



# Die/Ball Level Parameters and Channel Characteristics Annex

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**IEEE 802.3 50 Gb/s, 100 Gb/s, and 200 Gb/s Ethernet Task Force  
July 2016, San Diego**

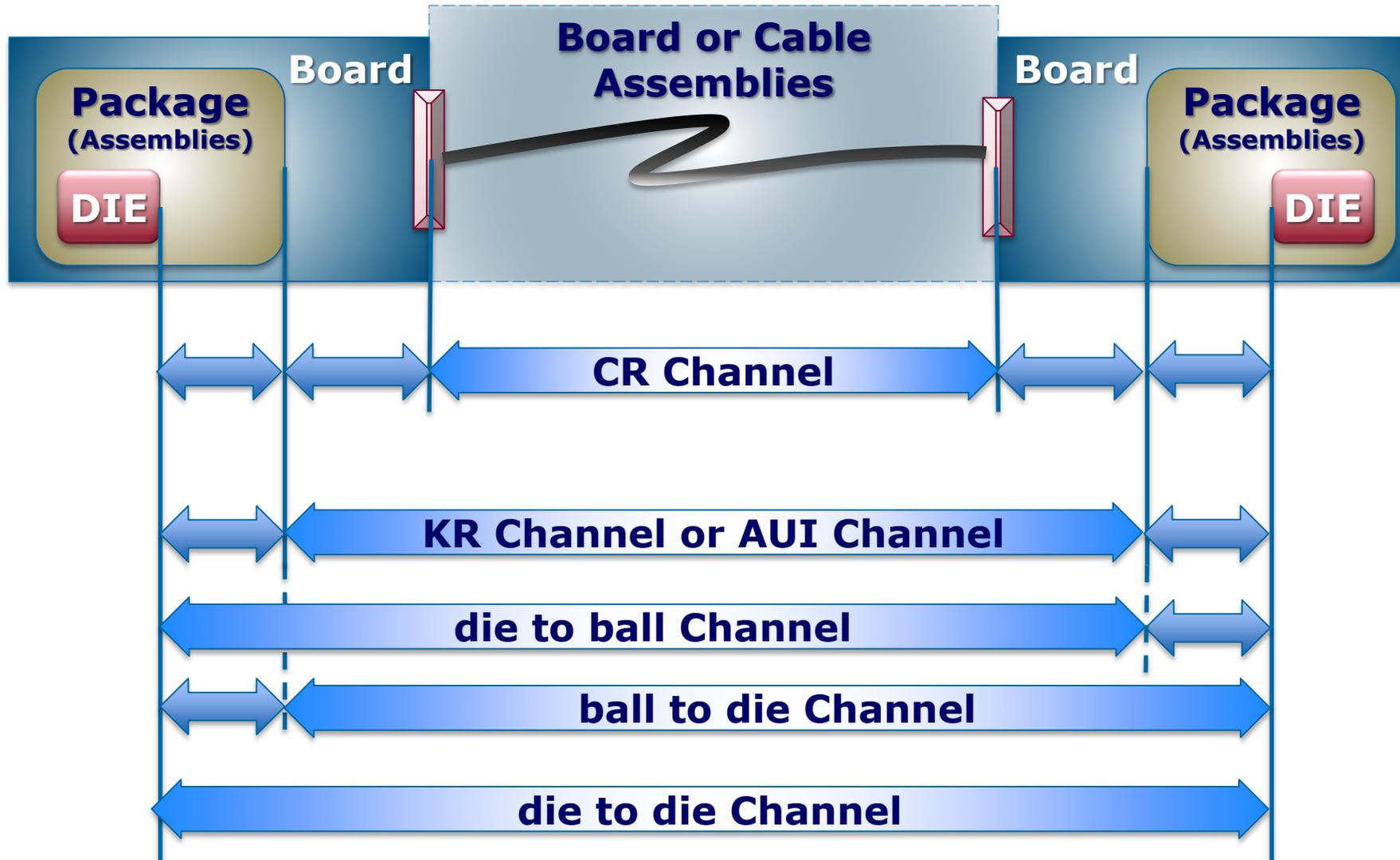
# Presentation Purpose

- ▶ Propose an informative baseline annex based on feedback from:  
[http://www.ieee802.org/3/cd/public/adhoc/archive/Mellitz\\_062216\\_3cd\\_01\\_adhoc.pdf](http://www.ieee802.org/3/cd/public/adhoc/archive/Mellitz_062216_3cd_01_adhoc.pdf)

