



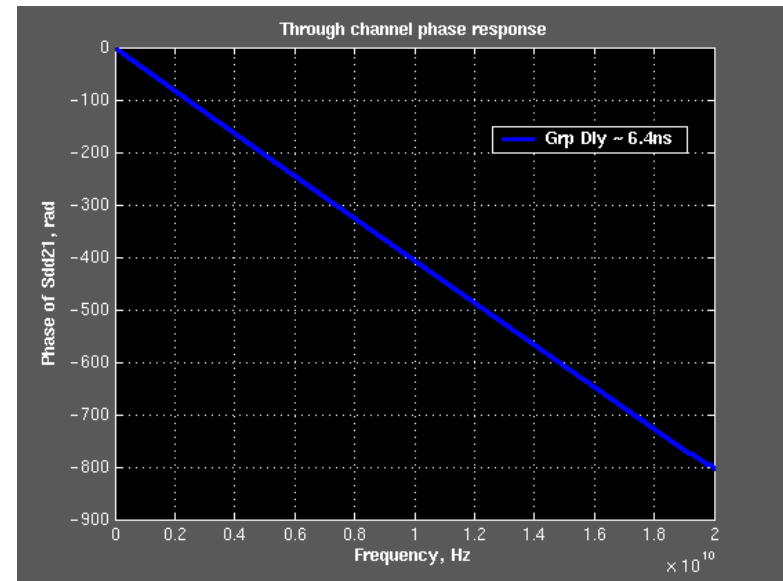
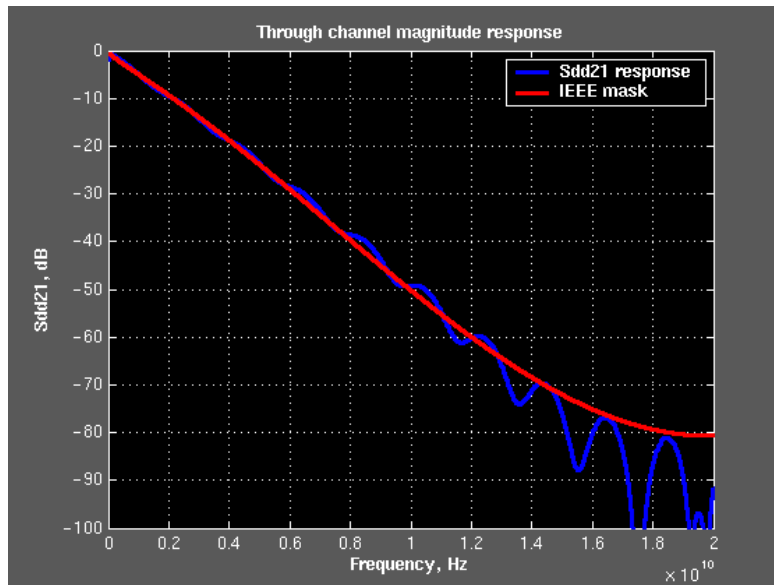
A Study of NRZ Signalling over Proposed IEEE Ethernet Backplane

*Nirmal Warke, Roland Moubarak
Texas Instruments Inc.
July 13, 2004*

Backplane channel model



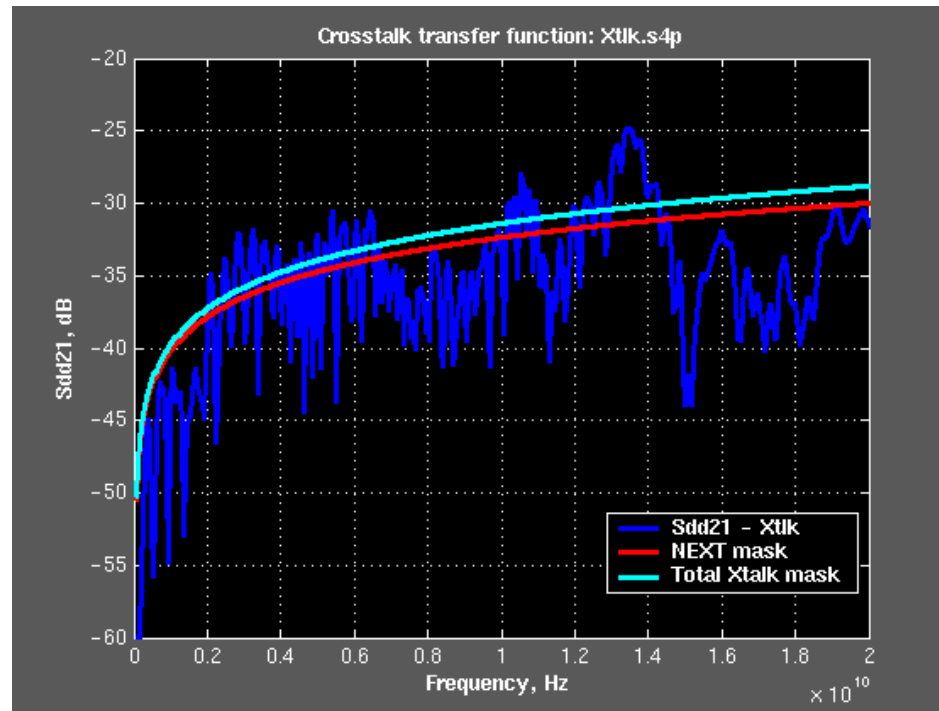
- The backplane channel s-parameters were synthesized to meet the IEEE Ethernet backplane channel Ad Hoc recommendations [25 May, 2004]



