Presentation to IEEE P802.3ap Backplane Ethernet Task Force
Channel ad-hoc Working Session

Title: **EIT Simulation Results**

Source: Joe Abler
abler@us.ibm.com
IBM Microelectronics

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Simulation setup for EIT

Simulation model base setup

Configuration	NRZ FFE3/DFE5
Launch amplitude set to minimum	800 mVpp
Transmitter DJ set to maximum	0.15 UIpp
Transmitter RJ set to maximum	0.0107 UIrms (0.15UIpp @ 10^{-12} BER)
Tx/Rx termination set to nominal (ideal)	5050/5050 ohms
Receiver DJ	0.10 UIpp
Receiver RJ set to maximum	0.0107 UIrms (0.15UIpp @ 10^{-12} BER)
Data rate	10.3 Gbps
Receiver offset	200 ppm
Data pattern (through channel)	PRBS23
Random noise	1.46mV rms
Minimum latch overdrive	10mV
Package	Spec_RL_cap_like
Simulation time	10M bits

Note:

- Several parameters are not set for worst case evaluation (i.e. results may still be optimistic for concluding limits on a test which must support all PVT variation)
  - Terminations (both Tx & Rx) are ideal 50ohm
  - Minimum latch overdrive is set to what's considered a nominal value

Simulation Cases

EIT Simulations

- Agilent ITTC_23 through channel
  - Also replicated as xtalk channel and calibrated for known amount of interference
- Conditions (in addition to base setup on previous page)
  - PRBS23 data pattern
  - 1010 xtalk pattern
  - Xtalk scaled to apply varying interference levels at receiver input
- Results run for 2 different TJ amounts
  - 0.30UI TJ & 0.28UI TJ
  - RJ kept constant as defined for base setup (SJ reduced 0.02UI)

Xtalk Comparison Simulations

- Agilent ITTC_23 through channel run with 3 different crosstalk aggressors
  - Tyco Case5_DS_13_10_N2_D13_L6.s4p
  - Molex 1m_INBOUND_FEXT/sf5k5g4h4_SPARS.s4p
  - Intel peters_01_0605_T12_next5.s4p
- Conditions (in addition to base setup on previous page)
  - PRBS23 data pattern
  - PRBS23 xtalk pattern
  - No xtalk scaling (1x factor)

Results run with varying % of DCD

- 0%, 3.13%, 6.25% UIpp DCD
- Amount of Tx DJ (SJ) appropriately reduced by % DCD to keep a constant TJ

Simulation Results - EIT with 0.30UI TJ

	DCD (UIpp)			
Agilent ITTC23 channel (%eye opening @ BER 10^{-12})	0	3.13%	4.69%	6.25%
Through channel only **	23.2	20.1	13.4	2.2
10mV EIT **	13.5	13.1	6.8	0
20mV EIT **	6.3	4.9	0	0
25mV EIT	1.2	0	not run	0
30mV EIT	0	0	not run	0

	DCD (UIpp)			
Agilent ITTC23 channel (mVpk opening @ BER 10^{-12}	0	3.13%	4.69%	6.25%
Through channel only **	40.3	30.0	19.7	2.0
10mV EIT **	24.3	18.4	10.2	0
20mV EIT **	12.4	7.6	0.5	0
25mV EIT	2.8	0.1	not run	0
30mV EIT	0	0	not run	0