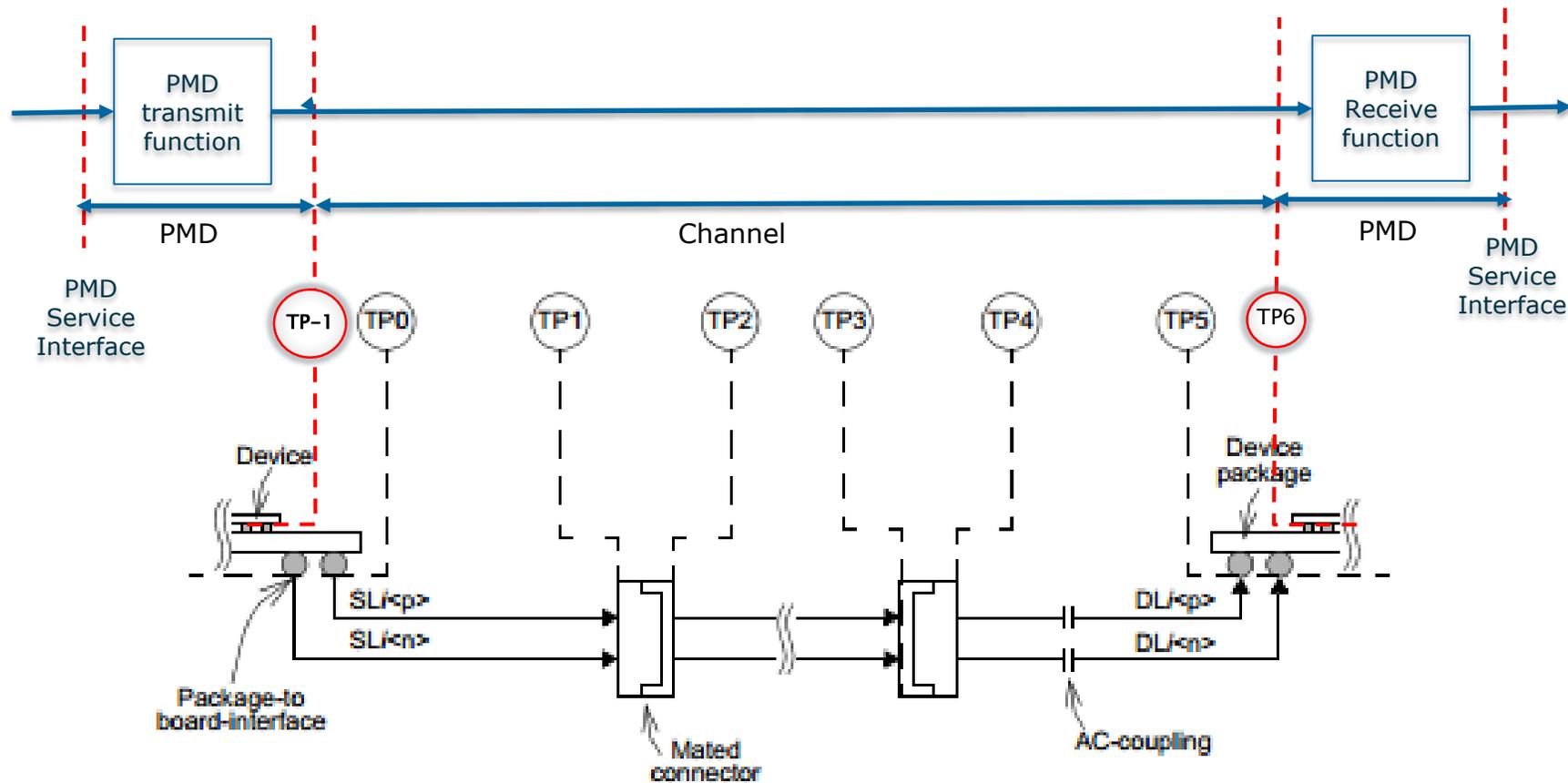
# Market Proposition – Some Thoughts

- ▶ Packages → large chunk of COM
  - Recouping 2dB of COM margin is attractive
  - For example the channel, PAM4\_2conn\_MP\_v2\_85ohm\_30dB\_Nom\_thru, has a COM or 1.26 dB for package 2, 2.48 dB for package 1, and 3.3 dB with no package.
- ▶ Interconnect may be more than just a package and board
  - Interposers, cable attached packages, topside package attachment, etc.
  - A plethora of connections
- ▶ Market innovation and new usage models often blur test points and interconnect assembly ownership
- ▶ Proposal: Informative Parameters and Channel characteristics Annex for 50G PAM4 lanes expanding the COM usage model
  - Better able to track innovative interconnect assemblies
  - A service to the industry

