Comment #72 (C2M) & #504 (C2C)

P802.3dj COM Parameter Value Consensus Building – AUI C2M & C2C, Part 2

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Review from Part #1

- Eta_0 = 1E-8
- # pre-cursor RXFFE taps (5)

Proposal – AUI C2M and AUI C2C (1/2)

- For 200G/lane AUI C2M and AUI C2C, set the COM parameter values as follows:
  - # RXFFE taps
    - Number of fixed-position taps (N_fix) = 14 (d_w + 1 + 8 fixed-position post-cursor taps)
    - Number of floating tap groups (N_g) = 2
    - Number of taps per floating tap group (N_f) = 4
    - Highest allowed tap index (N_max) = 50
  - $A\_v = A\_fe = 0.413$
  - $A\_ne = 0.45$
- Set COM = 3dB for analysis

Note: In 178A.1.8.1, "The total number of taps in the feed-forward filter, N_w, is $N\_fix + N\_g*N\_f$" (P656 L11) and this seems to include the precursor taps d_w (e.g., based on Figure 178A–8).

Proposal – AUI C2M and AUI C2C (2/2)

- Add editor's note:
    - "The A_v, A_{fe}, A_{ne}, N_{fix}, N_g, N_f, and N_{max} parameters values in this table are to be confirmed and may change based on further analysis. Contributions in this area are encouraged."
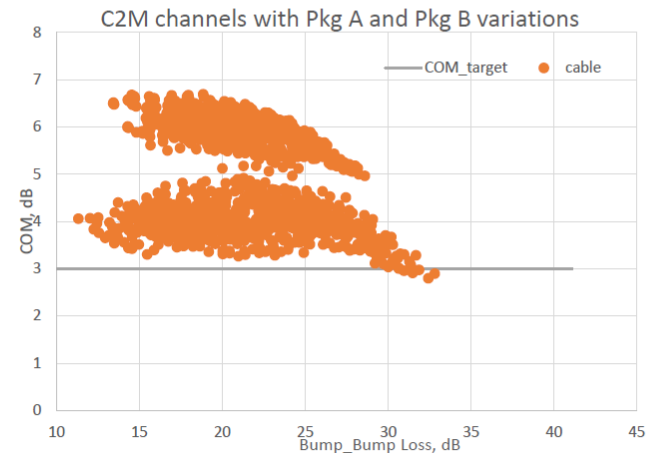
Supporting Analysis – C2M

C2M Channel Analysis – Config: 1
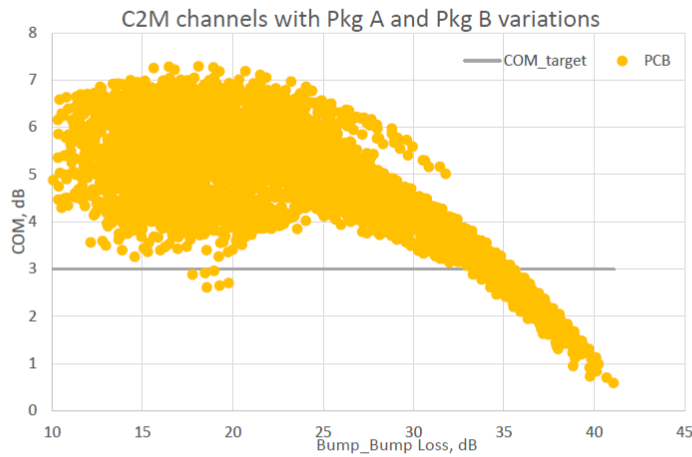
Config: 1
Receiver
- Num of RX FFE pre-cursors : 5
- Num of RX FFE fixed post cursors : 8
- Number of banks of floating up to 50 UI: 2

NEXT Voltage levels
- A_Ne = A_V

Excessive Skew cases removed

C2M channels with Pkg A and Pkg B variations

Loss Range /number of COM failures -- Loss Range: 8.7898 : 41.0683 *PCB host cases: 5292; Cabled-host cases : 1404*								
<=17		0	17-26		6	26-34		13
Cbl	Pcb		Cbl	Pcb		Cbl	Pcb	
0	0		0	6		6	7	

>34		263
Cbl	Pcb	
0	263	

C2M channels with Pkg A and Pkg B variations

IEEE P802.3dj 200Gb/s, 400Gb/s, 800Gb/s, and 1.6Tb/s C2M
Offline Consensus 30th May 2024

