

Status Update - SDD21 & SDD11/22 Model Development

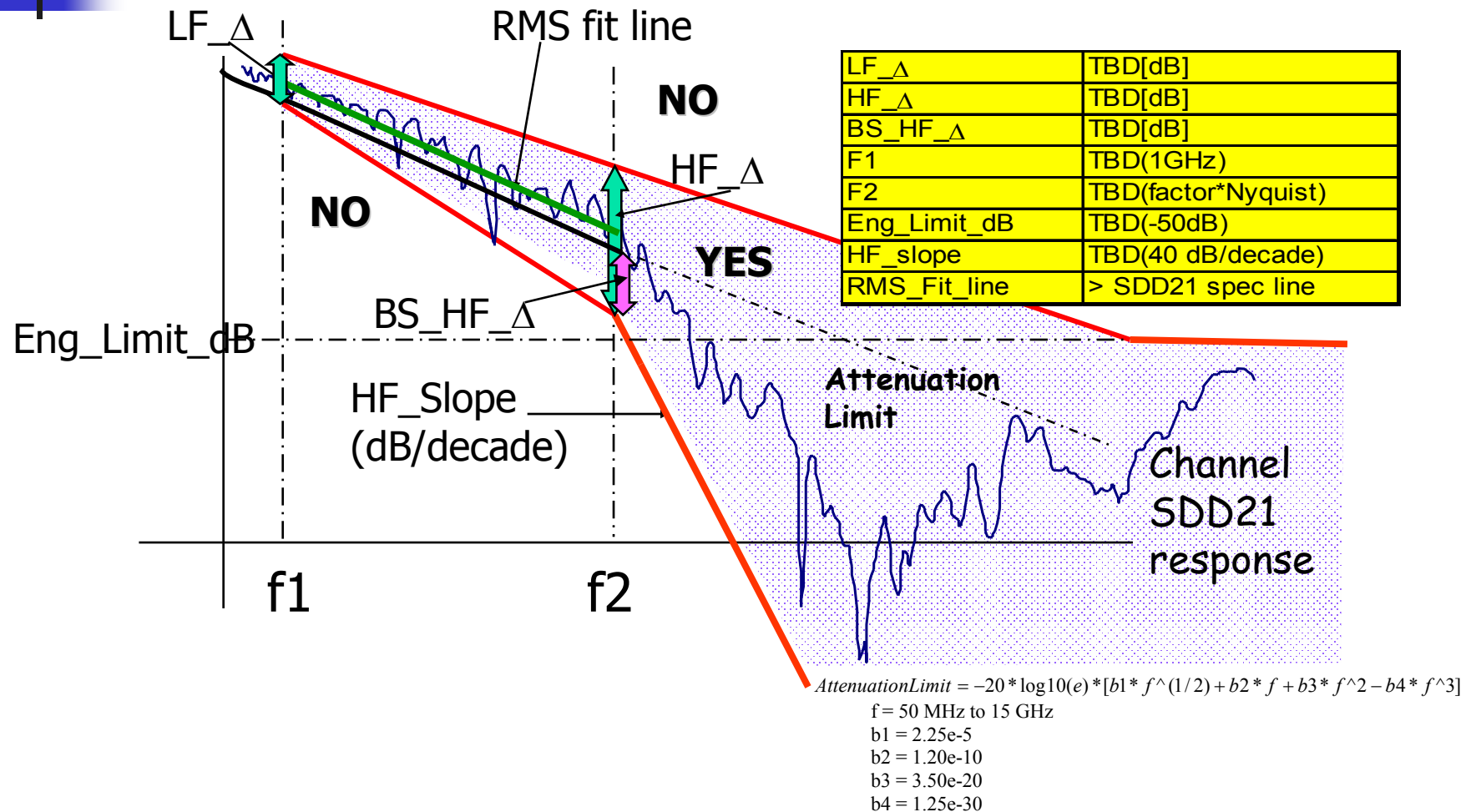


John D'Ambrosia, Tyco Electronics
Matt Hendrick, Intel

Acknowledgements

- Rich Mellitz, Intel
- Steve Krooswyk, Intel
- Mike Altmann, Intel
- Yves Braem, Tyco Electronics
- Mike Resso, Agilent
- Joe Abler, IBM

- Reference dambrosia_c1_0105
 - Recommended using proposed informative TP1 – TP4 SDD21 Channel Model Mask
 - Recommended eliminating informative TP1 – TP4 SDD11 / 22 model masks
 - Concern regarding this recommendation expressed
 - Recommended eliminating informative TP1 – TP4 SDD21 Group Delay Variation Mask
- Reference Rx models as defined in http://ieee802.org/3/ap/public/channel_model/mellitz_m1_0105.pdf






Review of Correlation Analysis

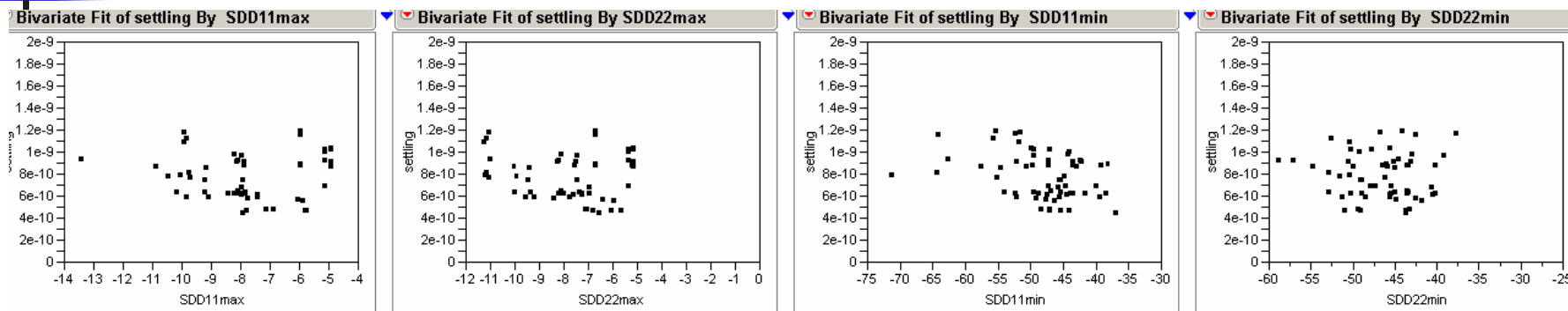
Parameter		Correlation
LFmax	Intel	Blue
	Tyco	
LFmin	Intel	
	Tyco	
HFmax	Intel	
	Tyco	
HFmin	Intel	Red
	Tyco	
BS_LF	Intel	
	Tyco	
BS_HF	Intel	
	Tyco	
FITabove	Intel	Red
	Tyco	
FITbelow	Intel	Red
	Tyco	
GD_min	Intel	Green
	Tyco	