# Keep KR and CR: Add Informative COM parameters



# Add 2 test points in the Annex define a die test point



# 50GBase-KR-D2D COM parameters (die to die)

- ▶ This is only a starting point
- ▶ Contribution may change parameters
  - Must be consistent with `cd KR and `bs C2C

Table 93A-1 parameters			
Parameter	Setting	Units	Information
f_b	26.5625	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[2.8e-4 2.8e-4]	nF	[TX RX]
z_p select	[1]		[test cases to run]
z_p (TX)	0	mm	[test cases]
z_p (NEXT)	0	mm	[test cases]
z_p (FEXT)	0	mm	[test cases]
z_p (RX)	0	mm	[test cases]
C_p	0.00E+00	nF	[TX RX]
R_0	50	Ohm	
R_d	[55 55]	Ohm	[TX RX]
f_r	0.75	*fb	
c(0)	0.6		min
c(-1)	[-0.15:0.05:0]		[min:step:max]
c(-2)	[0:0.05:0.15]		
c(1)	[-0.35:0.05:0]		[min:step:max]
g_DC	[-15:1:0]	dB	[min:step:max]
f_z	10.625	GHz	
f_p1	10.625	GHz	
f_p2	1.00E+99	GHz	
A_v	0.45	V	
A_fe	0.45	V	
A_ne	0.65	V	
L	4		
M	32		
N_b	16	UI	
b_max(1)	0.5		
b_max(2..N_b)	0.2		
sigma_RJ	0.01	UI	
A_DD	0.02	UI	
eta_0	2.60E-08	V <sup>2</sup> /GHz	
SNR_TX	34	dB	
R_LM	0.95		
DER_0	1.00E-04		
Operational control			
COM Pass threshold	3	dB	
Include PCB	0	Value	0, 1, 2
g_DC_HP	[-4:1:0]		[min:step:max]
f_HP_PZ	0.6640625	GHz	

# 50GBase-KR-D2B COM parameters (die to ball)

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- Contribution may change parameters
  - Must be consistent with `cd KR and `bs C2C

Table 93A-1 parameters			
Parameter	Setting	Units	Information
f_b	26.5625	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[2.8e-4 2.8e-4]	nF	[TX RX]
z_p select	[1 2]		[test cases to run]
z_p (TX)	[0 0]	mm	[test cases]
z_p (NEXT)	[12 30]	mm	[test cases]
z_p (FEXT)	[ 0 0]	mm	[test cases]
z_p (RX)	[12 30]	mm	[test cases]
C_p	[0 1.1e-4]	nF	[TX RX]
R_0	50	Ohm	
R_d	[55 55]	Ohm	[TX RX]
f_r	0.75	*fb	
c(0)	0.6		min
c(-1)	[-0.15:0.05:0]		[min:step:max]
c(-2)	[0:0.05:0.15]		
c(1)	[-0.35:0.05:0]		[min:step:max]
g_DC	[-15:1:0]	dB	[min:step:max]
f_z	10.625	GHz	
f_p1	10.625	GHz	
f_p2	1.00E+99	GHz	
A_v	0.45	V	
A_fe	0.45	V	
A_ne	0.65	V	
L	4		
M	32		
N_b	16	UI	
b_max(1)	0.5		
b_max(2..N_b)	0.2		
sigma_RJ	0.01	UI	
A_DD	0.02	UI	
eta_0	2.60E-08	V <sup>2</sup> /GHz	
SNR_TX	34	dB	
R_LM	0.95		
DER_0	1.00E-04		
Operational control			
COM Pass threshold	3	dB	
Include PCB	0	Value	0, 1, 2
g_DC_HP	[-4:1:0]		[min:step:max]
f_HP_PZ	0.6640625	GHz	