4

Data provided by Upen Reddy Kareti

Supporting Analysis – C2C
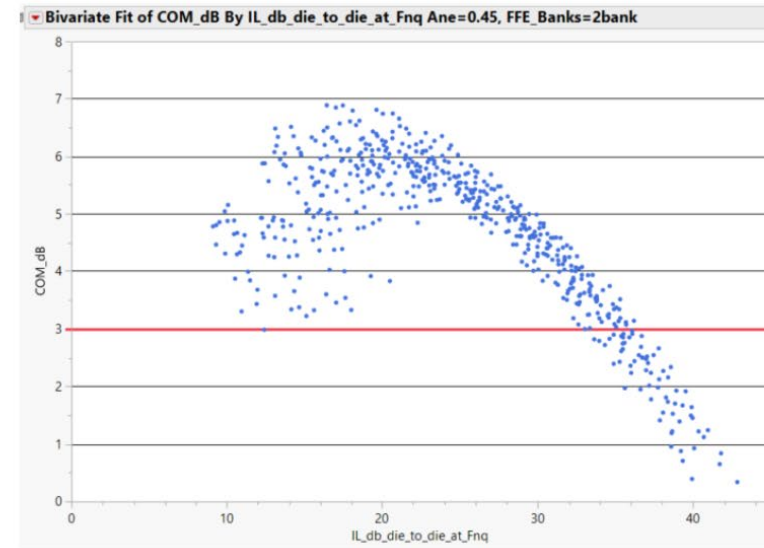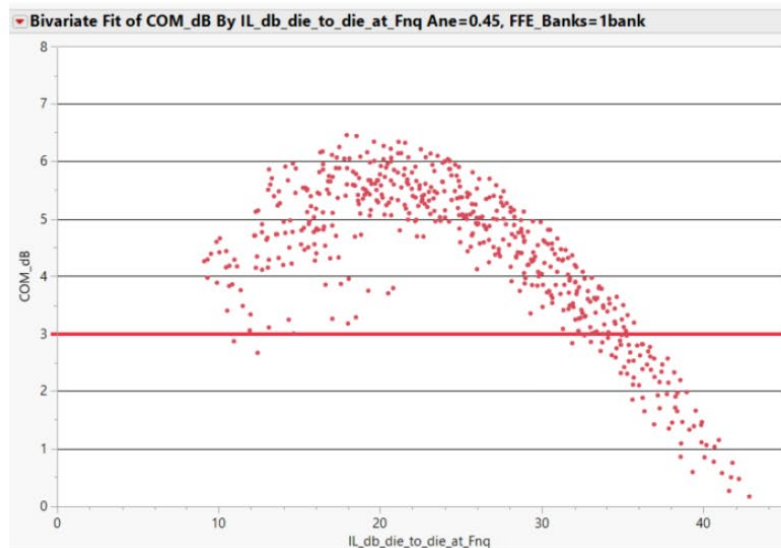
COM vs Loss (Die to Die) Ane = 0.45

Data provided by Howard Heck and Femi Akinwale

Next Steps

- More analysis to confirm the values on slide 3
  - Check the channel space for pass vs. fail
- Fill in the remaining COM parameter values

Thanks!

Supporting material - Upen

Channel Models

- [All channels that were contributed to 802.3dj project for C2M interface](#).
    - Includes PCB-host and Cabled-host channels

- Request from the Consensus Group:

The results are needed for discussion at the 30 May offline consensus building meeting.

Two candidate EQ models are requested:
- 5 pre, post 8 fixed + 1x4 (50)
- 5 pre, post 8 fixed + 2x4 (50)
- Plot the PCB and the cable on different plots, please.

Please keep A_v = 0.413 and A_fe = 0.413. The group also wants data with two values of A_ne = 0.45 and 0.608. Please start with A_ne = 0.45

In table form:

EQ	Highest priority		Lowest Priority	
	5 pre, post 8 fixed + 1x4 (50)	5 pre, post 8 fixed + 2x4 (50)	5 pre, post 8 fixed + 1x4 (50)	5 pre, post 8 fixed + 2x4 (50)
A_v	0.413	0.413	0.413	0.413
A_{ne}	0.413	0.413	0.413	0.413
A_v	0.45	0.45	0.608	0.608
	Config 2	**Config 1**	**Config 2a**	**Config 1a**

IEEE P802.3dj 200Gb/s, 400Gb/s, 800Gb/s, and 1.6Tb/s C2M
Offline Consensus 30th May 2024

