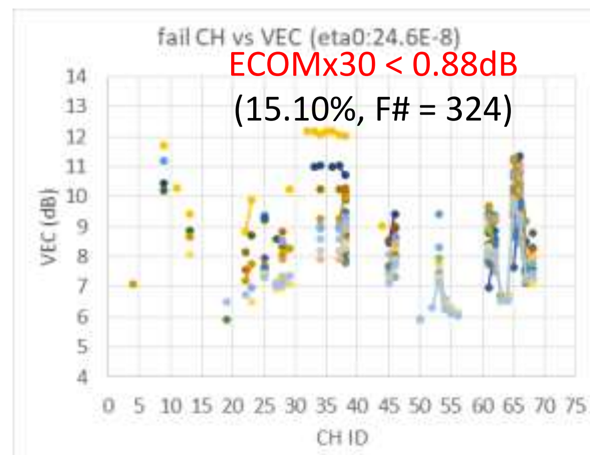






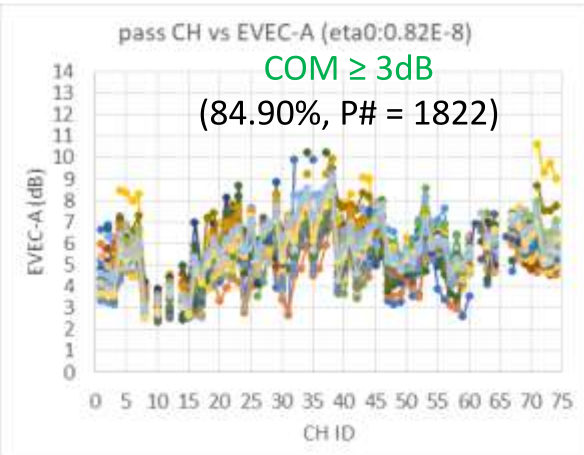


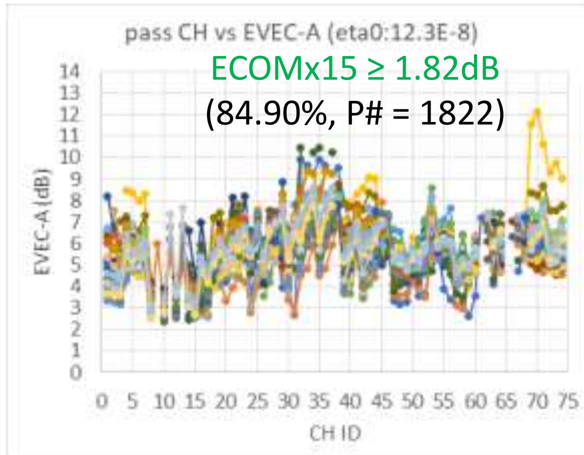


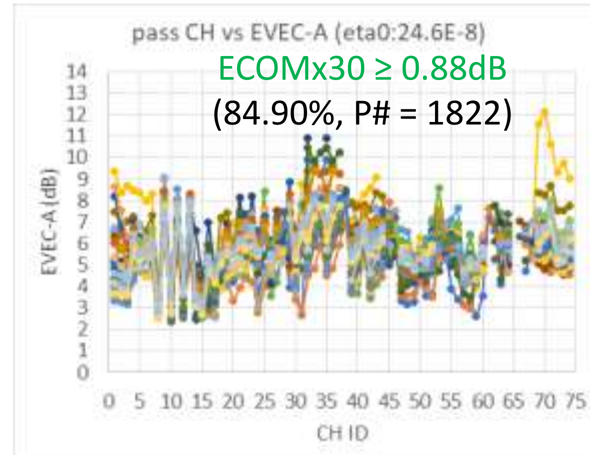


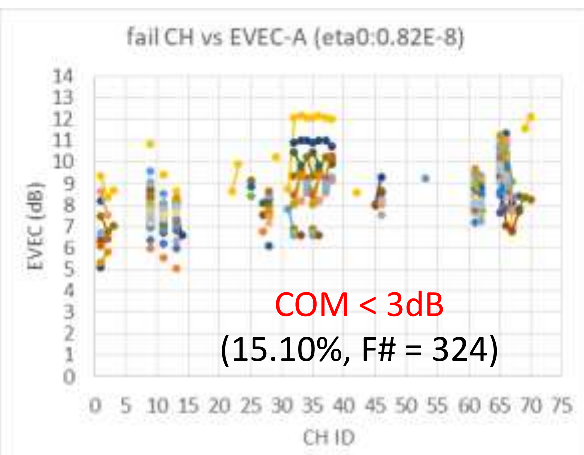
(E)COM Pass/Fail CH # vs EVEC-A

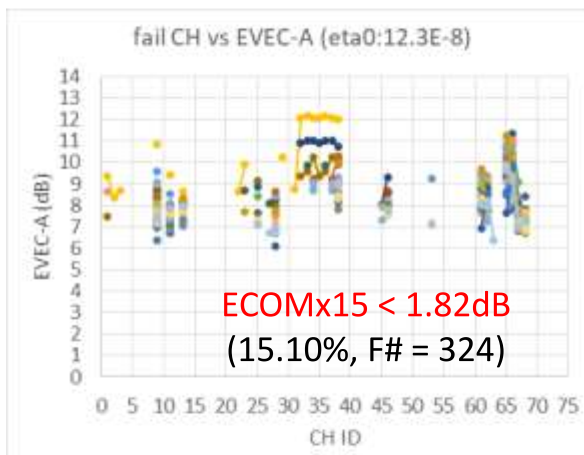
- EVEC-A is calculated from VEC and EH measured with eta0=0.82E-8 at TP1a
- Pass/fail distinction is by whole-link simulation with eta0=0.82E-8, 12.3E-8, or 24.6E-8