Parameter		Correlation
GD_max	Intel	Blue
	Tyco	
GDslope	Intel	Blue
	Tyco	
SDD11max	Intel	Blue
	Tyco	
SDD22max	Intel	Blue
	Tyco	
SDD11min	Intel	Blue
	Tyco	
SDD22min	Intel	Blue
	Tyco	
peak	Intel	Red
	Tyco	
n(TP)	Intel	Blue
	Tyco	
m(TN)	Intel	Blue
	Tyco	
TP(-1)	Intel	Red
	Tyco	
TP(1)	Intel	Black
	Tyco	
Total Length	Intel	Black
	Tyco	

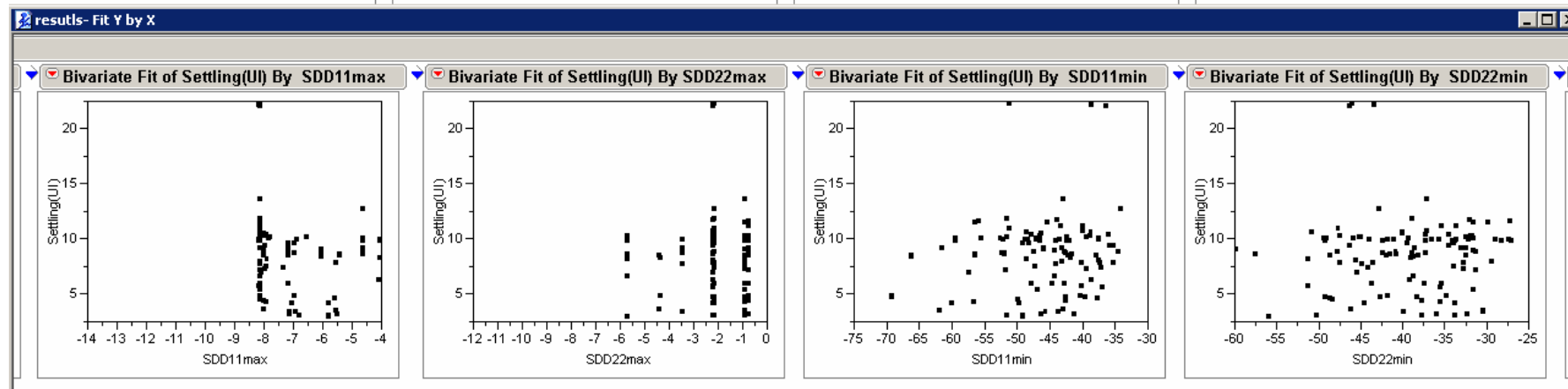
- dambrosia_c1_0105 recommended eliminating TP1 – TP4 Informative masks for SDD11/22 and Group Delay Variation.
- Concern expressed to deletion of informative TP1 - TP4 SDD11 /22 mask.