2
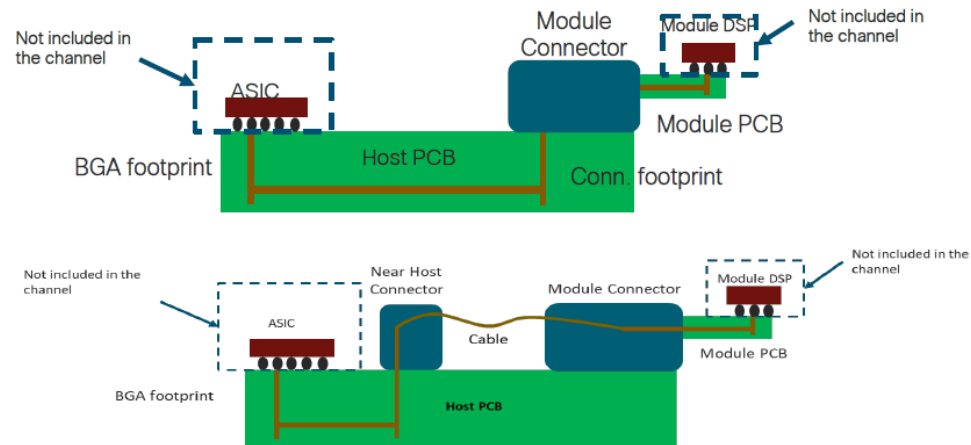
C2M Channel Analysis - Setup

- COM tool version: 4.6 Beta 2.
- Base configuration for simulation and test Configs Include:
  - Both types of packages (Type A and Type B)
  - Mixing of Package types for Package variations
    - Host Silicon package trace lengths – 8 mm to 45 mm
    - Module Silicon package trace lengths – 4 mm to 12 mm
  - Cover all Cabled-host and PCB-host channels contributed to IEEE C2M interface
    - All skew variations
    - Impedance variations
    - Temperature variations
  - Receiver
    - Num of RX FFE pre-cursors : 5
    - Num of RX FFE fixed post cursors : 8
    - Number of banks of floating up to 50 UI: 1 or 2
    - Input Reference Noise (ETA_0) levels (V^2/GHz) : 1e-8
  - NEXT Voltage levels
    - A_Ne = A_V
    - A_Ne = 0.608V

IEEE P802.3dj 200Gb/s, 400Gb/s, 800Gb/s, and 1.6Tb/s C2M
Offline Consensus 30th May 2024

3

Supporting material – Femi/Howard

Channel Models

- Based on Channels from the following contribution:
  - https://www.ieee802.org/3/dj/public/24_05/heck_3dj_01b_2405.pdf

Physical Channel Description (Simulated)

SOC Tx

Retimer Rx

- Number of Aggressors: 3 FEXT and 4 NEXT
- BGA escape model
  - BGA ball not included, 5 mil stub
  - Tx/RX via drill depths: 10/20, 35/45, 60/70
- Host PCB
  - Impedance: 85, 93, 100 Ω
  - Insertion loss: 1.5dB/in @53.125GHz
- Does not include package or silicon structures

Channels based on heck_3dj_01b_2403 w/ the addition of longer via lengths & PCB impedance corners.

We also analyze contributed channels in mellitz_3dj_elec_01_230504.

IEEE P802.3dj 200Gb/s, 400Gb/s, 800Gb/s, & 1.6Tb/s
C2C   Offline Consensus 30th May 2024

2

COM Configuration and Experiment

Parameter Values to Use

Parameter	Value	Units
A_v	0.413	V
A_fe	0.413	V
A_ne	0.608	V
fr	0.58*fr	GHz
b_max(1)	0.75	
g_DC	[-15:1:0]	dB
fz	42.5	GHz
fp1	42.5	GHz
fp2	106.25	GHz
g_DC_HP	[-6:1:0]	dB
f_HP_PZ	1.328125	GHz
Butterworth	1	
eta0	1.00E-08	V^2/GHz
Sigma_RJ	0.01	UI
A_DD	0.02	UI
SNR_TX	33	dB
R_LM	0.95	
ffe_pre_tap1_max	1	
ffe_post_tap1_max	1	
ffe_tapn_max	1	
Tr (ns)	0.004	ns

Ane =0.45

Channel Mix

	Parameter	min	max	step	# points
Channels	Ltxpkg	12	45	16.5	3
	Lrxpkg	4	12	4	3
	Lpcb	2	14	2	7
	Zpcb	85	100	7.5	3
	Ltxvia	10	60	25	3
	Lrxvia	20	70	25	
	# Channels				567
	A_ne	0.45	0.608		1
Reference RX	ffe_pre_tap_len	5	5	1	2
	ffe_post_tap_len	8	8	4	1
	N_bg	1	2	1	2
	N_bf	4	4	4	1
	N_f	50	50	10	1
	# RX combinations				4
	Total				2268