** These runs performed with twice the normal simulator resolution

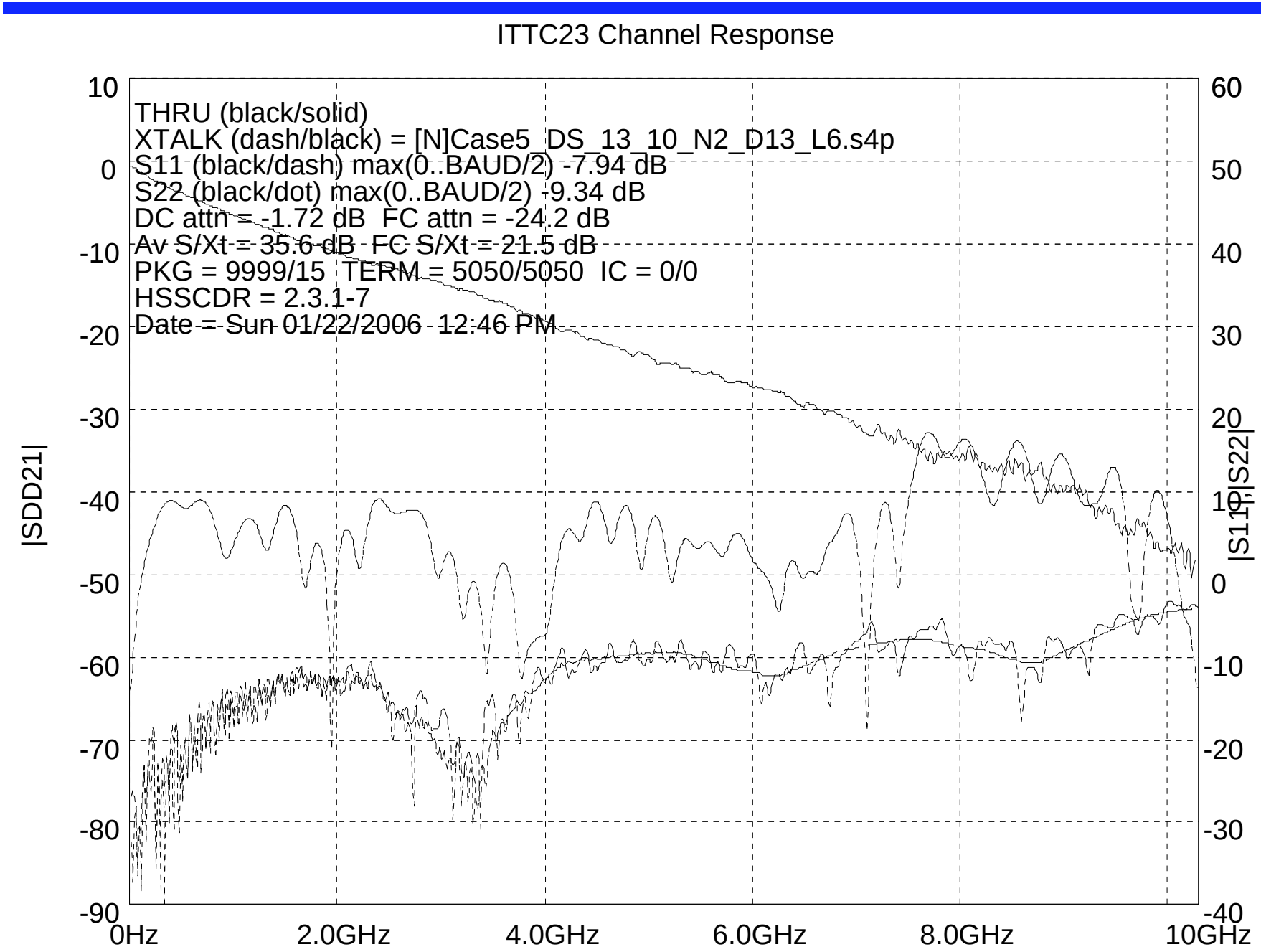
Simulation Results - EIT with 0.28UI TJ

	DCD (UIpp)			
Agilent ITTC23 channel (%eye opening @ BER 10^{-12})	0	3.13%	4.69%	6.25%
Through channel only **	24.7	21.9	13.4	6.0
10mV EIT **	16.7	14.5	7.9	0
20mV EIT **	9.3	5.8	0.1	0
25mV EIT	4.7	0	not run	0
30mV EIT	0	0	not run	0