Legend	
Strong	Red
Medium	Green
None	Blue
Not Available	Black

Tyco

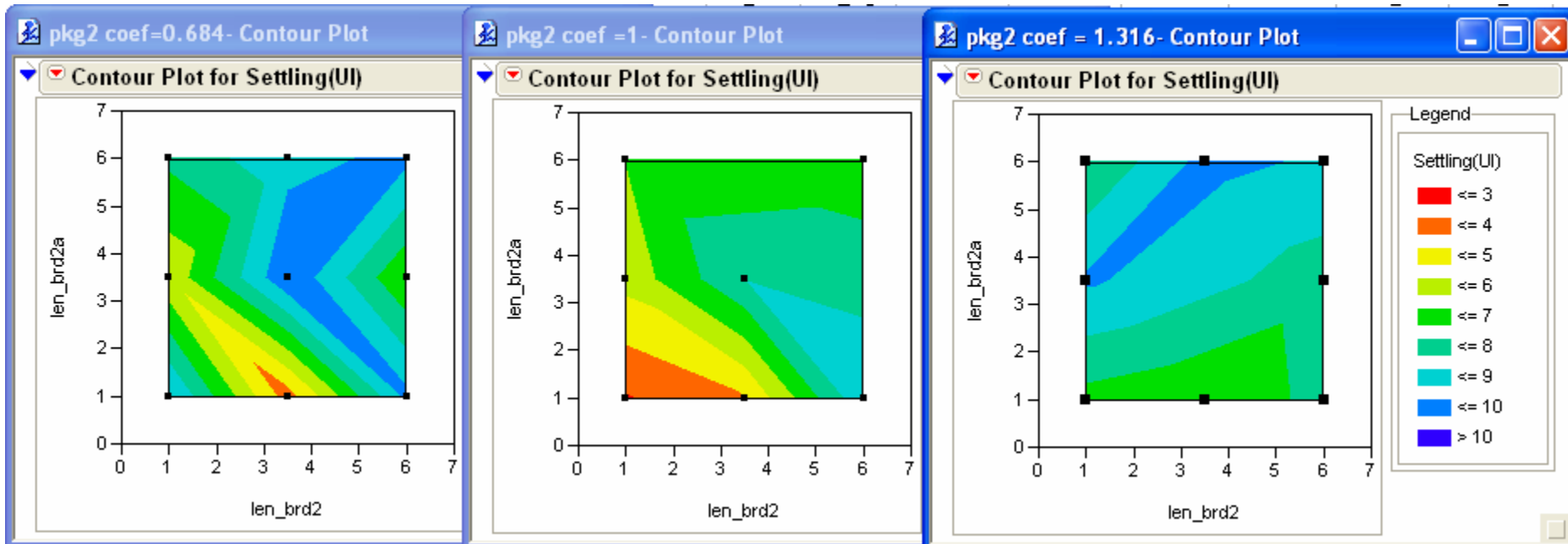


Intel



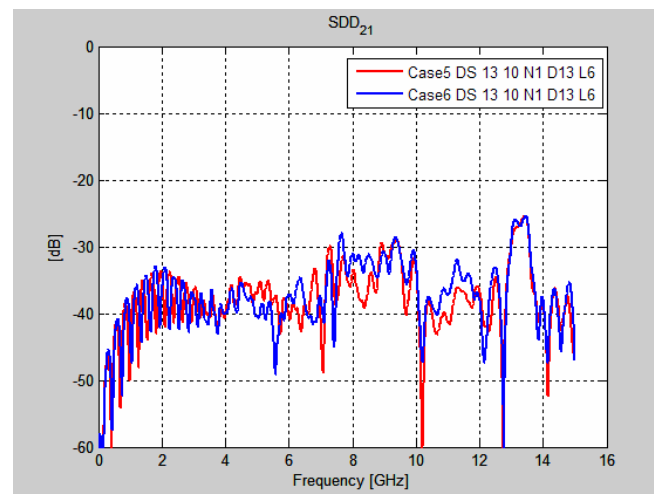
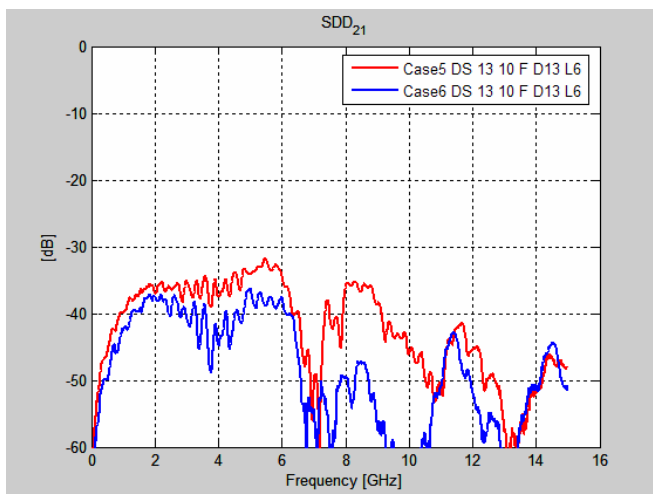
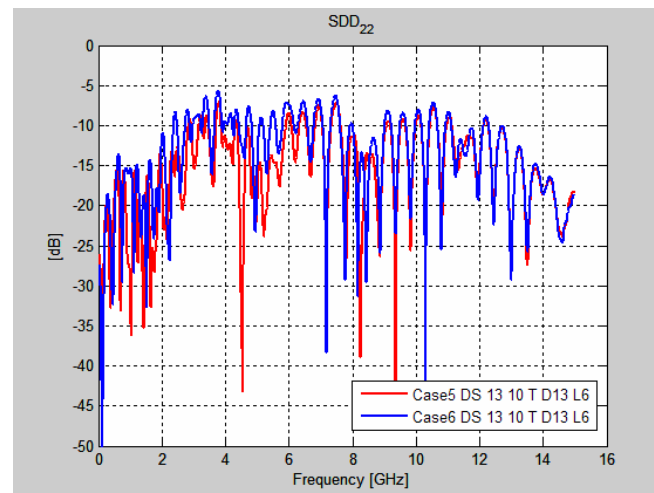
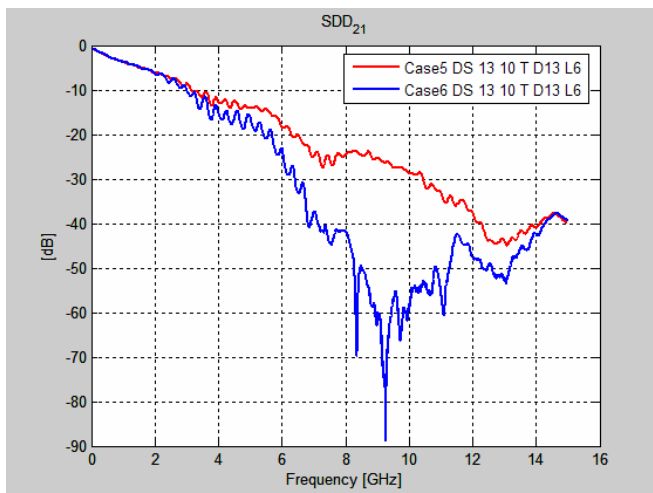
■ No correlation