COM Version: 4.5 Beta3

COM vs Loss (Die to Die) Ane = 0.45

Bivariate Fit of COM_dB By IL_db_die_to_die_at_Fnq Ane=0.45, FFE_Banks=1bank

Bivariate Fit of COM_dB By IL_db_die_to_die_at_Fnq Ane=0.45, FFE_Banks=2bank
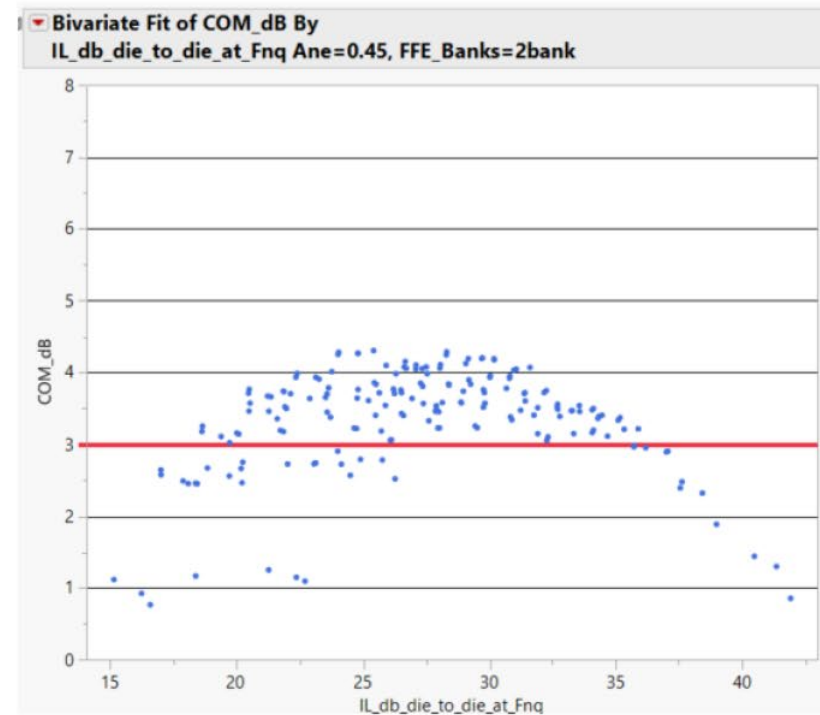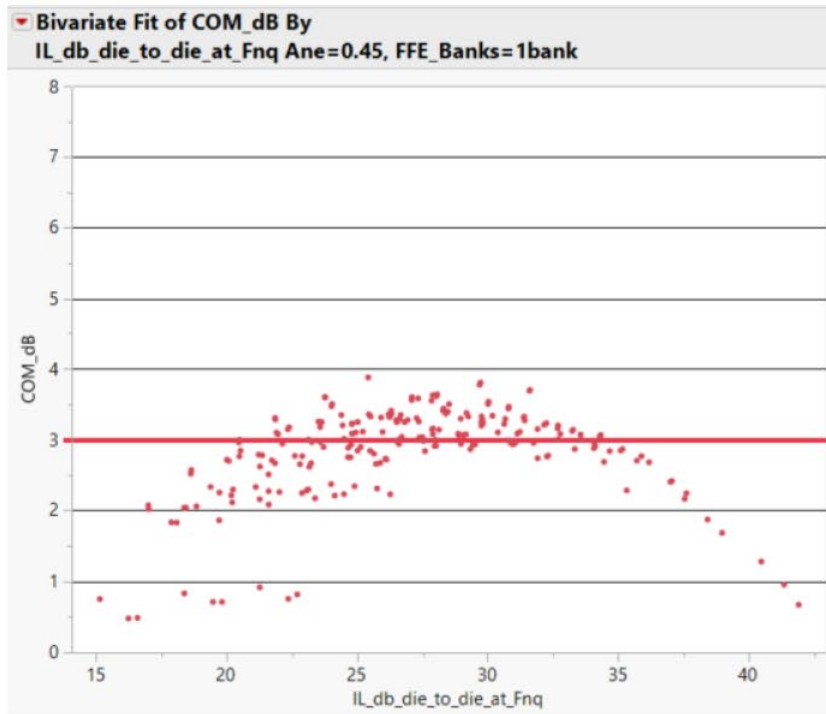
These are Mellitz C2C channels