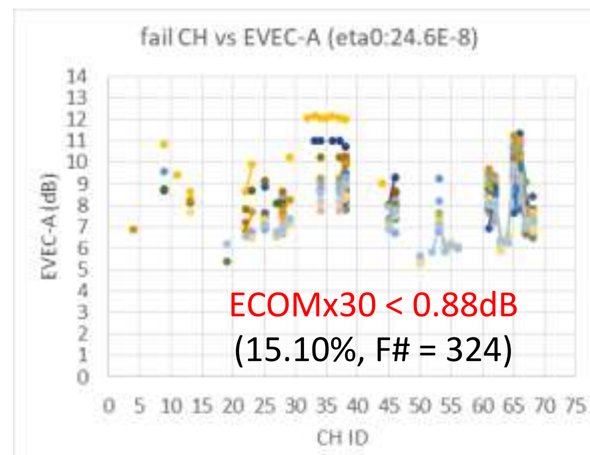






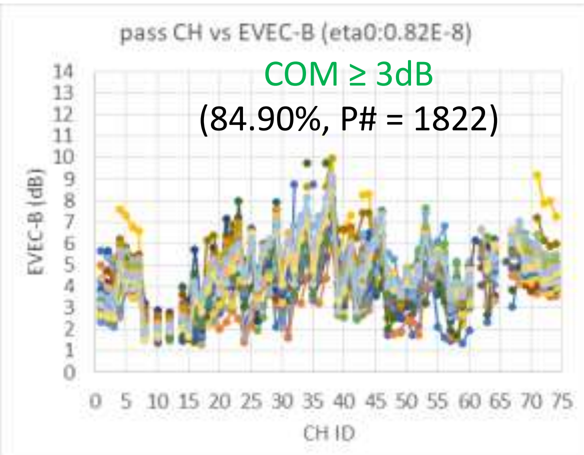


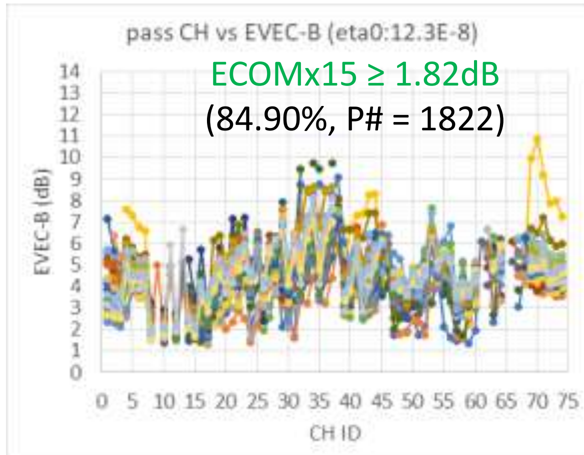


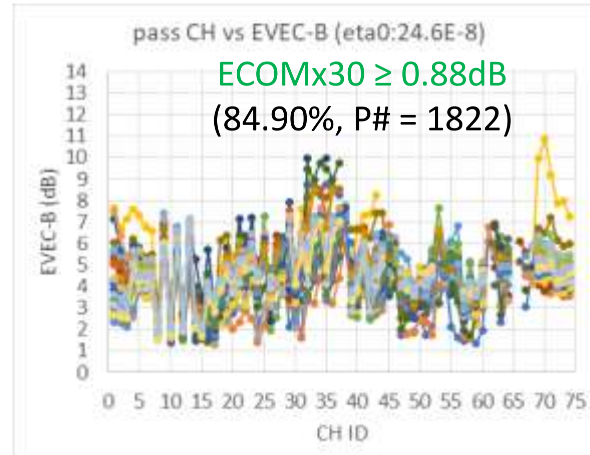


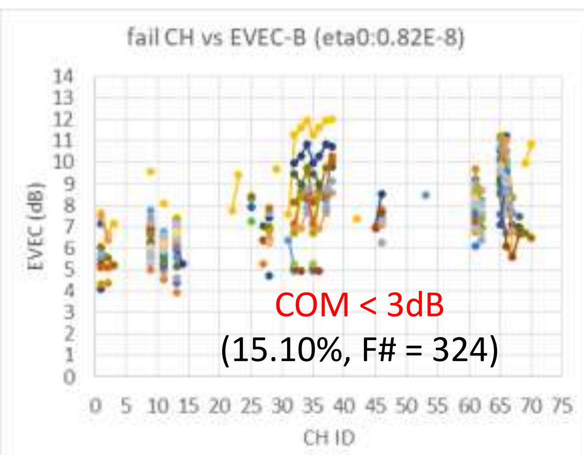
(E)COM Pass/Fail CH # vs EVEC-B

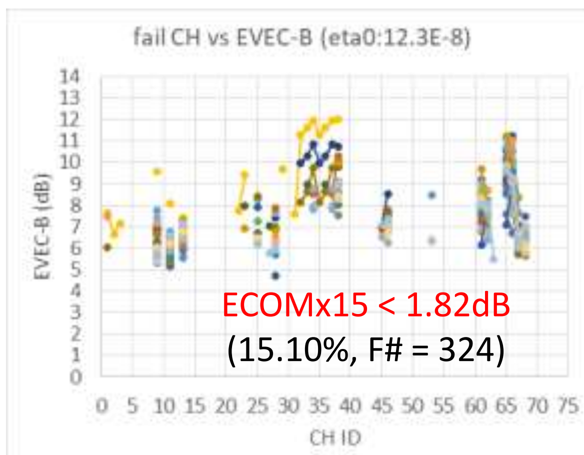
- EVEC-B is calculated from VEC and EH measured with eta0=0.82E-8 at TP1a