Effect due to 10dB packages

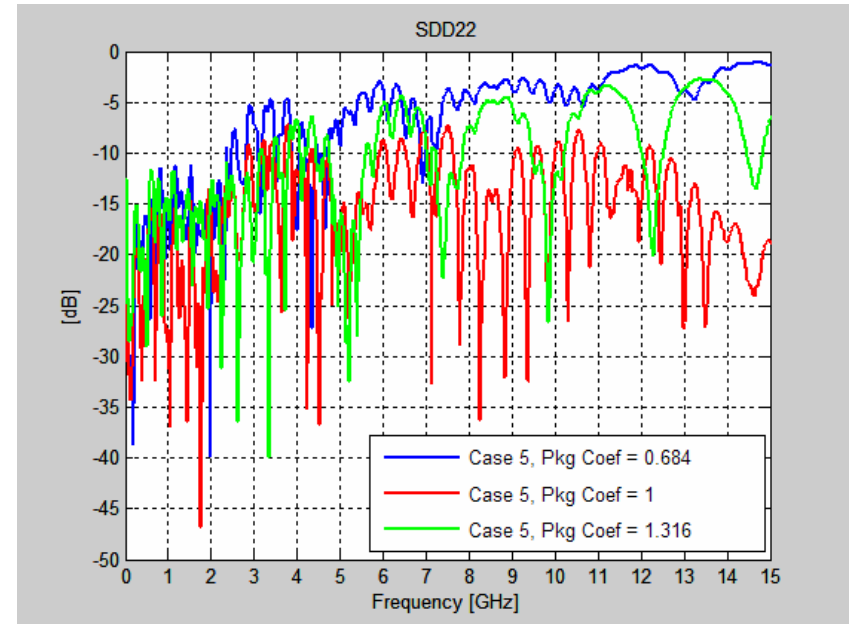
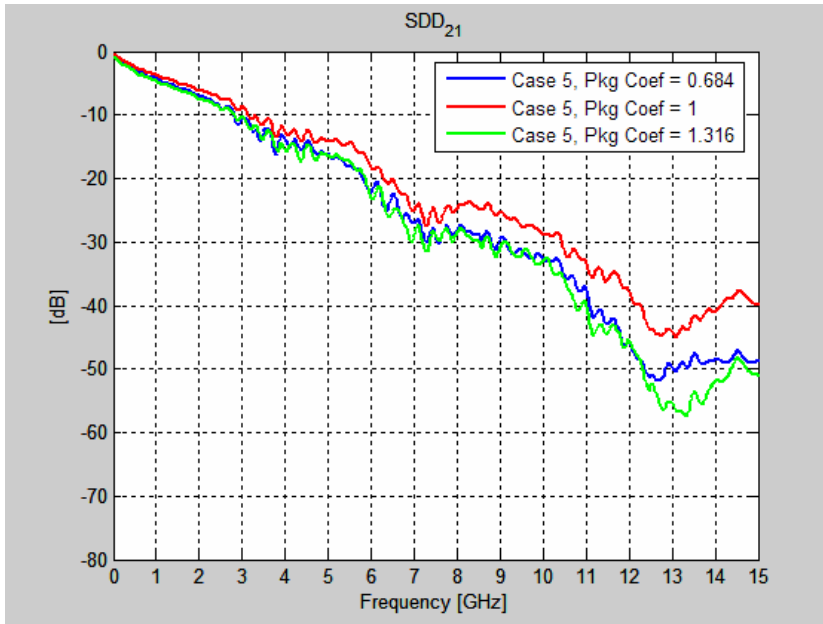


- len_brd2 – length from connector on Rx line card to AC coupling Cap
- len_brd2a – length from AC coupling cap to Rx
- Update from dambrosia_c1_0105.pdf
- 10 dB packages had an impact.
- Reference http://ieee802.org/3/ap/public/channel_model/mellitz_m1_0105.pdf

Cases #5 and #6 Frequency Characterization (dambrosia_02_0105)

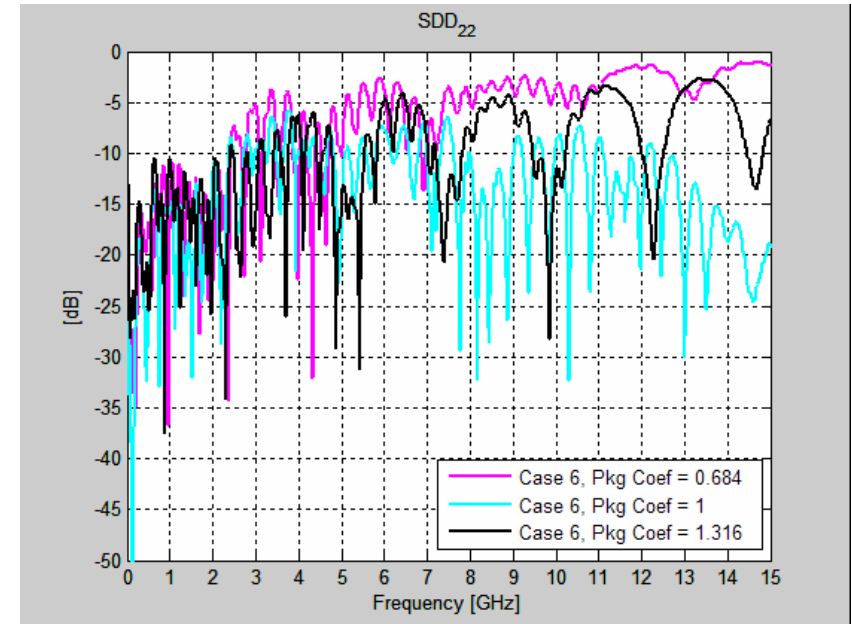
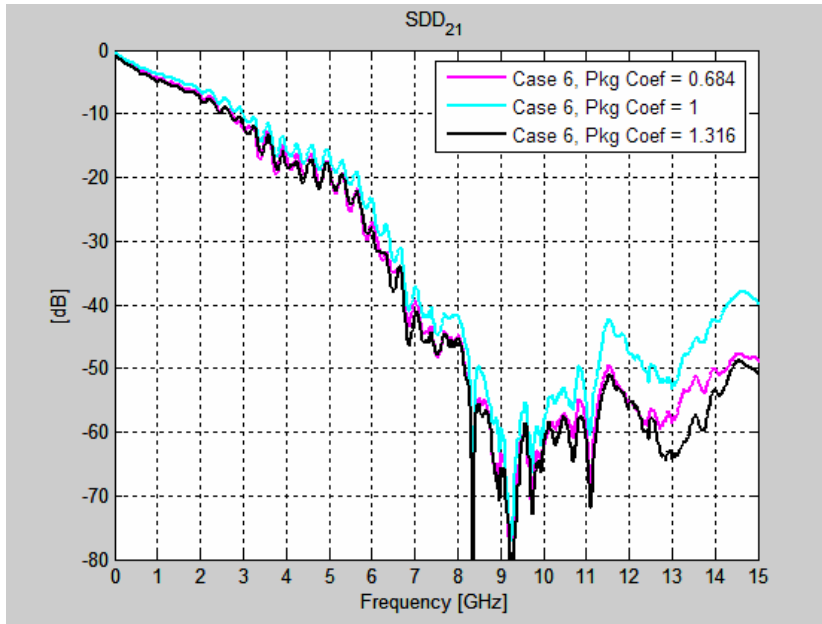


