

Progress Report on National's Dual Duplex Scheme for Gigabit Ethernet Copper PHY

Stephen Oh, Andrew Pagnon, Joshua Porten and
David Almagor
DSP Technology Group
National Semiconductor

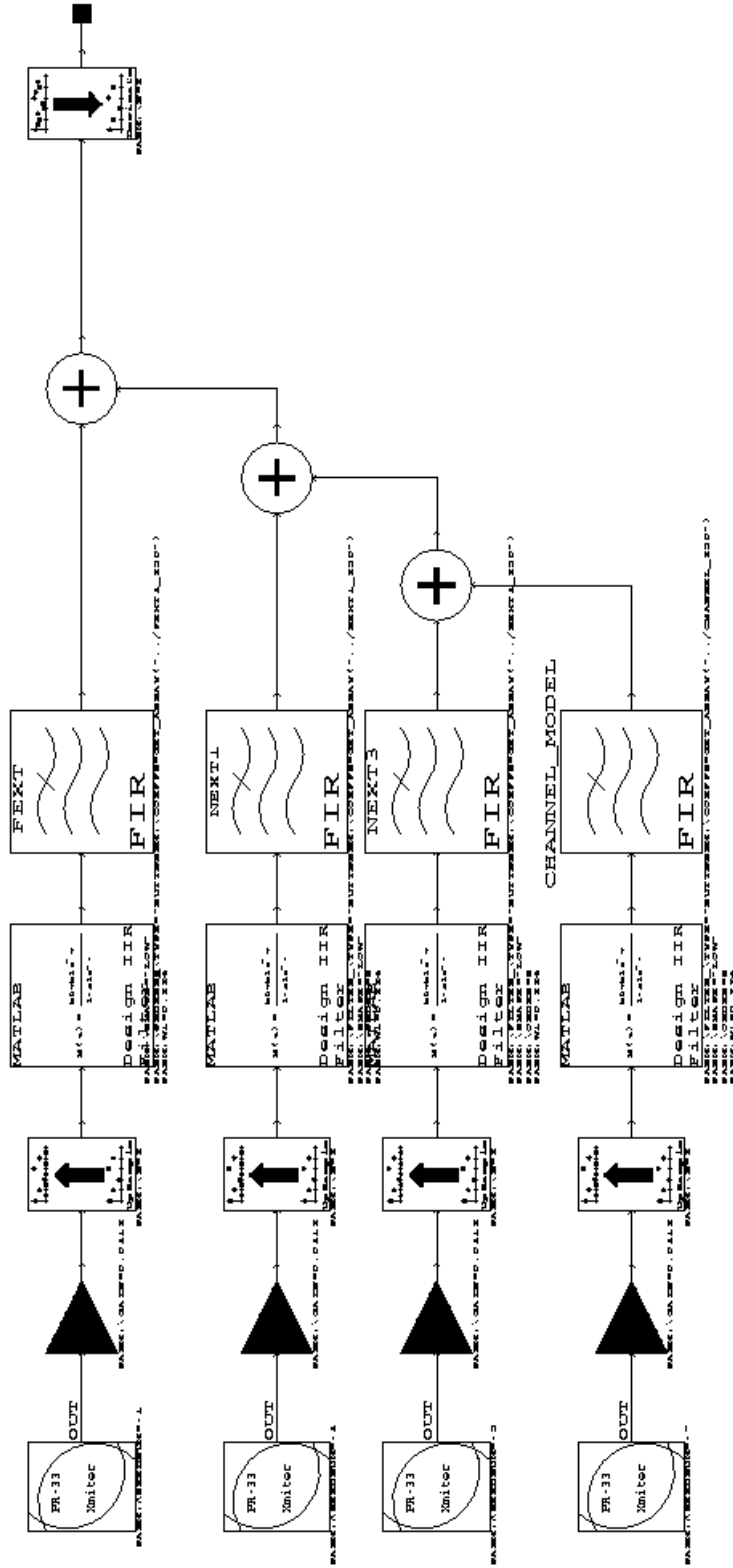
Agenda

- ❑ Status Report
 - ✓ Line code simulations
 - PR-1 (Partial Response)
 - QAM (Quadrature Amplitude Modulation)
 - ✓ Laboratory Set-up
 - Lab set-up for data acquisition system
 - Initial collected lab data
- ❑ Issues
 - ✓ Future work
 - ✓ Prototype

