

Update to dambrosia_c1_0605 – The Informative Model and Interesting Test Cases

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Tyco Electronics

ACKNOWLEDGEMENTS

- Intel
 - Rich Mellitz
 - Steve Krooswyk

Status

- Review of channel test data with simulation results (abler_01_0305, brink_01_0305, and altmann_02_0305) underway
 - With and without crosstalk
 - Different margins
- ICR analysis done via tools provided by Mellitz / Krooswyk
 - Tool permits 3 NEXT / 3 FEXT
 - Only direct adjacent pairs used
- Cascaded channel / package s-parameters provided by Mellitz

Results Per IBM

Results for Tyco Channels



timing margin (ps _{p-p} @ BER 10 ⁻¹²)	Case1	Case2	Case3	Case4	Case5	Case6	Case7
Signal ad-hoc setup	15.1	14	9.4	21.1	21.7	4.1	16.3
no NEXT	19.2	17.4	12.2	24.3	26.7	10.4	20.3
no FEXT	19.6	17.5	9.5	23.3	31.4	8.9	16.2
no Xtlk	23.5	22.7	12.8	28	28.7	13.1	12
no Xtlk or DCD	29.2	25.9	22	30.2	24.8	17.2	21.4

voltage margin (mV _{p-p diff} @ BER 10 ⁻¹²)	Case1	Case2	Case3	Case4	Case5	Case6	Case7
Signal ad-hoc setup	38	43	20	59	64	12	53
no NEXT	62	53	28	81	88	37	62
no FEXT	57	50	22	70	108	26	47
no Xtlk	72	66	30	88	112	45	43
no Xtlk or DCD	92	81	53	100	96	58	71

Results Per IBM

Results for Molex Channels



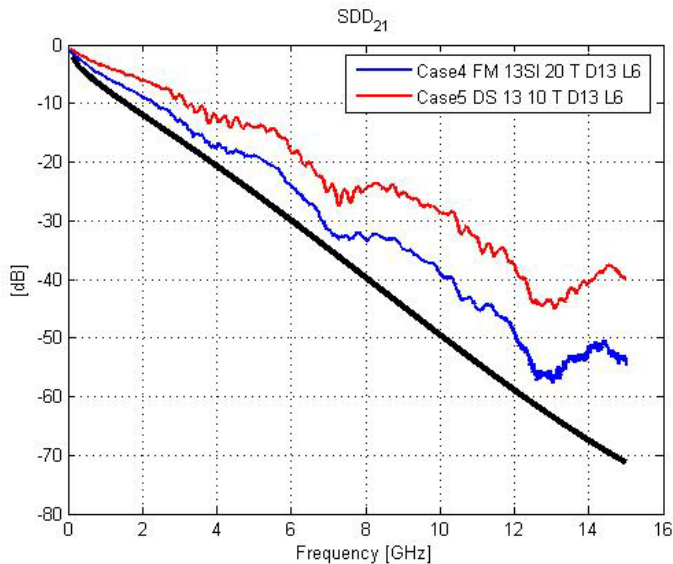
	Inbound				Outbound			
timing margin (ps _{p-p} @ BER 10 ⁻¹²)	j2k2	j3k3	j4k4	j5k5	j2k2	j3k3	j4k4	j5k5
Signal ad-hoc setup	3.6	E-11	E-07	7.0	13.9	4.6	8.2	15.8
no NEXT	7.5	6.7	E-10	9.7	16.4	11.6	15.7	18.1
no FEXT	12.3	20.8	18.1	22	27.2	23.9	23	26.3
no Xtlk	13.6	18.6	12.4	24.7	25.7	23.9	24.7	29.8
no Xtlk or DCD	19.3	21.6	15.4	24.7	25	27.8	27.8	26.8

	Inbound				Outbound			
voltage margin (mV _{p-p_diff} @ BER 10 ⁻¹²)	j2k2	j3k3	j4k4	j5k5	j2k2	j3k3	j4k4	j5k5
Signal ad-hoc setup	11	0	0	18	38	8	27	40
no NEXT	21	17	0	30	49	27	33	36
no FEXT	39	53	51	68	74	67	69	69
no Xtlk	46	59	39	74	82	74	80	82
no Xtlk or DCD	65	73	54	85	91	95	91	90

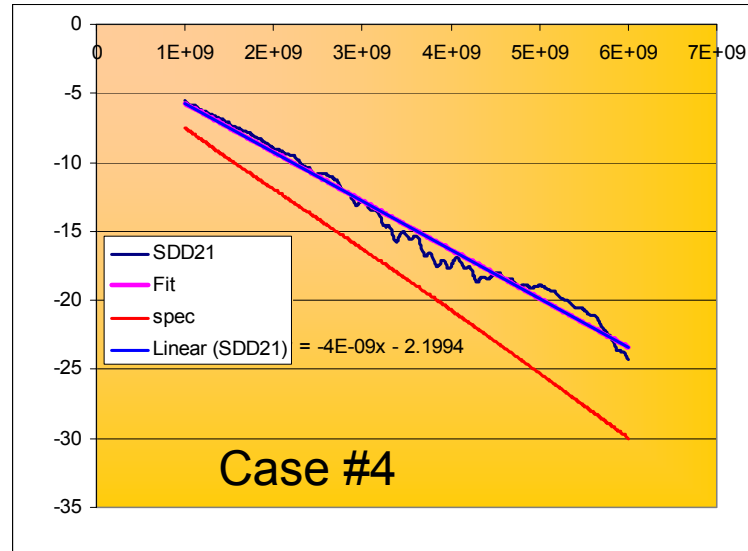
τ spaced, FFE 3 / DFE 5

Per abler_01_0305.pdf

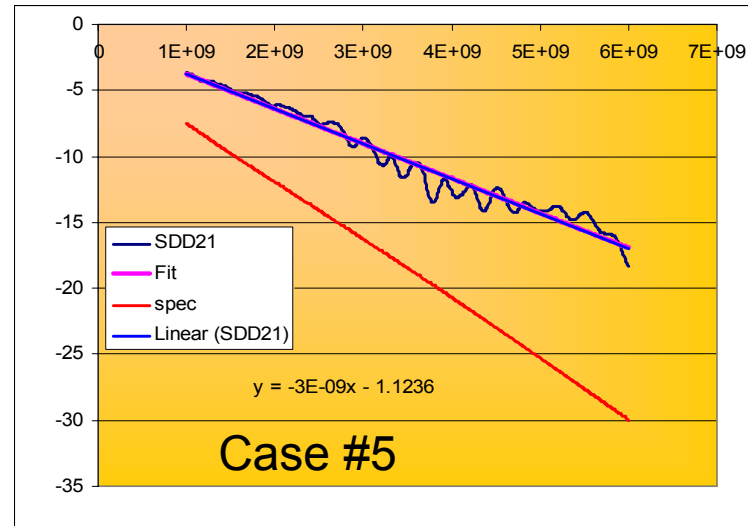
Tyco Case #4 / #5



- Case4 (6"LC + 20"BP + 6"LC)
- Case5 (6"LC + 10"BP + 6"LC)
- IBM analysis yielded similar results with and without crosstalk