Frequency Characterization – Case #5 Cascaded with Rx Packaging



Rx models as defined in http://ieee802.org/3/ap/public/channel_model/mellitz_m1_0105.pdf

Frequency Characterization – Case #6 Cascaded with Rx Packaging

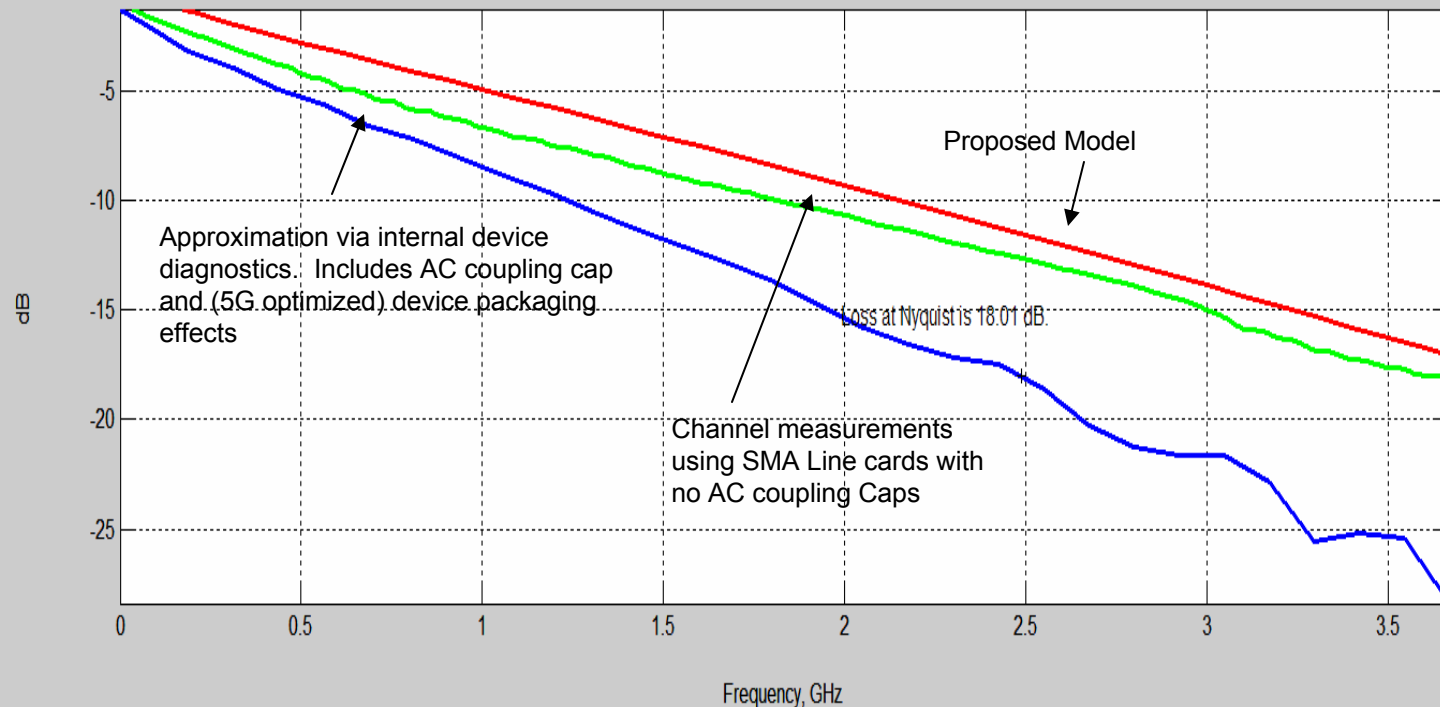


Rx models as defined in http://ieee802.org/3/ap/public/channel_model/mellitz_m1_0105.pdf