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Crosstalk channel model

- The crosstalk channel s-parameters (representing NEXT+FEXT) were based on actual measurements of channels that came close to meeting the Ad Hoc channel recommendation [25 May, 2004]



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Transmitter Configuration



- NRZ @ 10.31Gbps
- TX swing of 1200 mV pp diff
- TX random jitter = 1ps rms
- TX DJ jitter = 10ps pp
- TX LPF (single pole) @ 3/4 baud rate
- Optimized 2-tap TX FIR (or 1-tap equalizer) with 5-bit tap resolution ~ 11dB of high frequency emphasis

Receiver Configuration



- RX LPF (single pole) @ 3/4 baud rate
- 5-tap RX DFE (channel post-cursor taps 1-5) with 6-bit resolution; max value of DFE taps are limited to prevent potential error propagation
- RX random jitter = 1ps rms
- RX DJ jitter = 20ps pp
- RX CDR step resolution = 1/64 UI
- RX data slicer sensitivity = 10mV (differential)

Other Simulation Parameters

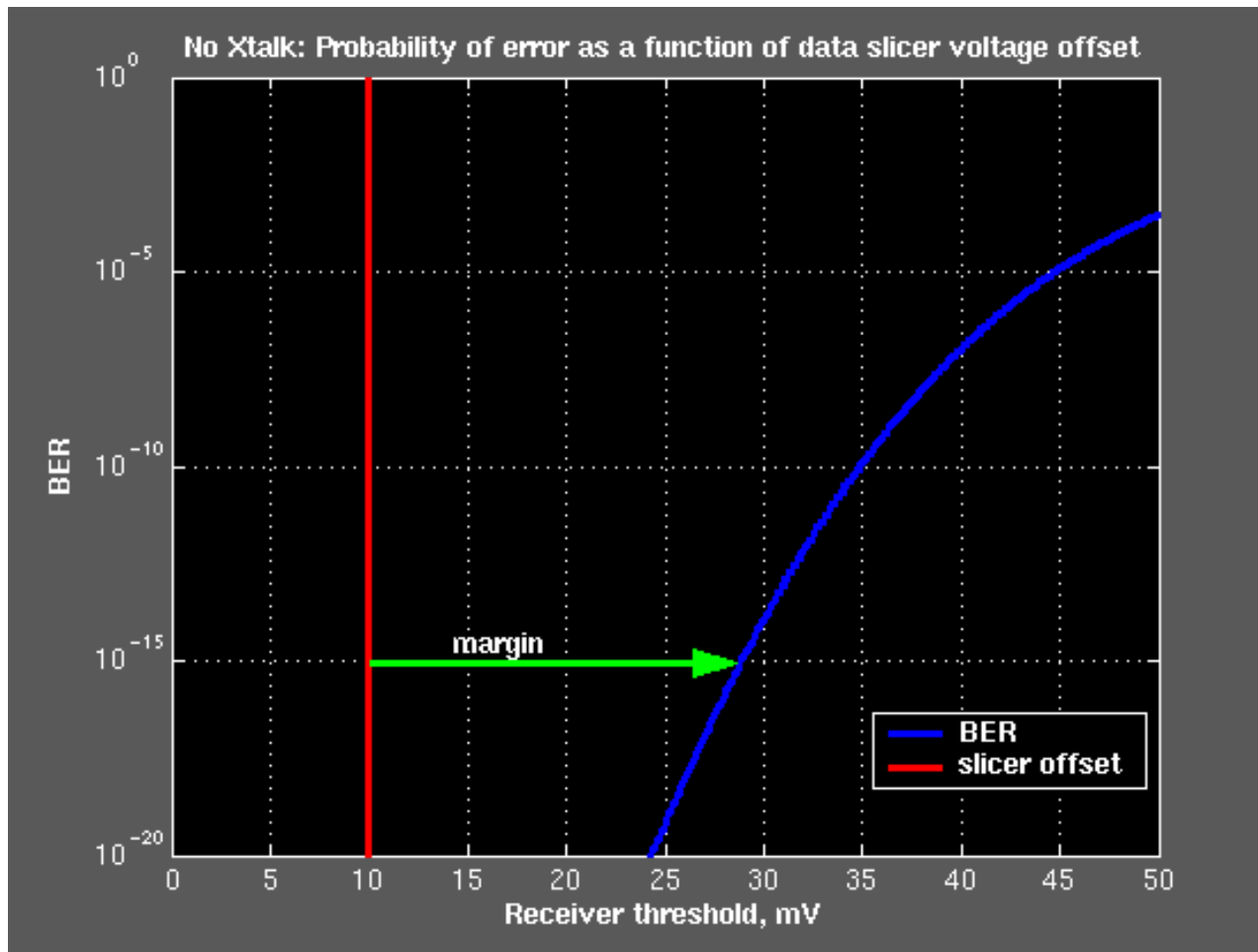


- Ideal Tx/Rx and channel reflection coefficients
- DFE taps and CDR lock phase are jointly optimized to minimize a cost function that is closely related to the BER
- Crosstalk channel phase delay (relative to through channel) chosen to be “worst case”
- Target BER = $1e-15$