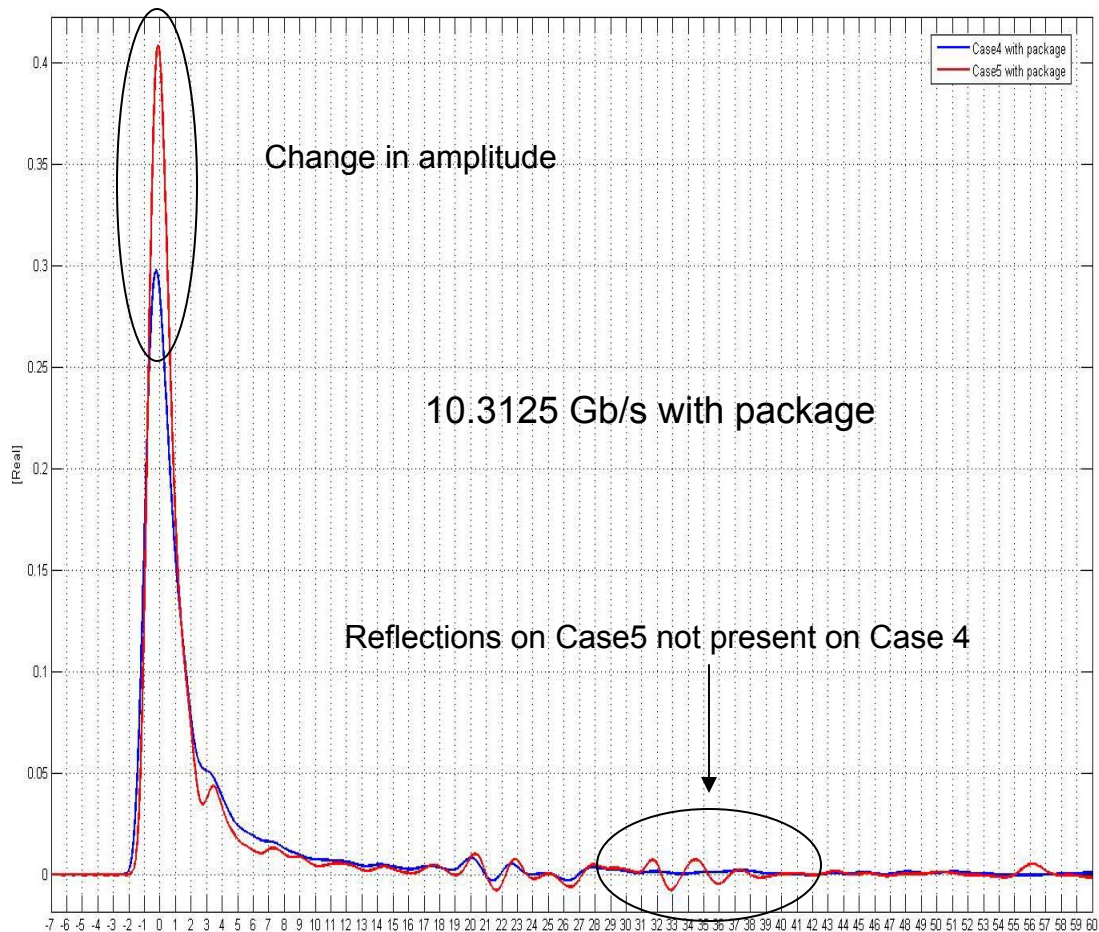
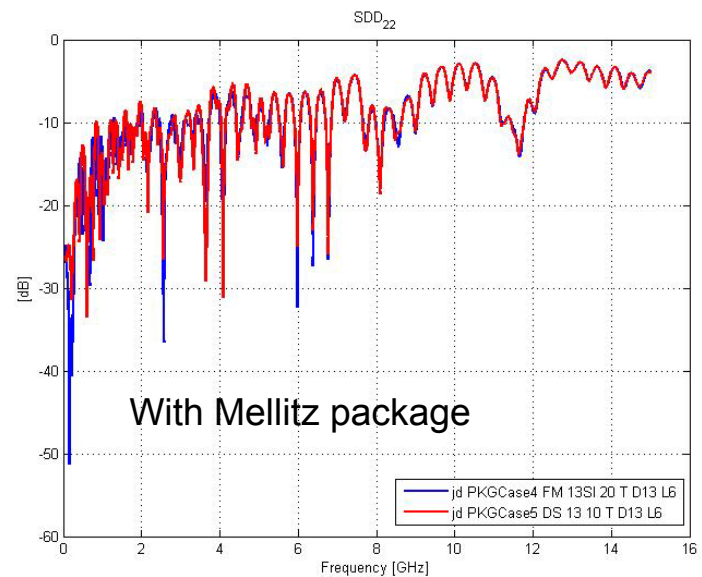
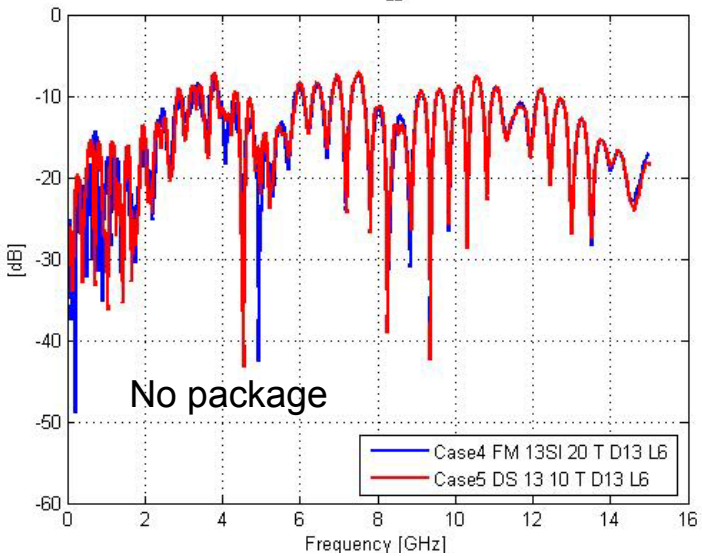