We've Seen This Before – A Channel the 5G Part Didn't Go 10G

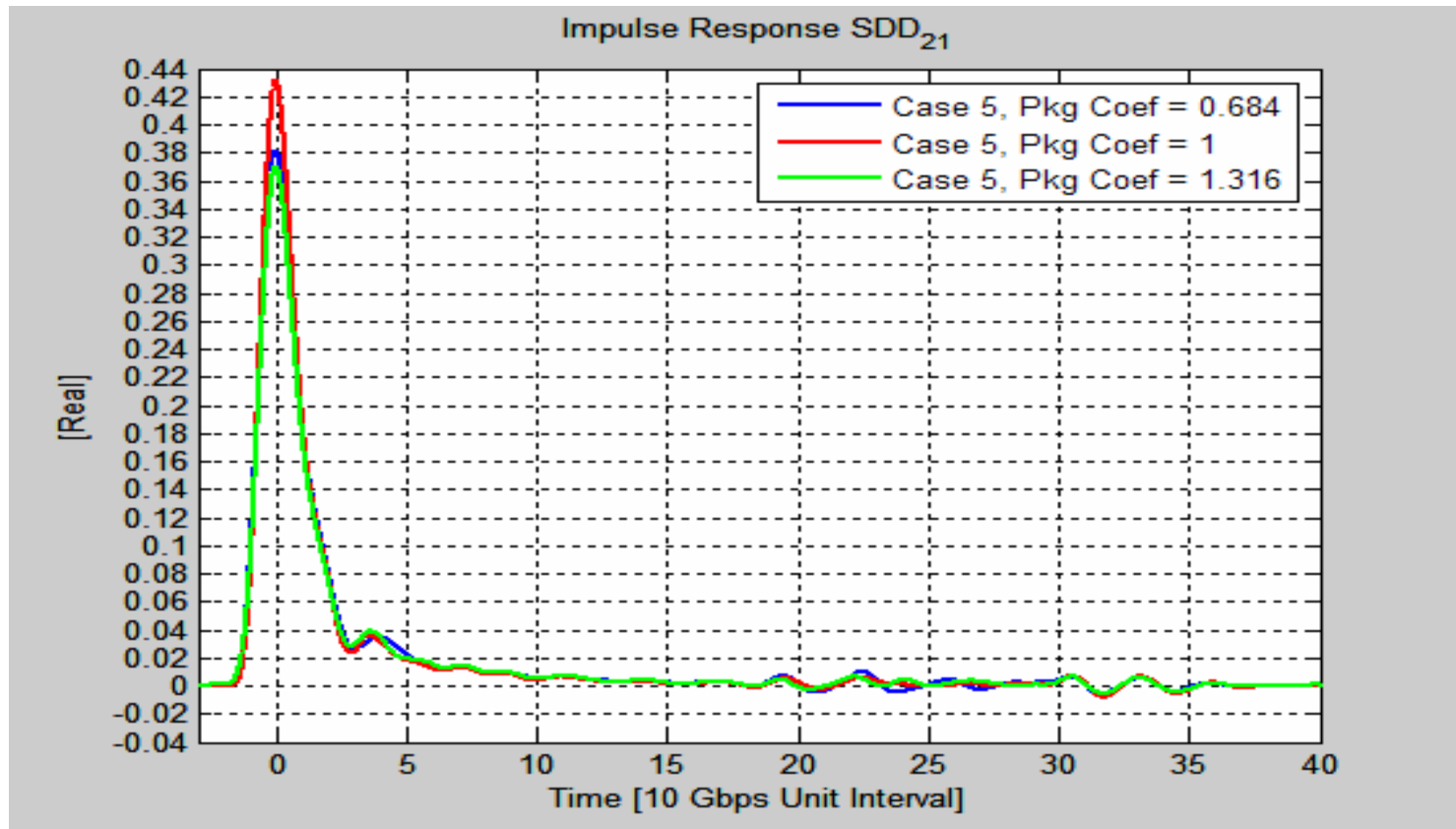


Tx + Channel + Rx Undersampler Response

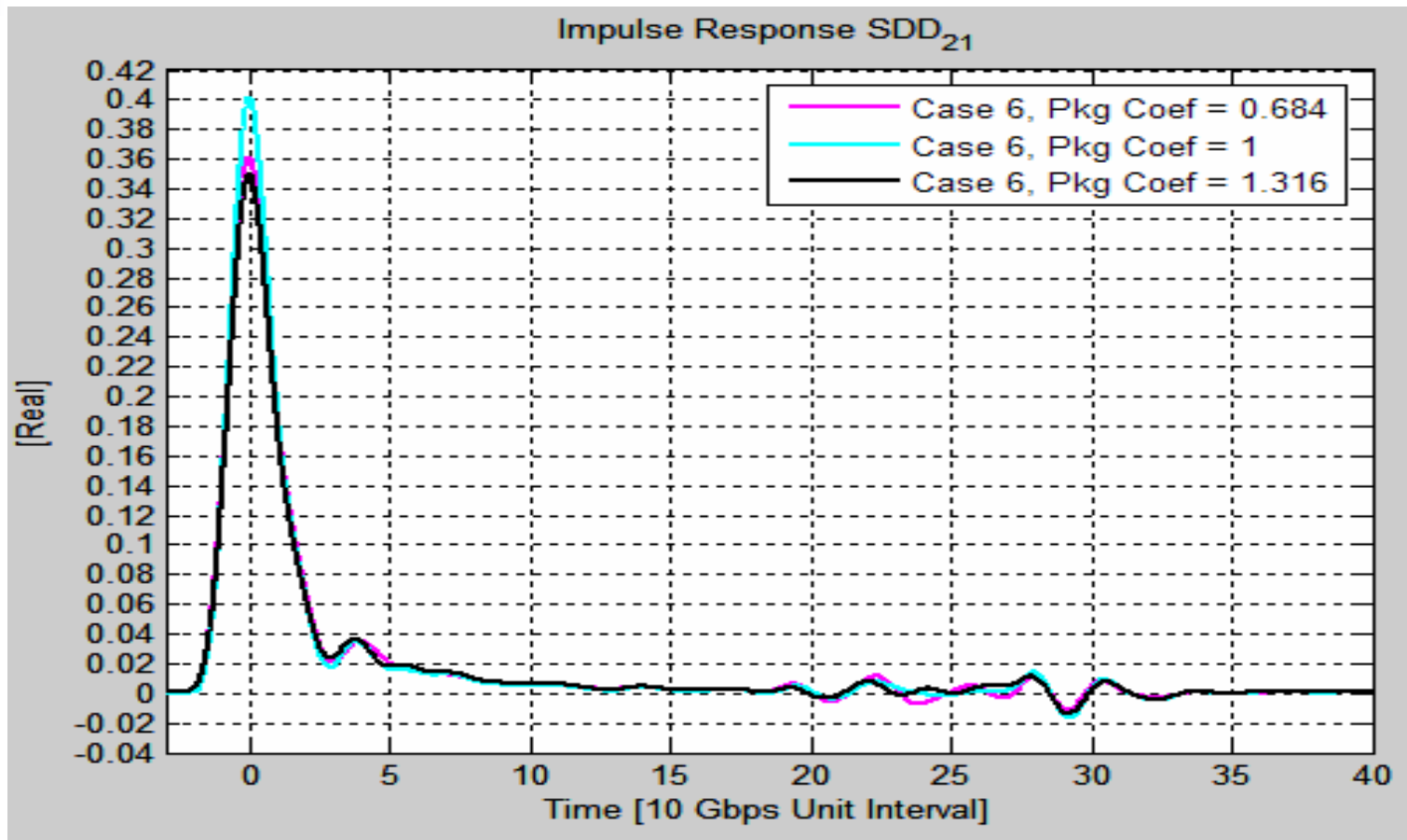


6000_Link3_Left_Channel0

Reference – "PAM-4 Link Analysis, "http://grouper.ieee.org/groups/802/3/ap/public/may04/dambrosia_01_0504.pdf"



Rx models as defined in http://ieee802.org/3/ap/public/channel_model/mellitz_m1_0105.pdf



