

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

**Title:** EIT Simulation Results

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**Date:** February 22, 2006

# Simulation setup for EIT

## Simulation model base setup

▪ Configuration	NRZ FFE3/DFE5
▪ Launch amplitude set to minimum	800 mVpp
▪ Transmitter DJ set to give total TJ = 0.28UI	0.13 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\_20dB\_returnloss 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

## Xtalk Comparison Simulations

- ▶ Channel combinations:
  - Agilent ITTC\_20dB\_returnloss through channel run with Molex INBOUND\_FEXT\_j5k5g4h4 Xtalk aggressor
  - Agilent Thru\_worst through channel run with Molex INBOUND\_FEXT\_j5k5g4h4 Xtalk aggressor
- ▶ 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%, 4.67, 6.25% Ulpp DCD
- ▶ Amount of Tx DJ (SJ) appropriately reduced by % DCD to keep a constant TJ

# Simulation Results - EIT with 0.28UI TJ



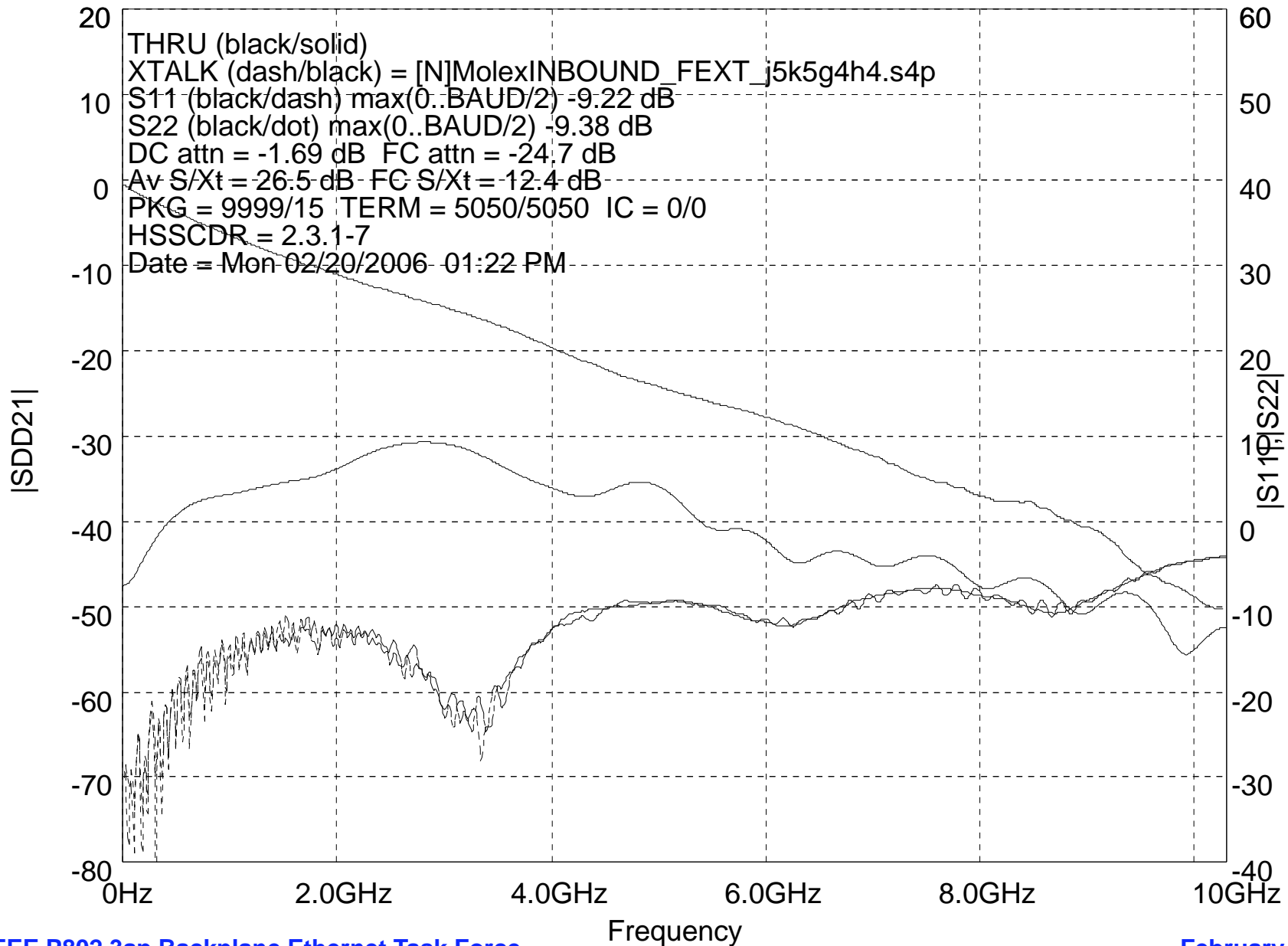
	DCD (UIpp)			
Agilent ITTC20dB channel (%eye opening @ BER $10^{-12}$ )	0	3.13%	4.69%	6.25%
Through channel only	27.0	26.2	17.8	10.2
10mV EIT	18.8	15.8	10.0	0
15mV EIT	13.0	12.1	5.1	0
20mV EIT	9.2	6.6	0	0
25mV EIT	5.7	1.3	0	0
30mV EIT	1.3	0	0	0

	DCD (UIpp)			
Agilent ITTC20dB channel (mVpk opening @ BER $10^{-12}$ )	0	3.13%	4.69%	6.25%
Through channel only	47.4	38.0	24.7	12.2
10mV EIT	34.5	22.4	13.0	0
15mV EIT	25.0	16.8	7.1	0
20mV EIT	16.8	10.3	0.4	0
25mV EIT	10.1	2.3	0	0
30mV EIT	2.9	0	0	0