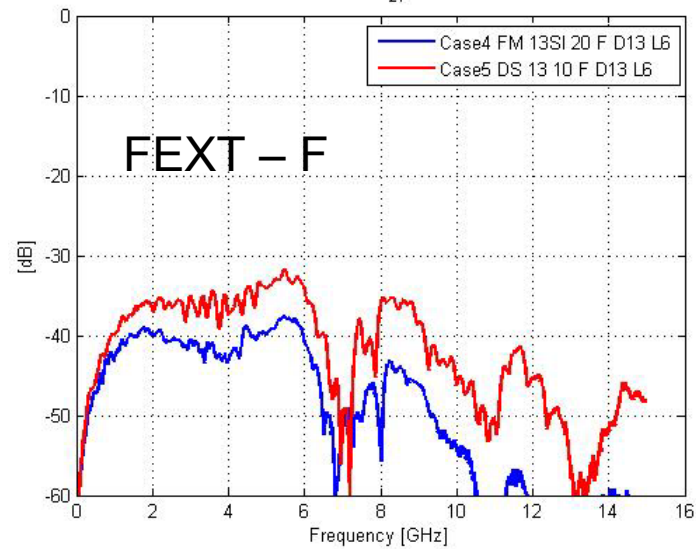
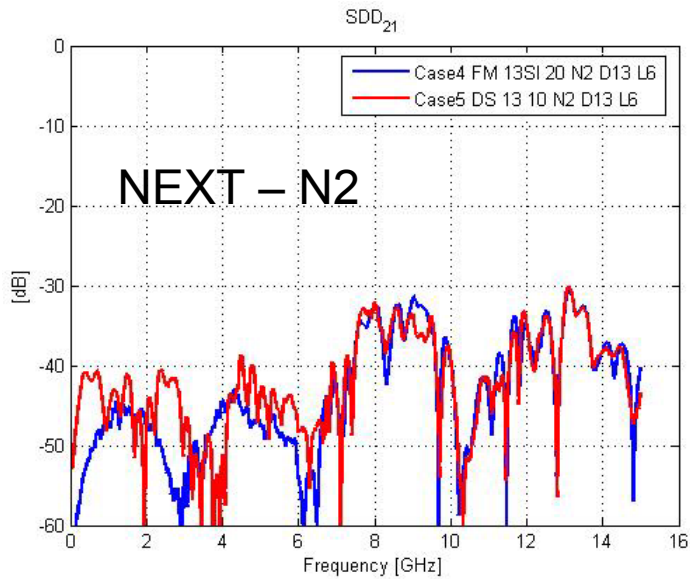
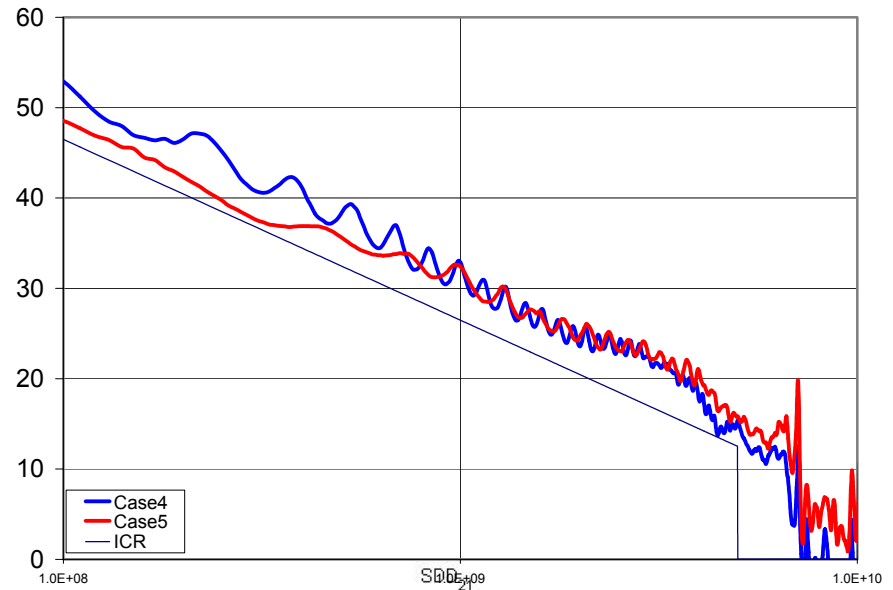
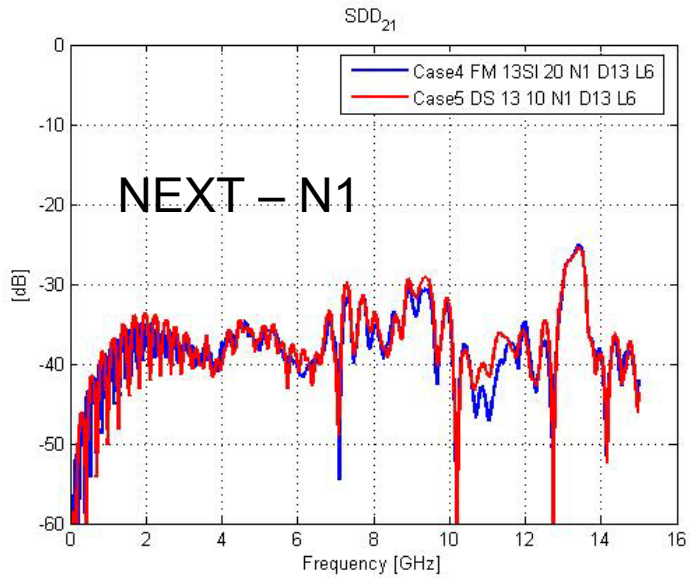
LFMax	0.164174
LFMin	0
HFMax	1.054754
HFMin	1.747552
BS_LF	0
BS_HF	0
Fit > spec	6.598816
Fit < spec	0