Rx models as defined in http://ieee802.org/3/ap/public/channel_model/mellitz_m1_0105.pdf

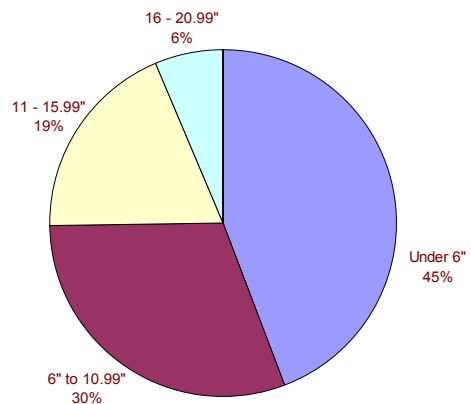
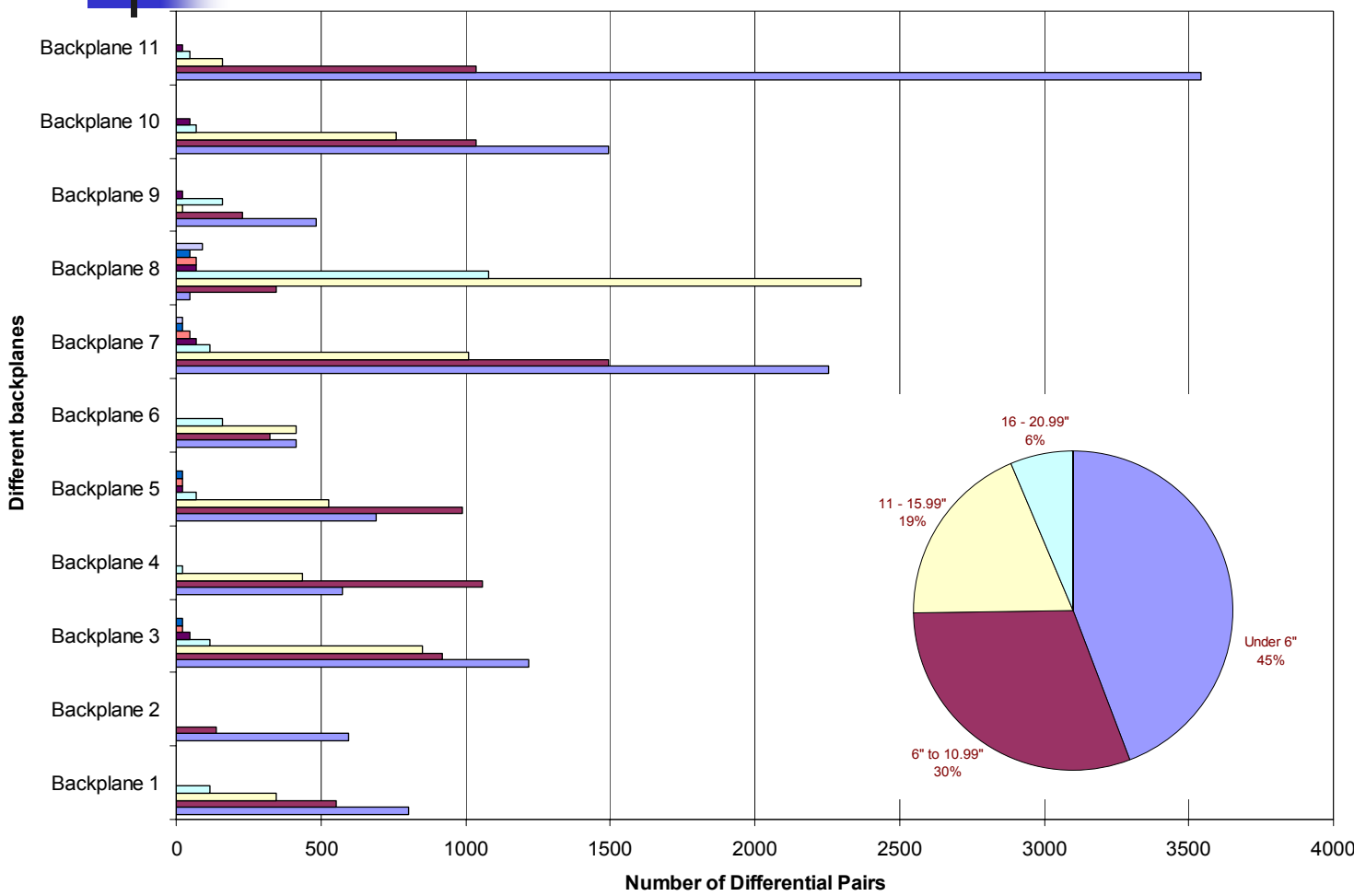
	Case 5 FFE3/DFE3	Case 5 FFE3/DFE5	Case 6 FFE3/DFE3	Case 6 FFE3/DFE5
1. Original results	18.9%	22.2%	0% (BER floor at E-12)	5.5%
2. No Packaging	15.7%	17.1%	<0 (BER floor at E-8)	<0 (BER floor at E-11)
3. No Packaging, No IC	27.4%	27.0%	16.5%	19.9%
4. No Packaging, No IC, No Xtalk	32.9%	33.0%	20.8%	22.1%