- Pass/fail distinction is by whole-link simulation with eta0=0.82E-8, 12.3E-8, or 24.6E-8

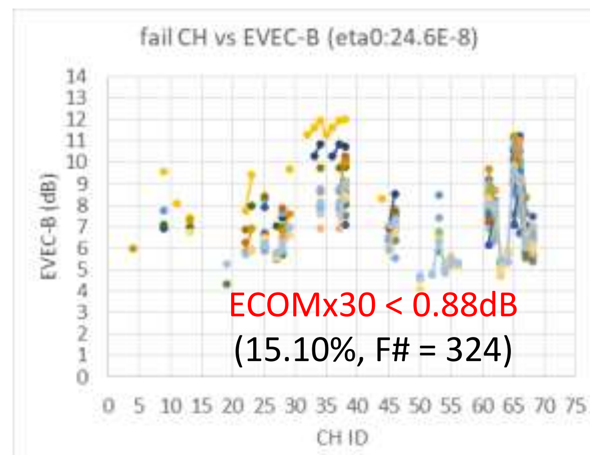












(E)COM Pass/Fail CH # vs VECx30

- VEC is measured with eta0=24.6E-8
- Pass/fail distinction is by whole-link simulation with eta0=0.82E-8, 12.3E-8, or 24.6E-8