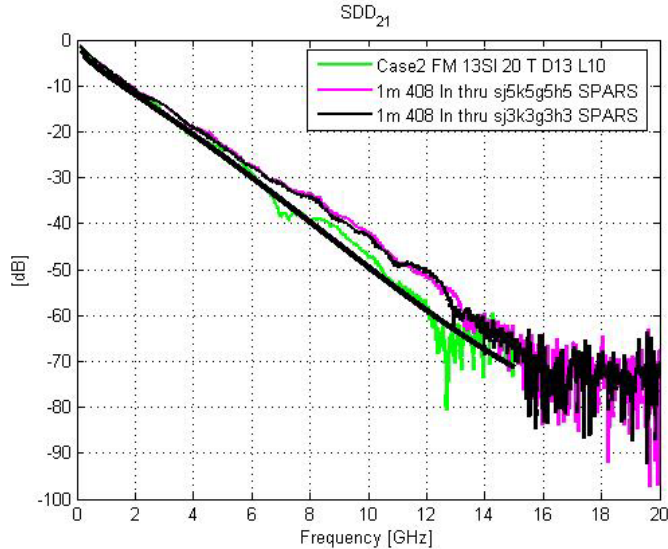
LFMax	0.102906
LFMin	0
HFMax	1.382335
HFMin	2.400285
BS_LF	0
BS_HF	0
Fit > spec	13.04792
Fit < spec	0

SDD₂₂





Tyco Case #2 – Molex In3 / In5



Per abler_01_0305,

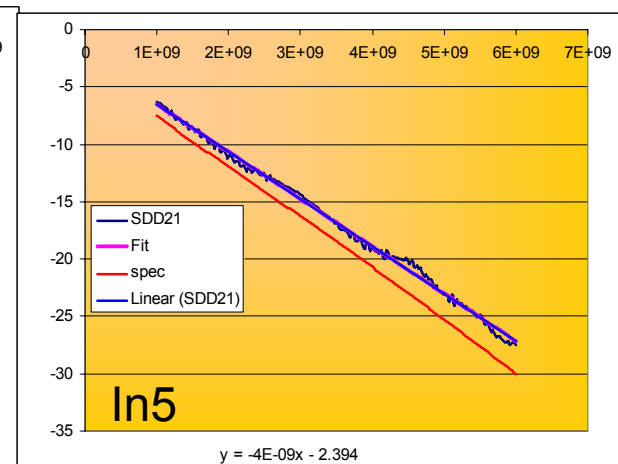
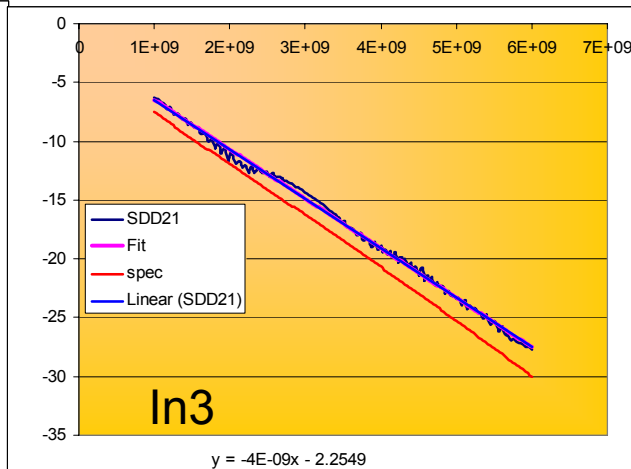
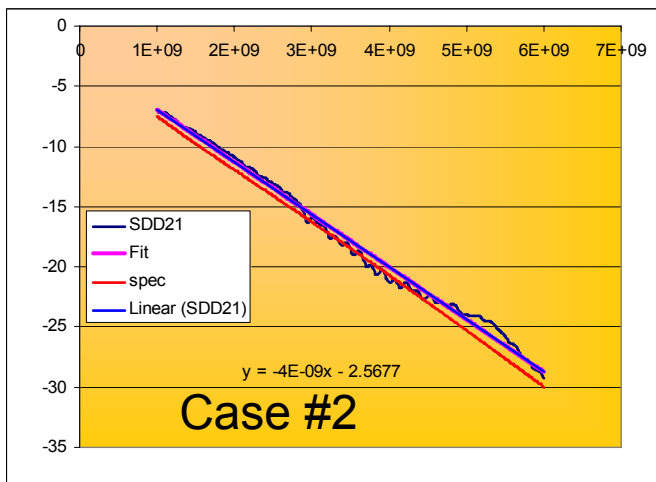
- With xtalk #2 at top of in/Out2-5 for timing margin, but has highest voltage margin of all
- With no xtalk #2 yielded higher voltage / timing margin than In2-In4, but not In5, despite having more loss and ripple. #2 slightly less than Out2-5 in voltage/timing

