Channel Ad Hoc
June 1, 2005
ACR Update

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Tyco Electronics

Status

- Single Aggressor / ACR concept verbiage drafted
  - ACR renamed to ICR (insertion loss / crosstalk ratio) for clarity
  - "attenuation" refers to LMS fit data
- ICR analysis pending tool development
- Summary presentation of all available channel data with informative methodologies underway
  - Summary of channel data
  - Analysis per Mellitz tool on 802.3ap website
- Review of channel test data with simulation results (abler_01_0305) underway
  - Includes with and without crosstalk results

Results Per IBM

Results for Tyco Channels

IBM

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

τ spaced, FFE 3 / DFE 5
Per abler_01_0305.pdf

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IEEE P802.3ap Backplane Ethernet Task Force
Channel Ad Hoc, June 1, 2005

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Results Per IBM

Results for Molex Channels

IBM

timing margin $(ps_{p-p}$ @ BER $10^{-12})$	Inbound				Outbound			
	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

voltage margin $(mV_{p-p\_diff}$ @ BER $10^{-12})$	Inbound				Outbound			
	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

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Tyco Case #4 / #5
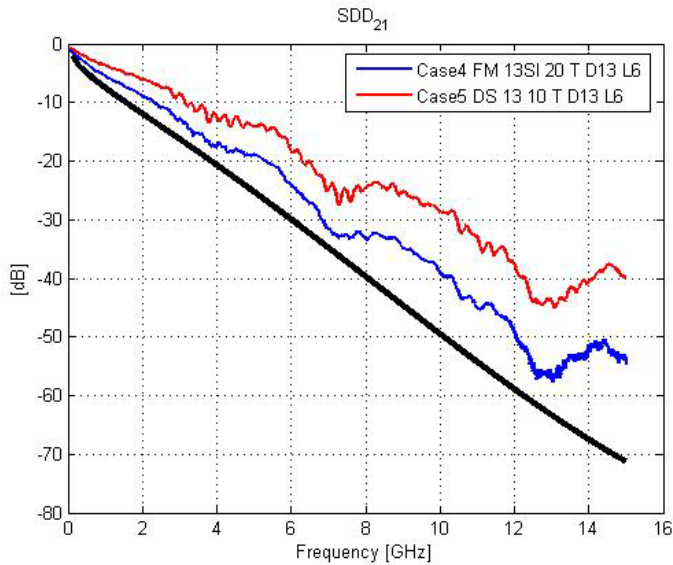
• IBM analysis yielded similar results with and without crosstalk

Case #4
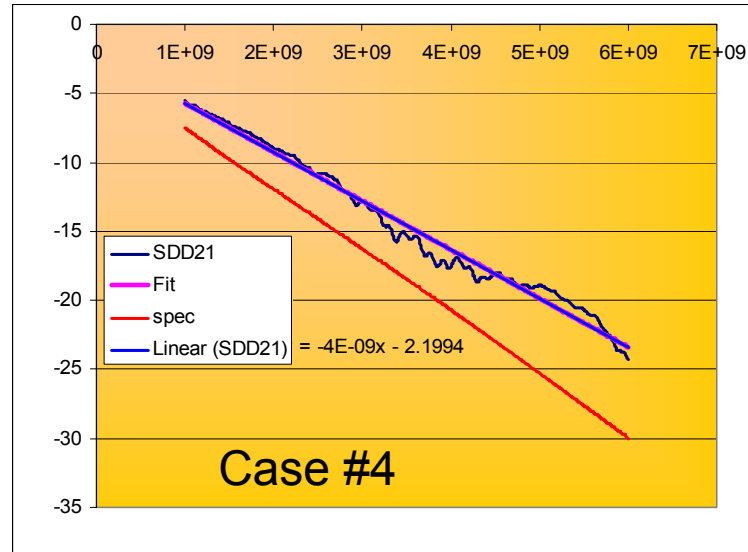
LFMax	0.164174
LFMin	0
HFMax	1.054754
HFMin	1.747552
BS_LF	0
BS_HF	0
Fit > spec	6.598816
Fit < spec	0