Simulation 1 – Original simulations, as specified in abler_01_00904.pdf

Simulation 2 – As stated in Simulation #1, except packaging removed

Simulation 3 – As stated in Simulation #2, except IC Model (ESD and load structures) replaced with perfect 50Ω terminations.

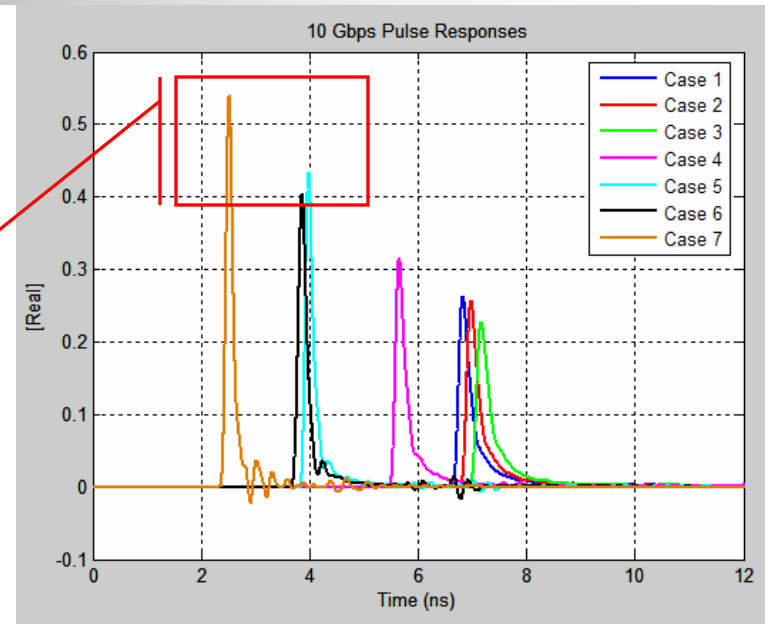
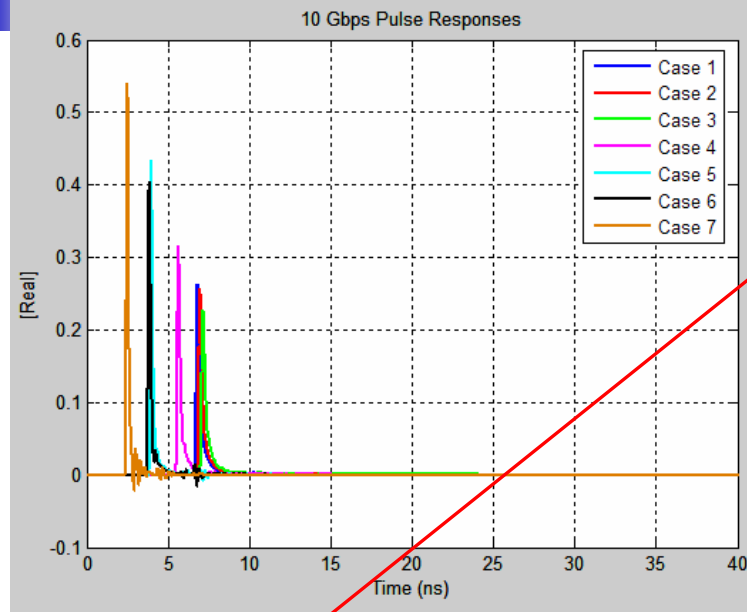
Simulation 4 – As stated in Simulation #3, except all crosstalk removed



“The longest traces in a backplane must be distributed throughout the entire stackup. Selective use of materials on certain layers will not provide enough routing channels for these tracks. This issue grows as you move from a central switching architecture to a mesh architecture. “

Robert Jardon
Jardon Engineering
Director of Technology

Pulse Reponse of All Tyco Channels



Note – The two most difficult channels had the greatest peak
Let's look at Cases #5 and #6

- Parameters used in analysis based on proposed informative TP1 – TP4 SDD21 model are strong indicators of settling time.
- Need to review parameters in relation to efforts of Signaling Ad Hoc
- TP1 – TP4 SDD11 / 22 is meaningful, but not by itself. It works in conjunction with -
 - Tx Launched Signal
 - Channel (TP1 / TP4) throughput
 - Channel (TP1 / TP4) return loss
 - Device return loss
 - Package and IC (ESD / termination) effects
- Different channels exist in a backplane environment and each results in different frequency content delivery to the receiver resulting in different reflection characteristics.

- Adopt proposed TP1/TP4 Informative SDD21 model template
 - Specific recommendations for each value needs to be completed upon Signal Ad Hoc analysis
- Eliminate proposed TP1/TP4 Informative SDD11 / 22 mask
 - Leave to normative analysis with inclusion of packaging effects
- Eliminate TP1/TP4 Informative Group Delay template