Case #2

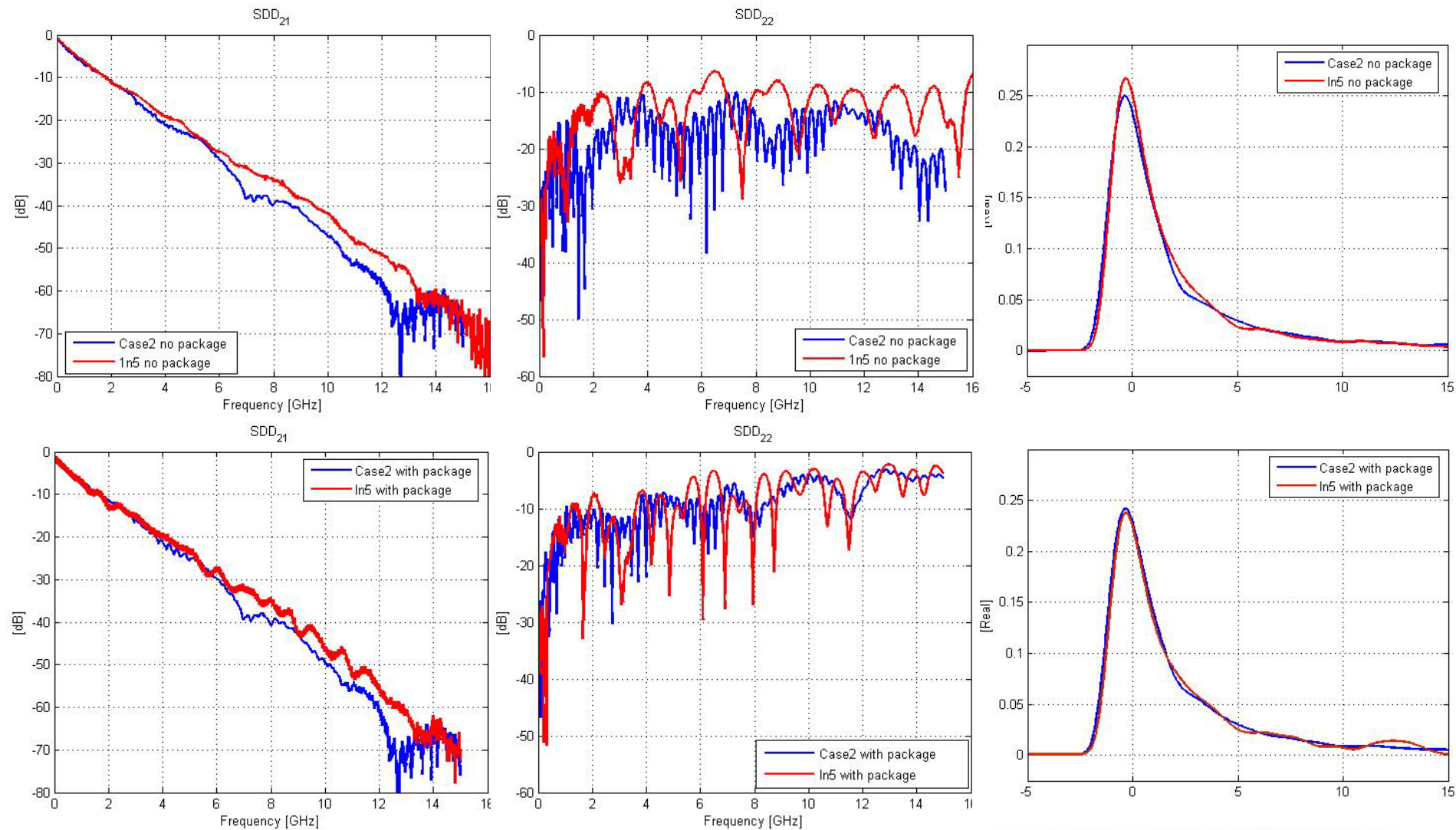
In3

In5

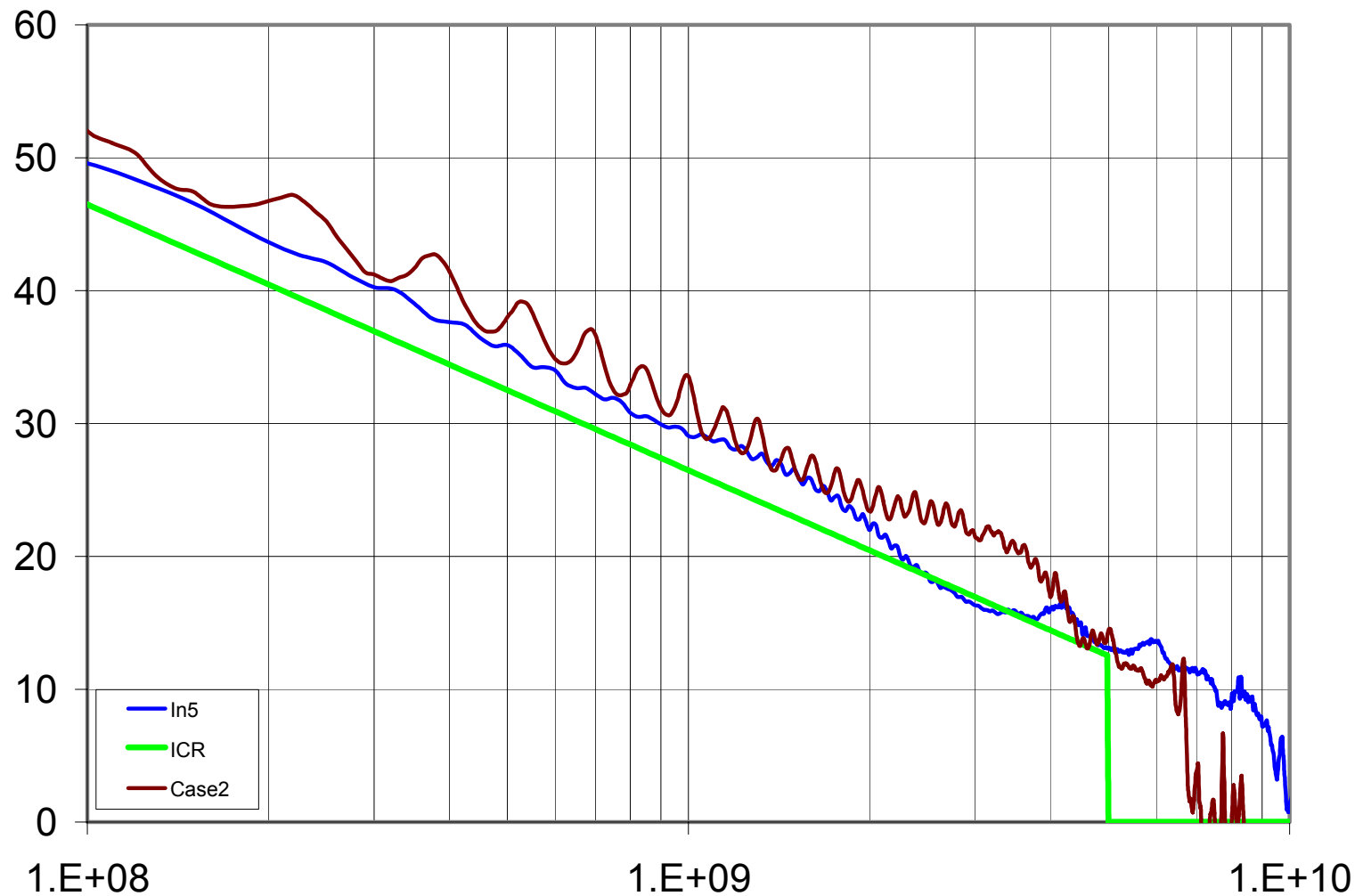
LFMax	0	LFMax	0.21697	LFMax	0.240619
LFMin	0.071895	LFMin	0	LFMin	0
HFMax	1.21961	HFMax	0.608648	HFMax	1.114086
HFMin	1.350991	HFMin	1.180235	HFMin	0.865992
BS_LF	0	BS_LF	0	BS_LF	0
BS_HF	0.690954	BS_HF	0	BS_HF	0
Fit > spec	1.248363	Fit > spec	2.477449	Fit > spec	2.856249
Fit < spec	0	Fit < spec	0	Fit < spec	0