# 50GBase-KR-B2D COM parameters (ball to die)

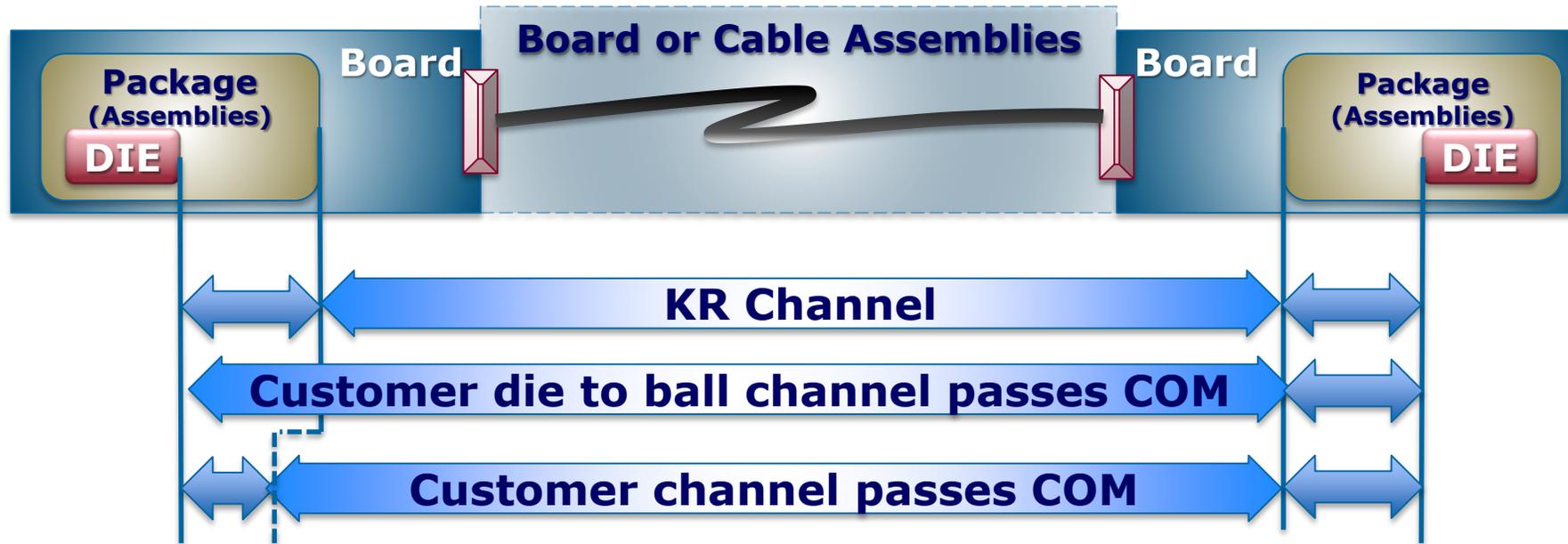
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z_p (TX)	[12 30]	mm	[test cases]
z_p (NEXT)	[0 0]	mm	[test cases]
z_p (FEXT)	[12 30]	mm	[test cases]
z_p (RX)	[0 0]	mm	[test cases]
C_p	[ 1.1e-4 0]	nF	[TX RX]
R_0	50	Ohm	
R_d	[55 55]	Ohm	[TX RX]
f_r	0.75	*fb	
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c(-1)	[-0.15:0.05:0]		[min:step:max]
c(-2)	[0:0.05:0.15]		
c(1)	[-0.35:0.05:0]		[min:step:max]
g_DC	[-15:1:0]	dB	[min:step:max]
f_z	10.625	GHz	
f_p1	10.625	GHz	
f_p2	1.00E+99	GHz	
A_v	0.45	V	
A_fe	0.45	V	
A_ne	0.65	V	
L	4		
M	32		
N_b	16	UI	
b_max(1)	0.5		
b_max(2..N_b)	0.2		
sigma_RJ	0.01	UI	
A_DD	0.02	UI	
eta_0	2.60E-08	V <sup>2</sup> /GHz	
SNR_TX	31	dB	
R_LM	0.95		
DER_0	1.00E-04		
Operational control			
COM Pass threshold	3	dB	
Include PCB	0	Value	0, 1, 2
g_DC_HP	[-4:1:0]		[min:step:max]
f_HP_PZ	0.6640625	GHz	

# Other parameters and considerations

- ▶ 50GAUI-D2D COM parameters
- ▶ 50GAUI-D2B COM parameters
- ▶ 50GAUI-B2D COM parameters
- ▶ 100G and 200G parameters are the same as 50G

# Simple Use Case Example



- ▶ Customer has channel that slightly exceeds COM
- ▶ Vendor offers chip that allows more channel
- ▶ Vendor provides package s-parameters and maybe other COM parameters for customer
- ★ Customer's channel now passes COM

# Proposal

- ▶ Motion:
  - Accept this proposal as a baseline for an informative Annex.