Performance Measure:

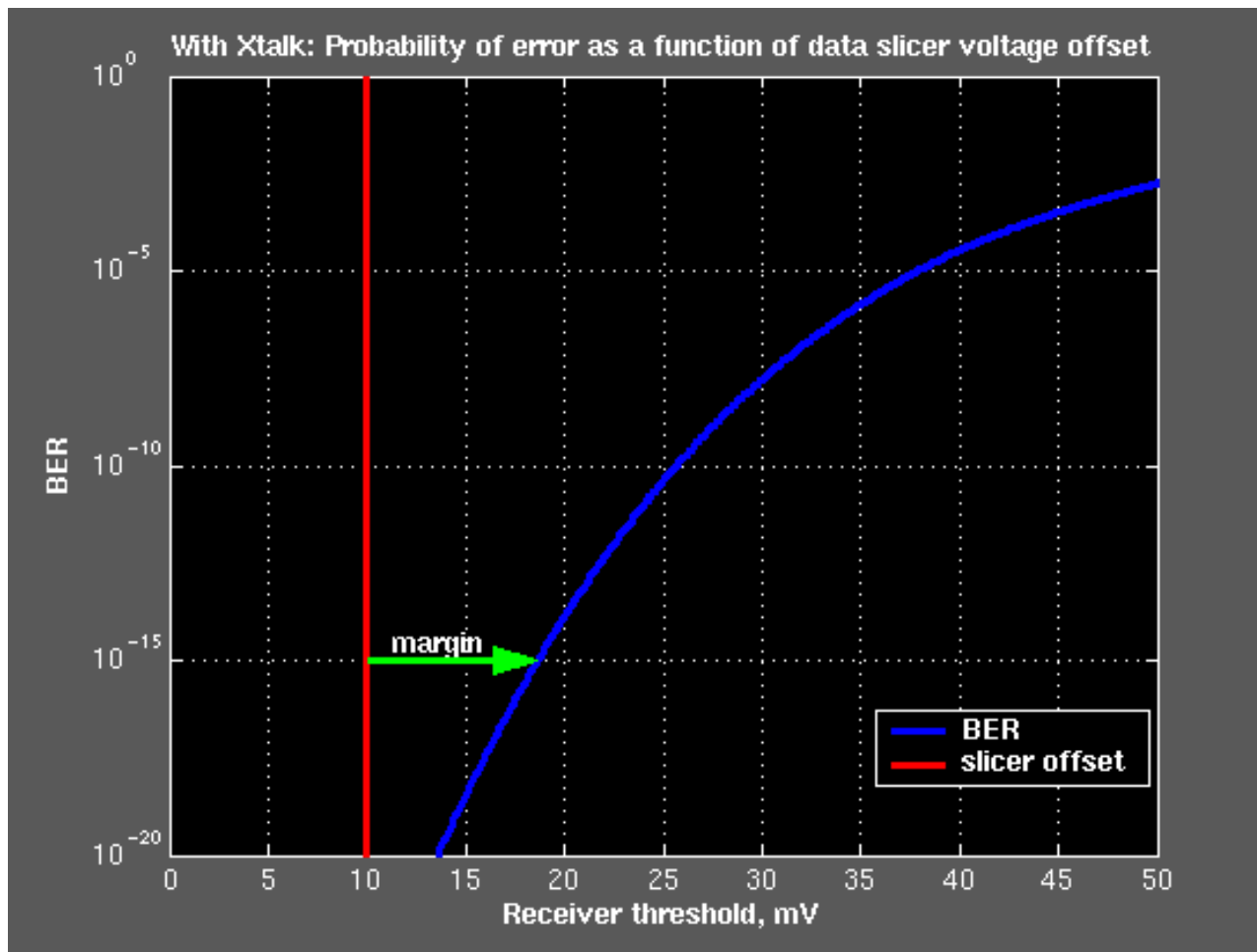
- Performance is measured in terms of Rx data slicer voltage offset required to achieve the target BER. Alternatively, the BER can be estimated for the Rx data slicer voltage offset.

Simulation Results – no Xtalk



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Simulation Results – with Xtalk



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Summary of Results



- With no crosstalk present Rx voltage margin = 18.8mV for $1e-15$ BER (= 22.2mV for $1e-12$ BER)
- With assumed crosstalk present Rx voltage margin = 8.6mV for $1e-15$ BER (= 12.5mV for $1e-12$ BER)

Note:

- Reflections at Tx/backplane and backplane/Rx boundary need to be considered
- Through as well as crosstalk channel considered to be “worst case”