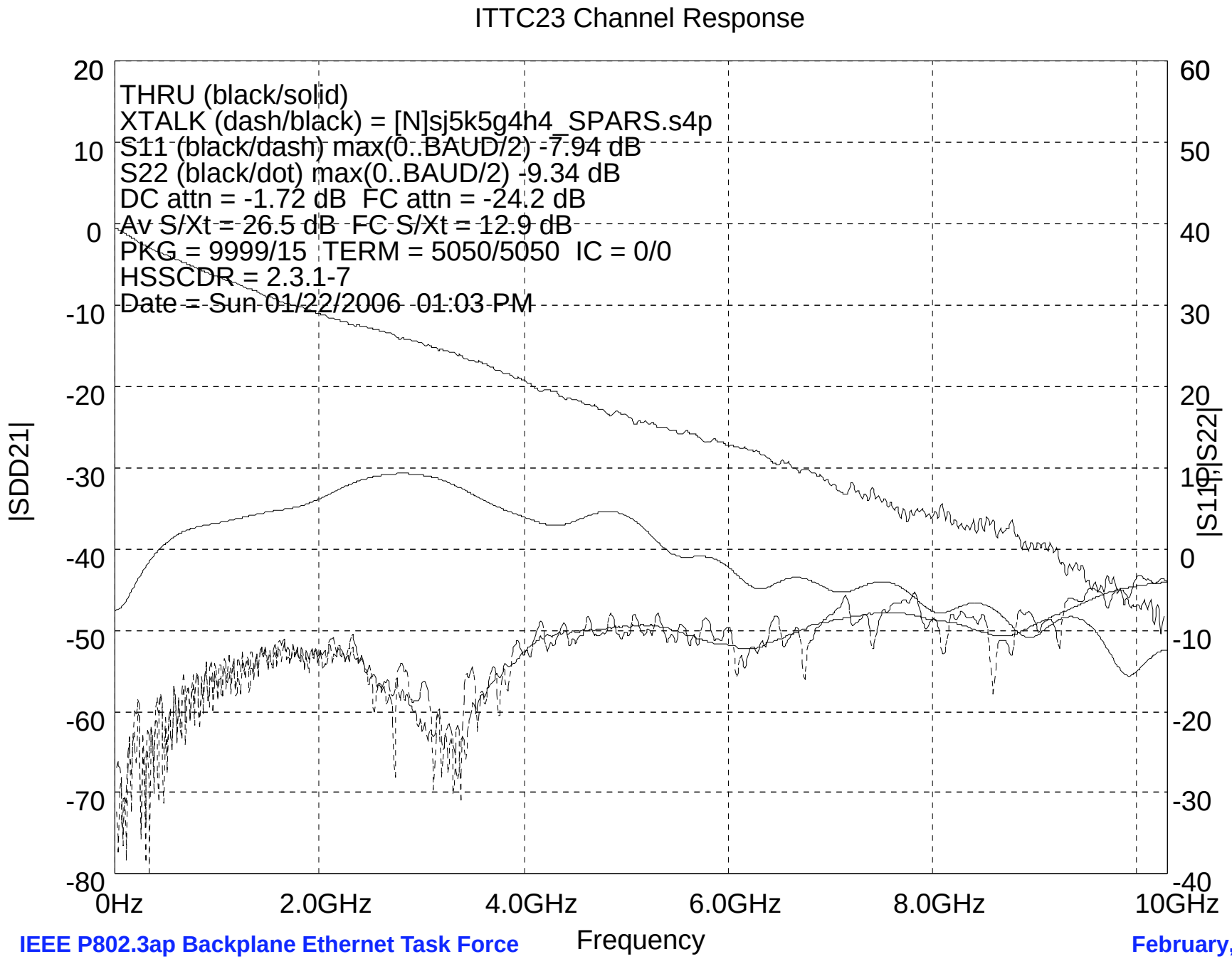
	DCD (UIpp)			
Agilent ITTC23 channel (mVpk opening @ BER 10^{-12}	0	3.13%	4.69%	6.25%
Through channel only **	43.0	33.1	20.5	5.5
10mV EIT **	29.3	17.9	11.2	0
20mV EIT **	15.6	8.6	0.6	0
25mV EIT	6.9	0.2	not run	0
30mV EIT	0	0	not run	0