Status Report

- ❑ Line Coding Simulations for dual-duplex
 - ✓ Partial Response (PR) Class 1
 - Start with 9-level PAM: 17 level PR
 - Baud rate: 166.7 MHz
 - Bandwidth: 83.3 MHz with 0% Excess Bandwidth (EBW)
 - Analog Filter: 3rd order Butterworth
 - Impairments:
 - Channel Model
 - 2 self-NEXT
 - No Echo
 - 2 FEXT
 - ✓ Another scheme
 - 33 level PR
 - Baud rate: 125 MHz
 - Bandwidth: 62.5 MHz with 0% EBW
 - Analog Filter: 3rd order Butterworth filter
 - Impairments
 - Same as 17 level PR

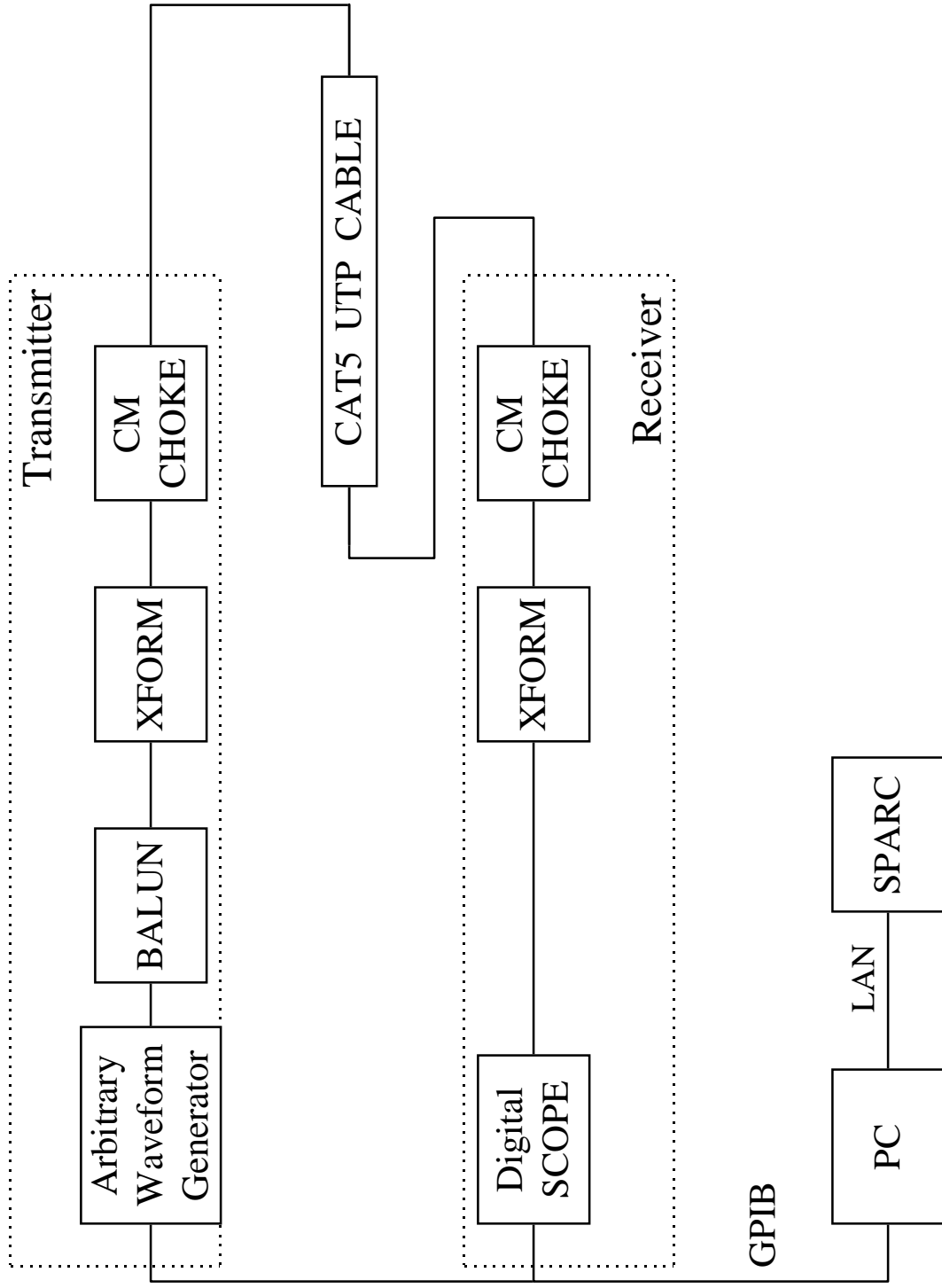
Channel Model



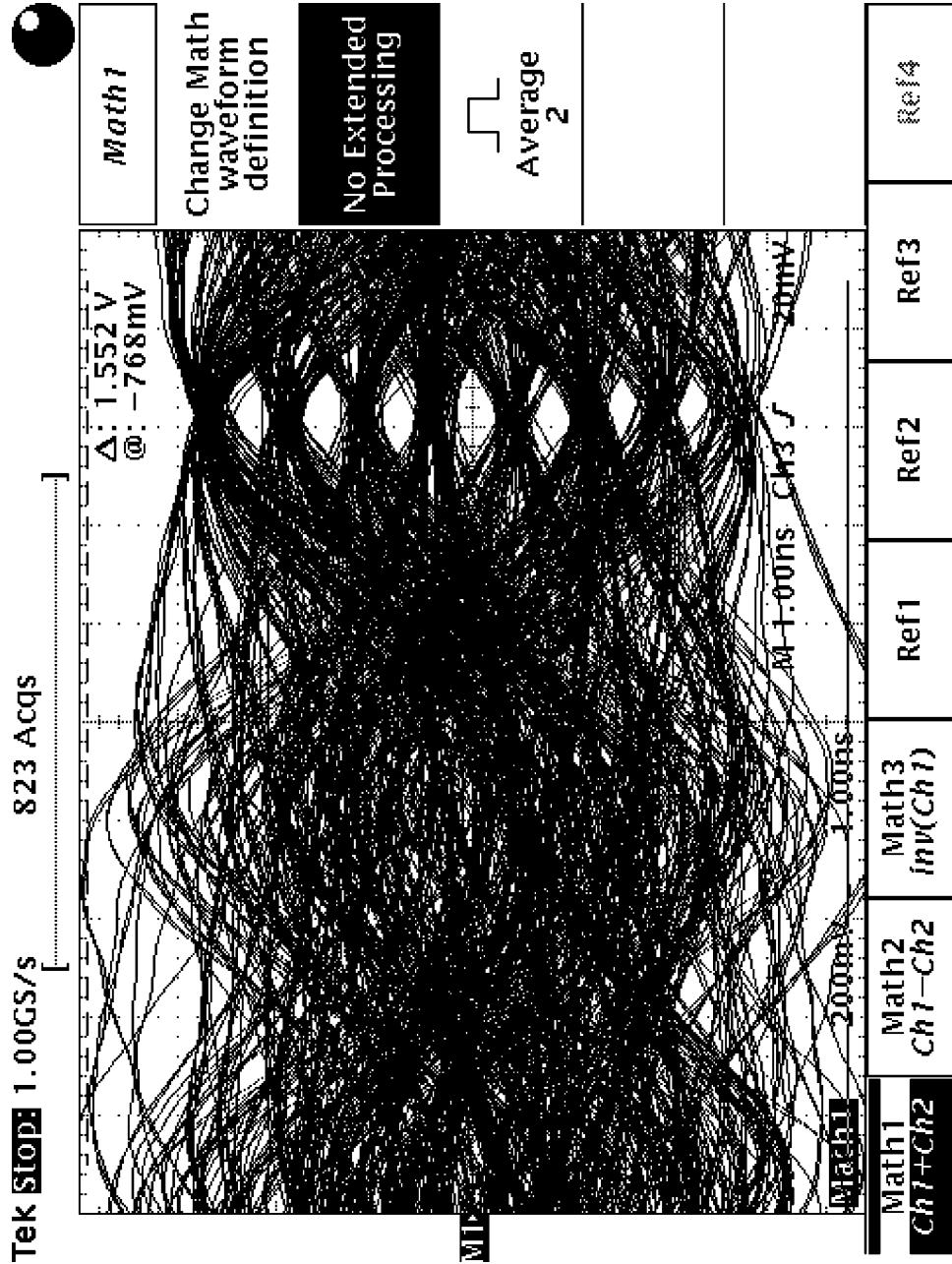
Status Report (continued)

- ❑ Line code simulations
 - ✓ 64 QAM simulations
 - Baud Rate = 83.33 MHz (500 Mbits/sec, 6 bits/symbol)
 - Excess Bandwidth = 20%
 - No Echo Canceller
 - Two NEXT Cancellers
 - 2 FEXT included