$= -4E-09x - 2.1994$

Case #5
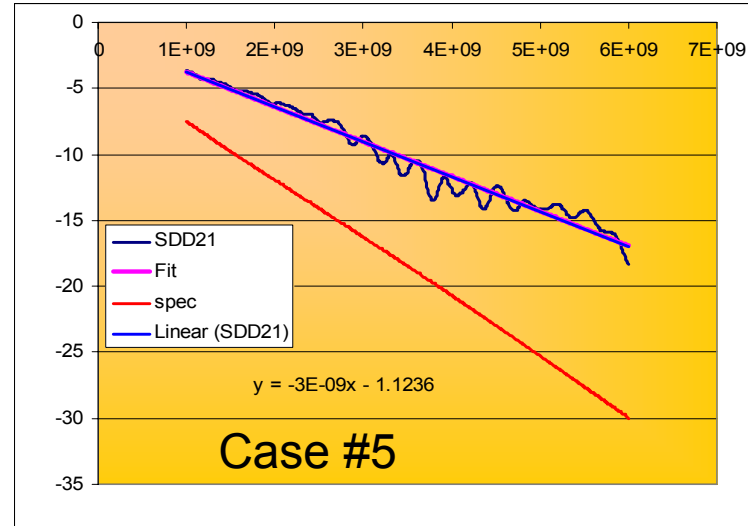
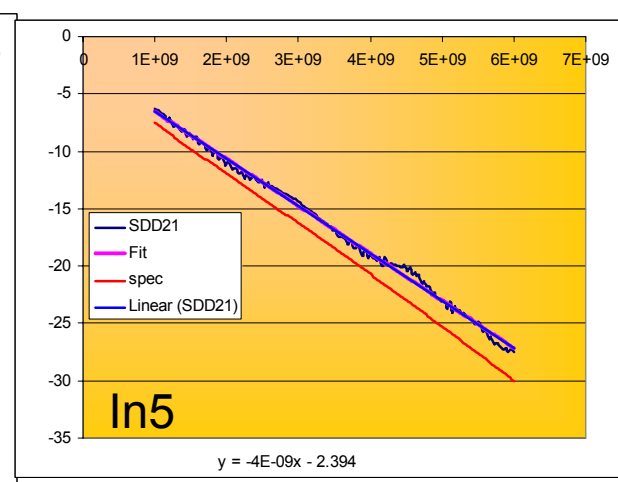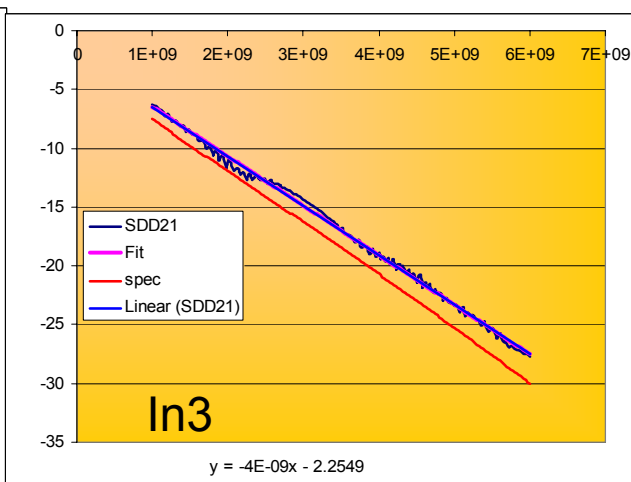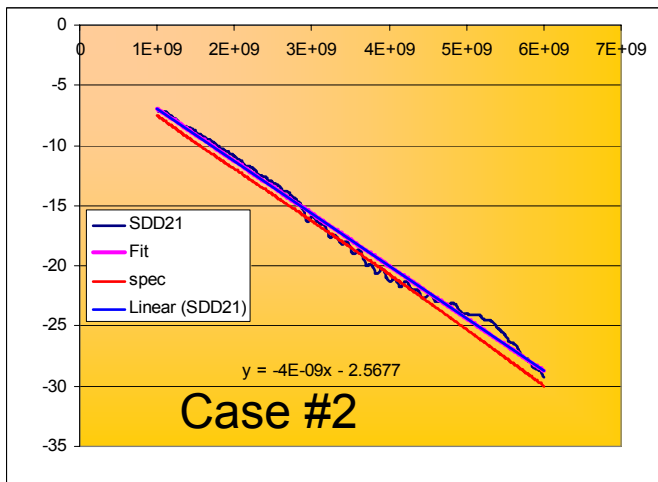| LFMax	0.102906
LFMin	0
HFMax	1.382335
HFMin	2.400285
BS_LF	0
BS_HF	0
Fit > spec	13.04792
Fit < spec	0