** These runs performed with twice the normal simulator resolution

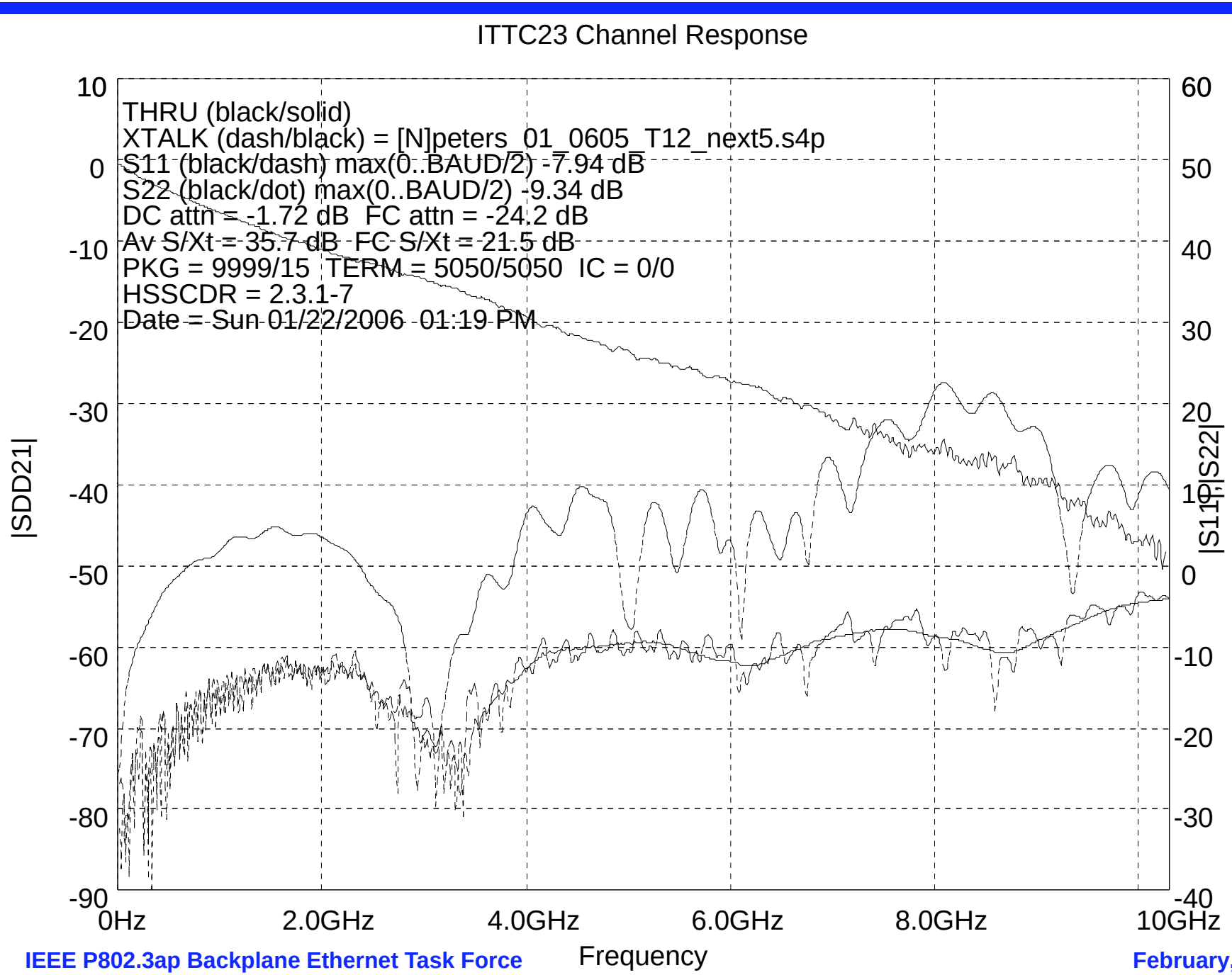
Frequency Response w/ Tyco Xtalk Channel



Frequency Response w/ Molex Xtalk Channel



Frequency Response w/ Intel Xtalk Channel



Simulation Results - Xtalk Comparison

Agilent ITTC23 channel (%eye opening @ BER 10^{-12})	DCD (UIpp)		
	0	3.13%	6.25%
Through channel only	21.4	18.5	7.5
Tyco xtalk	16.8	16.8	0.1
Molex xtalk	9.9	3.4	0
Peters xtalk	19.2	18.3	0

Agilent ITTC23 channel (mVpk opening @ BER 10^{-12}	DCD (UIpp)		
	0	3.13%	6.25%
Through channel only	37.0	32.1	6.5
Tyco xtalk	30.0	30.1	1.1
Molex xtalk	17.8	14.8	0
Peters xtalk	33.4	29.6	0.1

Conclusion

The reduced channel attenuation of ITTC23 provides improved margin for EIT testing:

Channel	Fc attenuation *	EIT floor
ITTC23	-24.2 dB	25 mV
ITTC1016 **	-26.1 dB	10 mV
TC measured **	-27.5 dB	15 mV

* Includes package

** Reference abler_01_0106

DCD impact:

- 5% DCD is roughly equivalent to 10mV EIT delta vs. no DCD

Coming up off the floor and accounting for 5% DCD:

- Results show a 10mV, perhaps 15mV, EIT is achievable for an ITTC23 type channel
- Reducing TJ to 0.28UI really doesn't change this conclusion any

Crosstalk simulations:

- Tyco and Peters crosstalk against ITTC23 channel impact is less than 10mV EIT
  - Would be ok against a specification of 15mV EIT
- Molex crosstalk impact is between 10mV and 20mV EIT
  - Would fail against a specification of 10mV EIT, and be borderline or fail against a specification of 15mV EIT

Even with reduced channel attenuation, specification does not allow all channel attributes to be taken to extreme limits:

- ITTC23 channel has virtually no ripple
- Molex xtalk is within ICR spec