# ITTC20dB Response w/ Molex Xtalk Channel



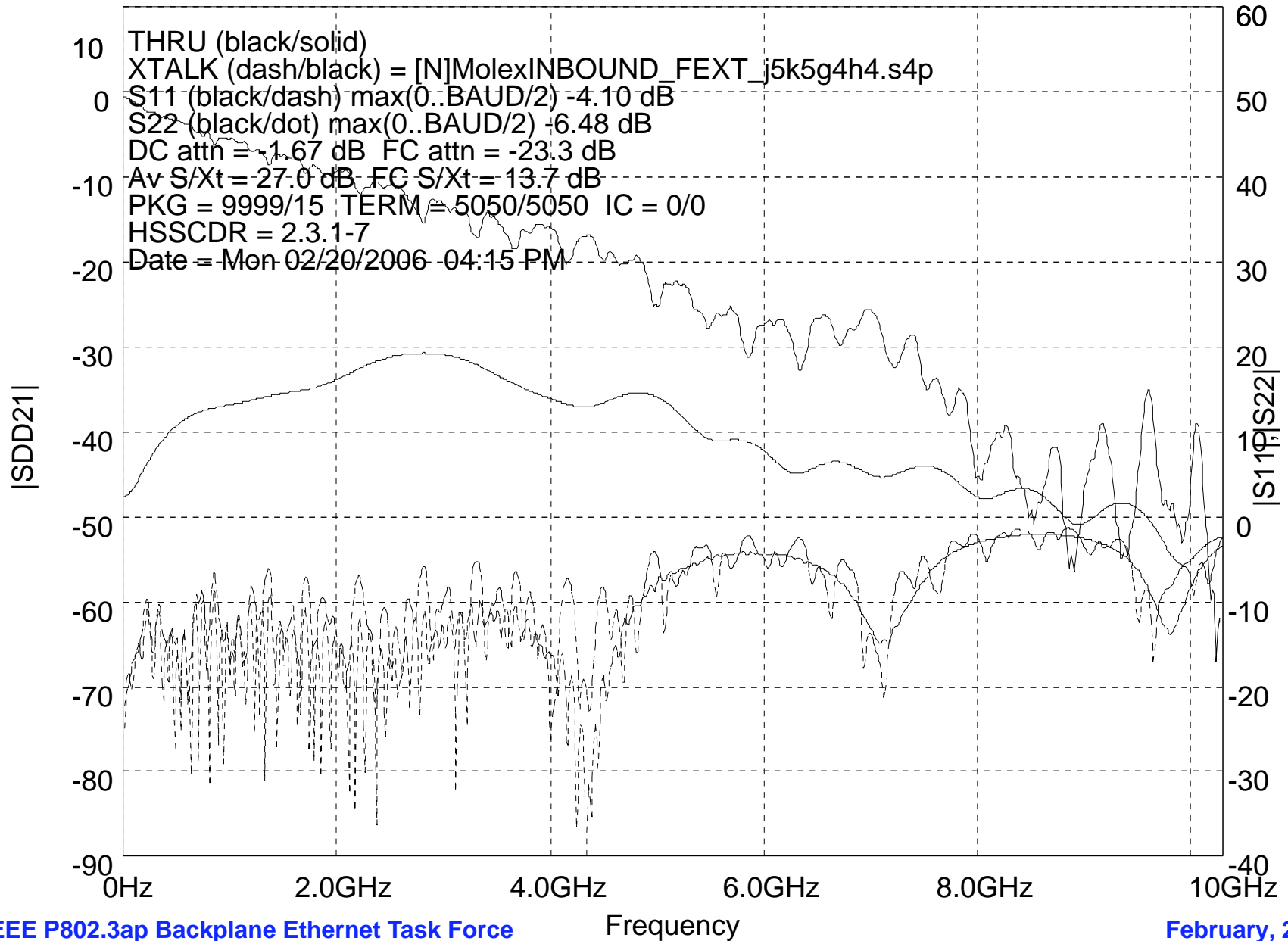
ITTC20dB Channel Response



# Thru\_worst Response w/ Molex Xtalk Channel



ThruWC Channel Response



# Simulation Results - Xtalk Comparison



	DCD (U1pp)			
(%eye opening @ BER $10^{-12}$ )	0	3.13%	4.69%	6.25%
ITTC20dB - through only	27.0	26.2	17.8	10.2
ITTC20dB - w/ Molex Xtlk	21.6	18.3	14.9	0
Thru_worst - through only	3.6	0	0	0
Thru_worst - w/ Molex Xtlk	0	0	0	0

	DCD (U1pp)			
(mVpk opening @ BER $10^{-12}$ )	0	3.13%	4.69%	6.25%
ITTC20dB - through only	47.4	38.0	24.7	12.2
ITTC20dB - w/ Molex Xtlk	37.3	23.1	14.6	0
Thru_worst - through only	7.6	0.2	0.1	0
Thru_worst - w/ Molex Xtlk	0.1	0	0	0

# Conclusion

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## Considering results using the ITTC20dB channel:

- ▶ An EIT value of 10mV (or less) would be comparable to the Molex applied xtalk
- ▶ An EIT value of 25mV for a test with no DCD would allow for minimal eye opening in an equivalent setup with 5% DCD.

## Considering results with the Thru\_worst channel:

- ▶ My comments about not taking all attributes to extreme worst limits would seem to apply...