$y = -3E-09x - 1.1236$

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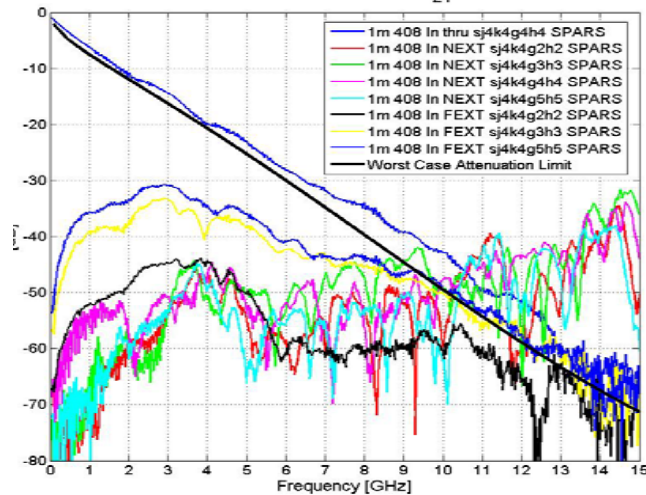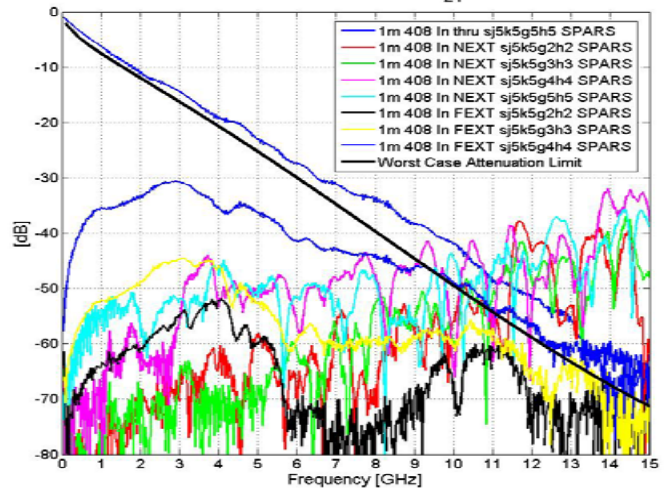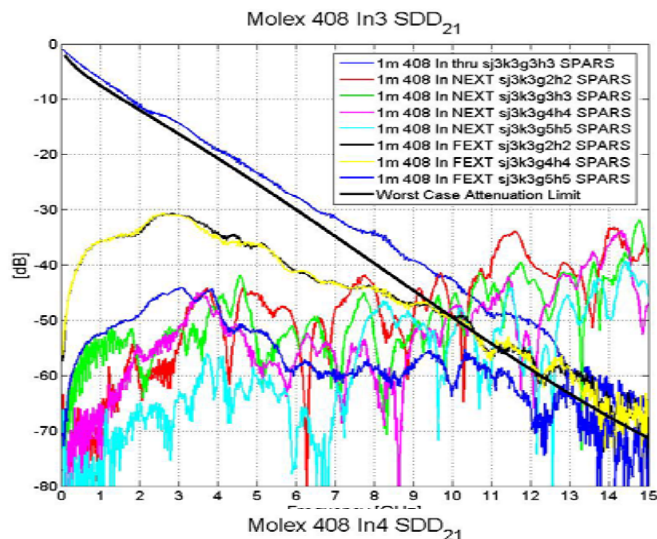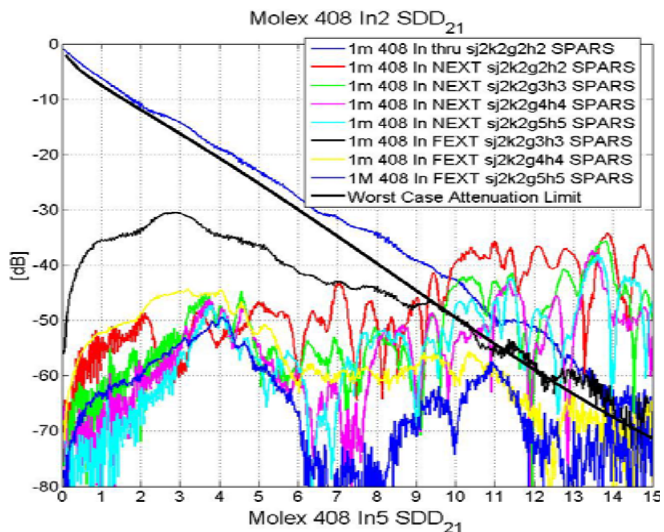Electronics