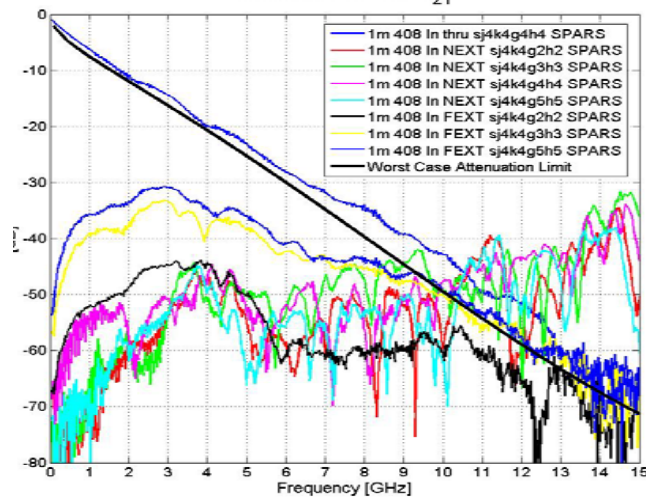
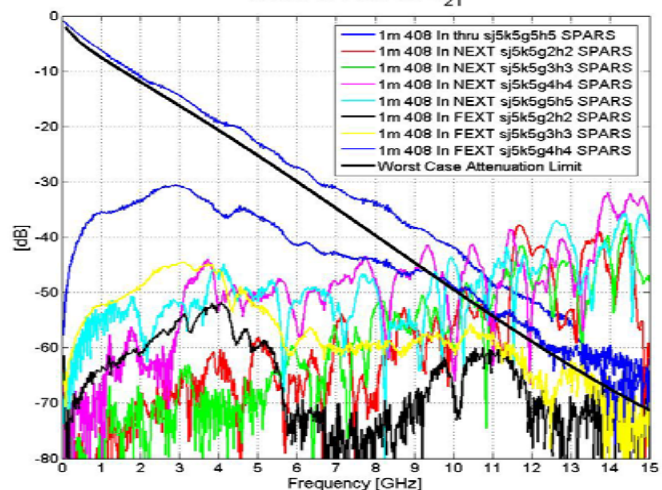
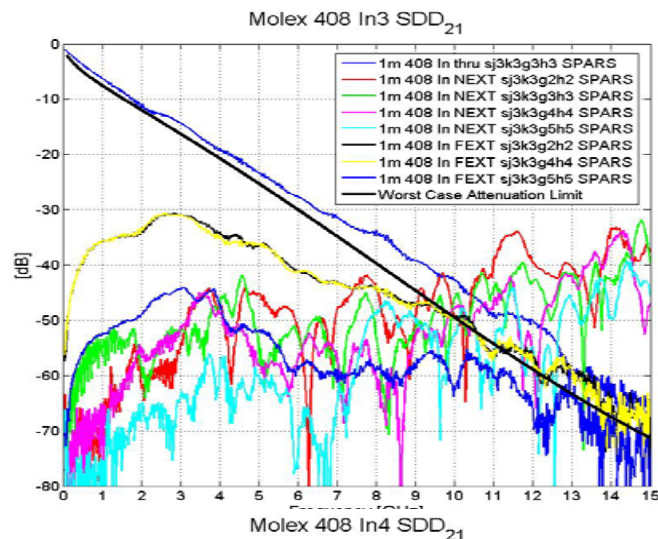
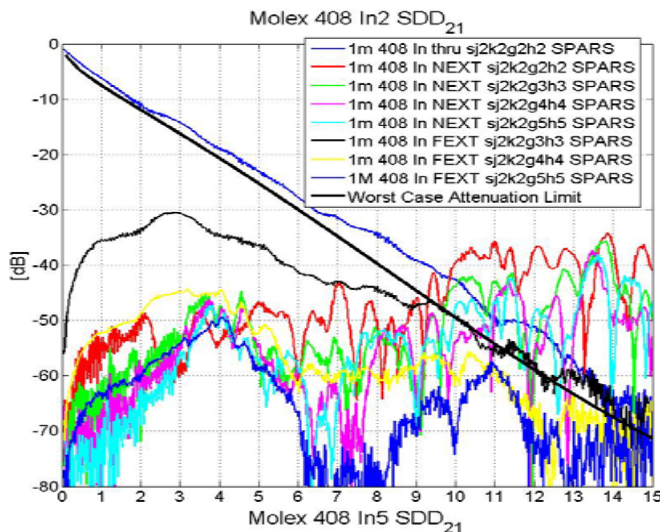
Case2 / In5 Comparison



Case2 / In5 ICR



Molex In2/5 vs In3/4

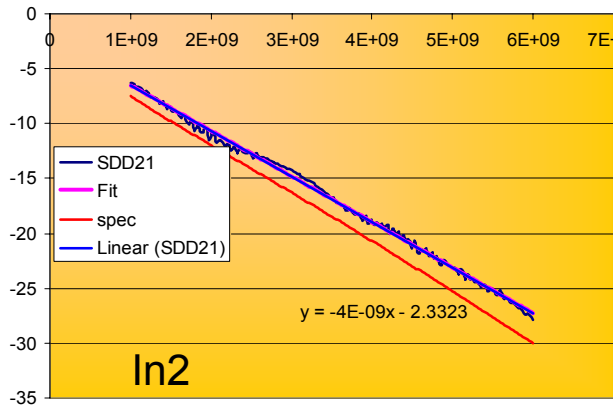


•Per abler_01_0305, for signal ad hoc setup 2/5 were always better for voltage / timing margin than 3/4