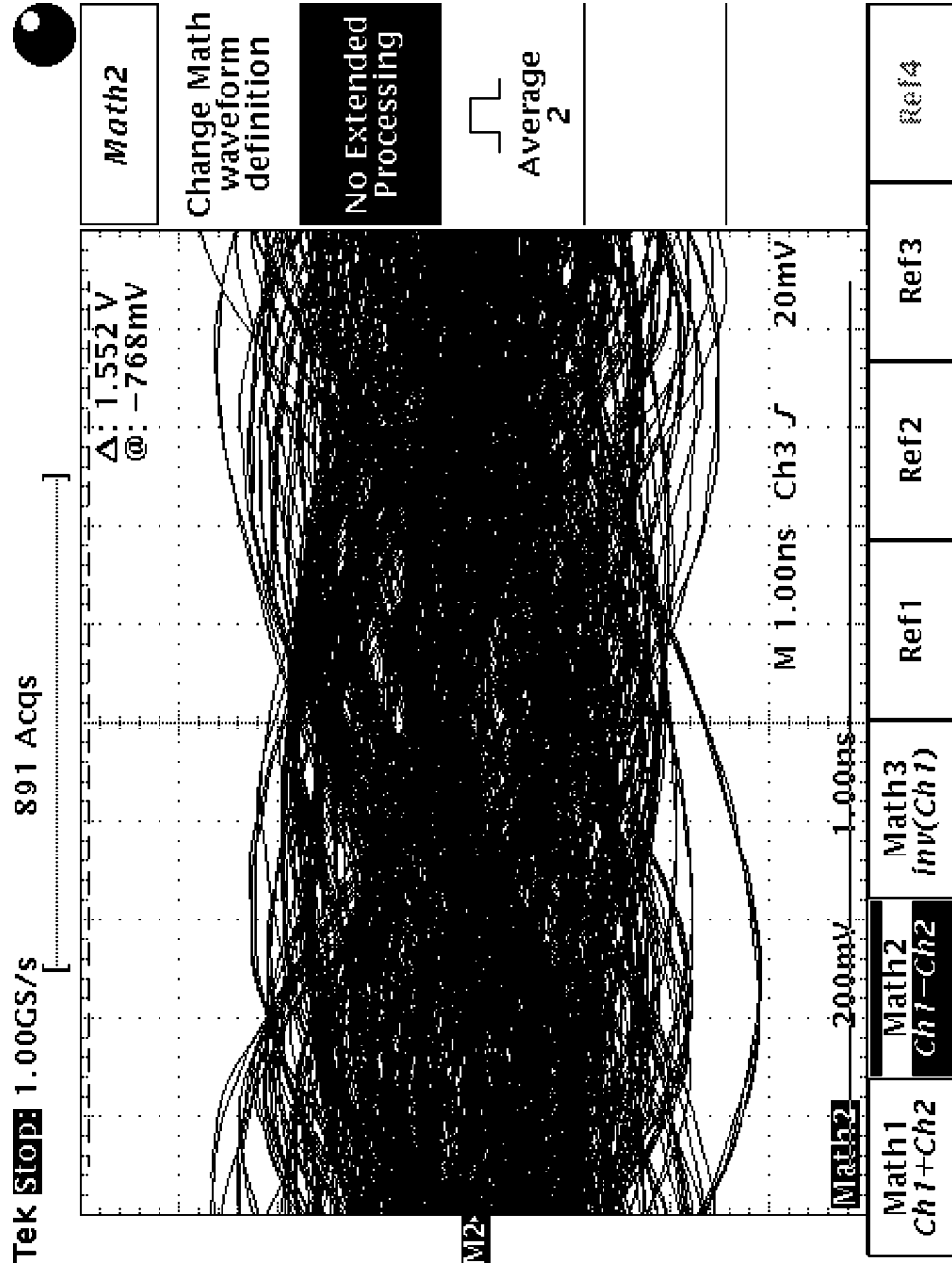
LAB SETUP



COAX CONNECTION, 250MS/S QAM64 EYES OPEN



50FT CAT5 UTP + TERM CONNECTION, 250MS/S QAM64 EYES CLOSED



Issues

- Future work
 - ✓ On going Investigation for the dual duplex scheme
 - PR-17 and PR-33 will be thoroughly investigated
 - QAM 64 and QAM 81 (9x9) will be investigated
 - All simulations will be tested with the collected lab data
 - ✓ Lab set-up
 - Initial Data Acquisition set-up almost done
 - More sophisticated laboratory set-up is planned
 - ✓ Prototype
 - Evaluating building a pre-silicon prototype