Tyco Case #2 – Molex In3 / In5
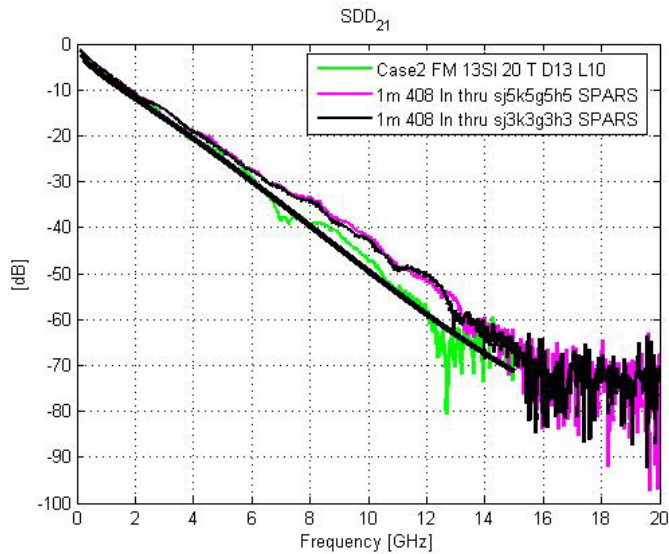
Per abler_01_0305,