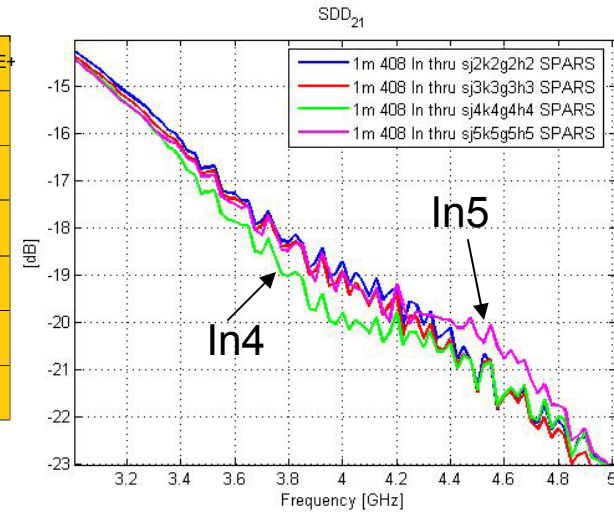
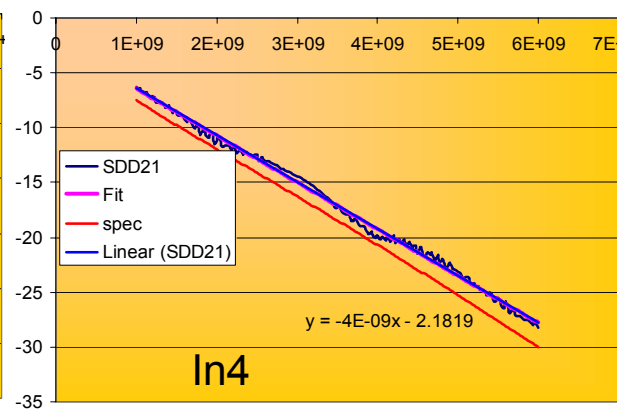
•2/5 have 1 high xtalk aggressor, 3/4 have 2 high xtalk aggressors (adjacent pair FEXT)