- 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

Case #2

$y = -4E-09x - 2.5677$

In3

$y = -4E-09x - 2.2549$

In5

$y = -4E-09x - 2.394$

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Molex In2/5 vs In3/4

Molex 408 In2 SDD_{21}

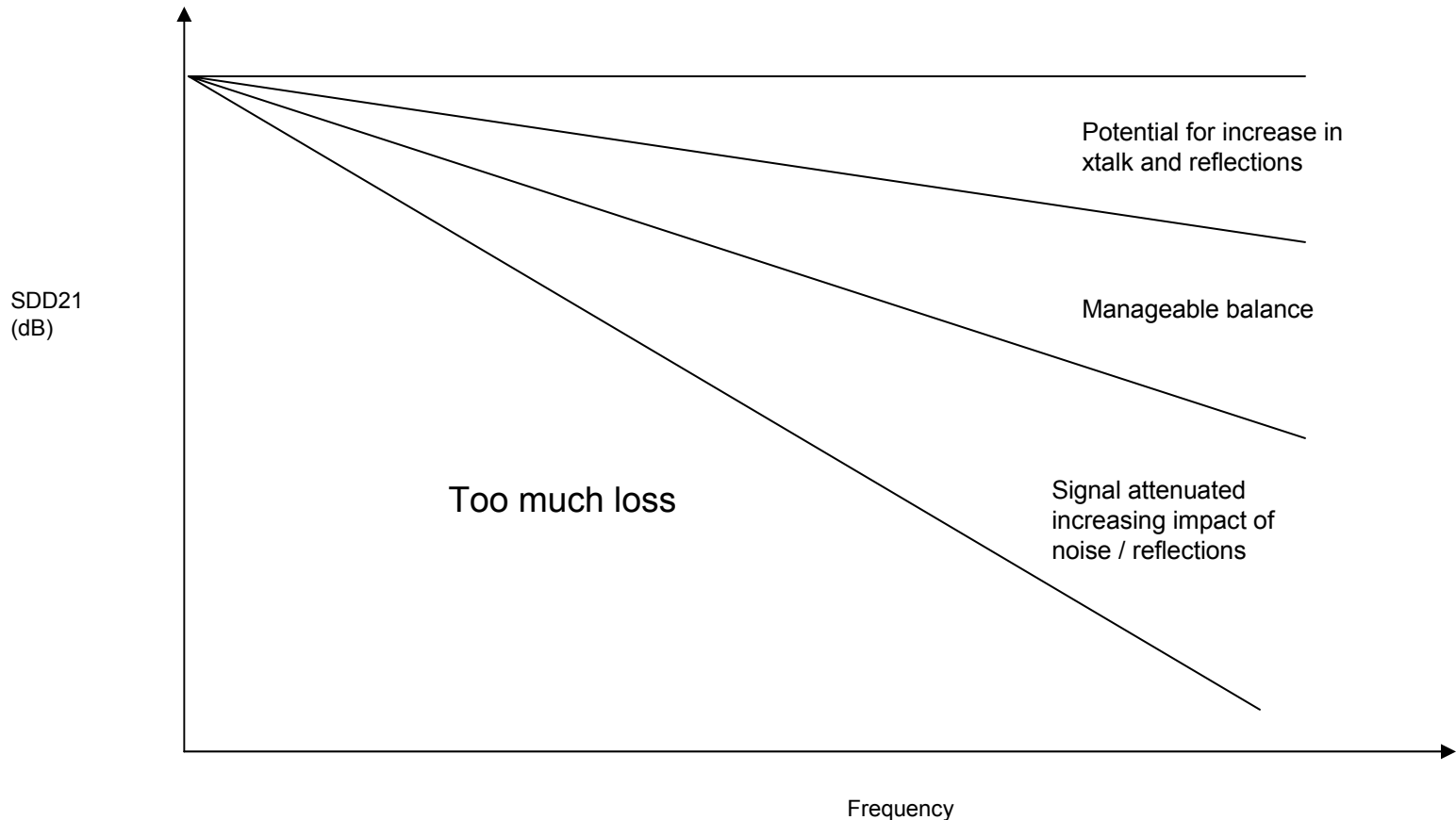Molex 408 In3 SDD_{21}

Molex 408 In5 SDD_{21}

Molex 408 In4 SDD_{21}

- 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)

Conceptual Observations

SDD21
(dB)

Potential for increase in
xtalk and reflections

Manageable balance

Too much loss

Signal attenuated
increasing impact of
noise / reflections

Frequency

Pre-ICR Analysis Findings

- Before applying ICR / xtalk there appears to be a secondary relationship not bounded yet that appears to impact the initial "No Xtalk" condition
  - Suspect return loss. Need a relationship bound, Mellitz voltage transfer function?
  - This could have an impact on the ICR analysis.
- We can't look at only one condition, but need to test informative model set across range of conditions
  - Tyco / Intel test cases should probably be judged on their own and separate from Molex test cases due to use of same line cards, i.e. return loss, over range of backplane conditions
  - Molex test cases 2/5 vs 3/4 provide interesting point for ICR
- PER ICR discussion, receiver can't distinguish between NEXT and FEXT. FEXT should not be discounted.

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Recommendations

- Add some type of relationship bound on channel return loss. Mellitz voltage transfer function?

- Going through channel data on website is challenging.
  - Group data approved per Motion #4, March 2005 in a separate table at top of web page?
  - Having data per channel set would make things easier and remove potential for errors.

- It would be useful to have someone else repeat the exercise performed by IBM as another implementation data point.