LMS Fit In2 – In5

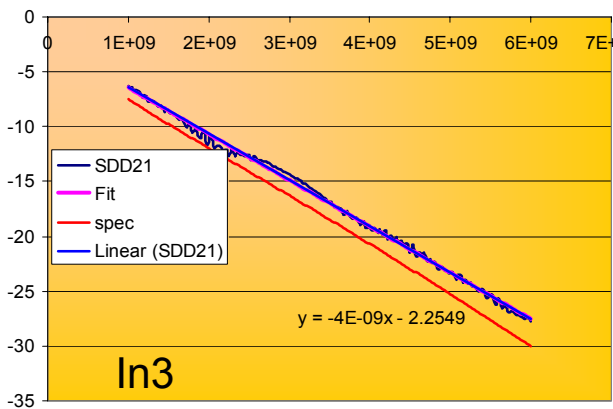
Thru SDD21, Fit, and Spec



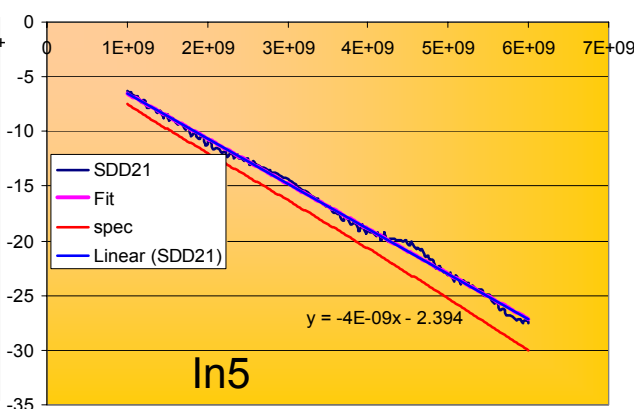
Thru SDD21, Fit, and Spec



Thru SDD21, Fit, and Spec

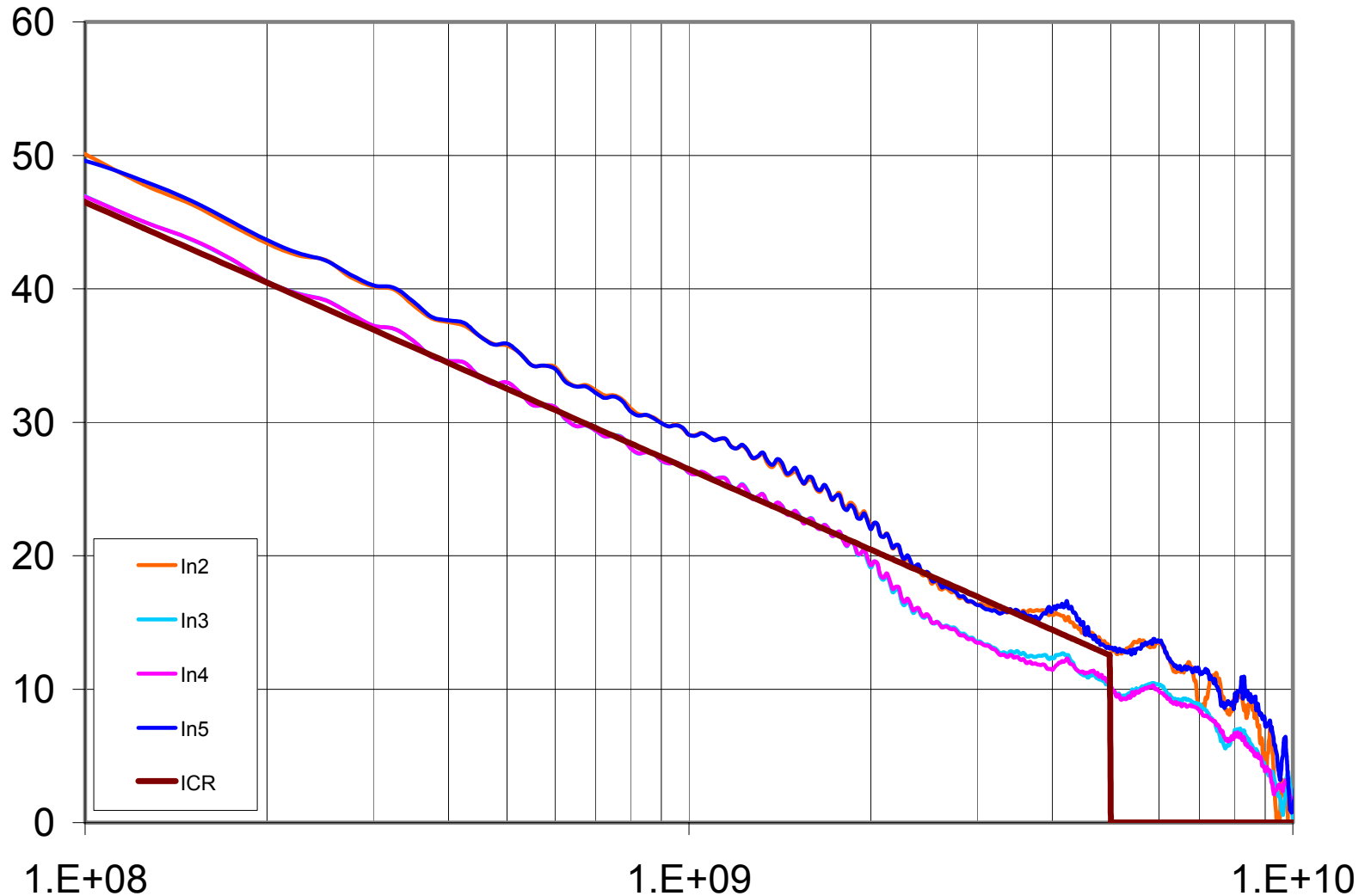


Thru SDD21, Fit, and Spec

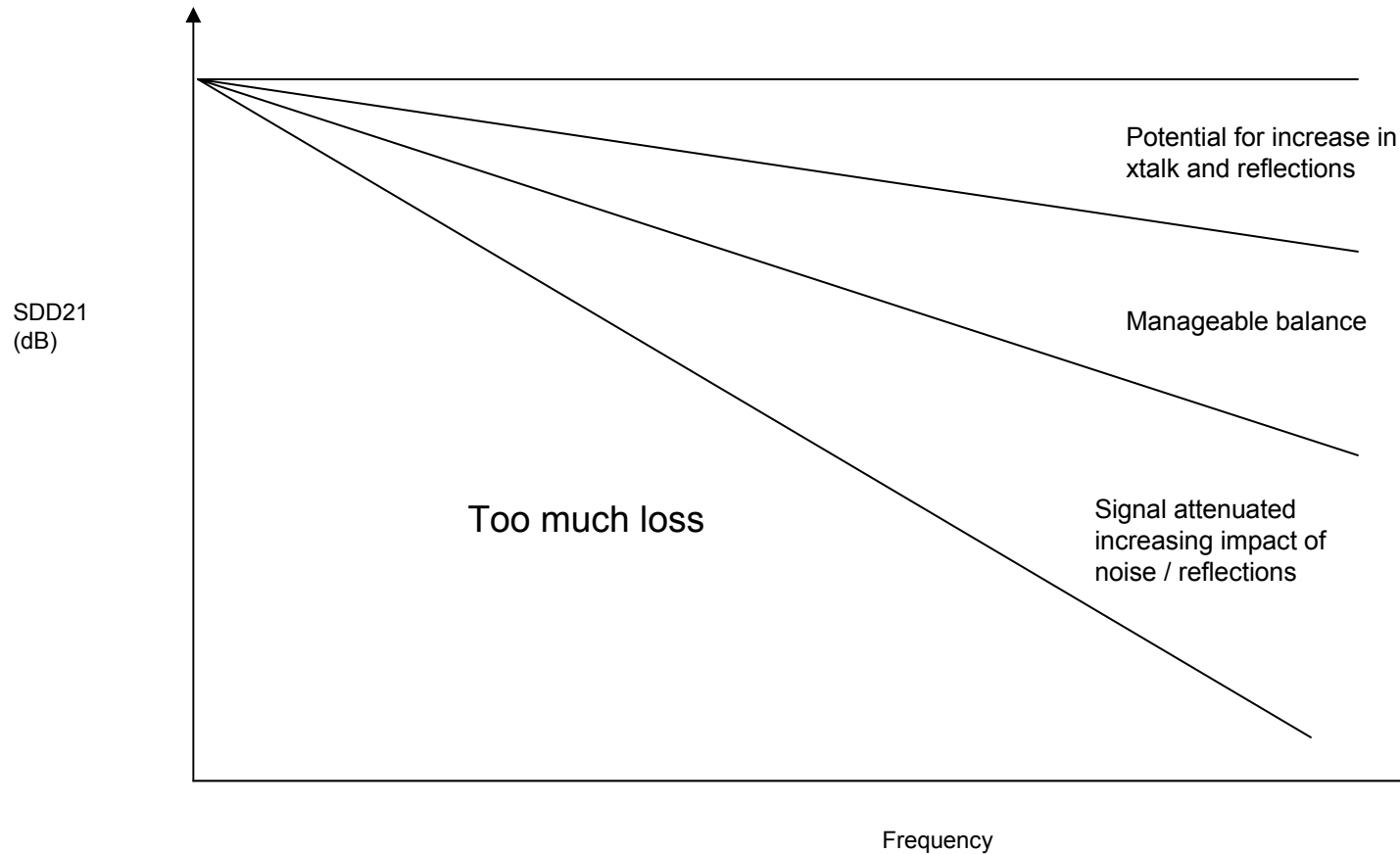


Per IBM With no xtalk, In5 had best timing / voltage margin, In4 had worst timing / voltage margin

ICR In2 – In5



Conceptual Observations



Conclusions

- Aspects of Informative Model
 - LMS fit provides
 - Good insight if similar SDD22
 - Misleading when SDD22 are different
 - Interaction between channel SDD21 / SDD22 and package model
 - ICR provides valuable insight
 - Acceptable LMS fit does not ensure superior performance.
 - Being further above the maximum attenuation limit does not ensure superior performance.
 - Channel performance is synergistic!
 - ICR better indication of overall performance
 - ICR can be used for single aggressor evaluation