

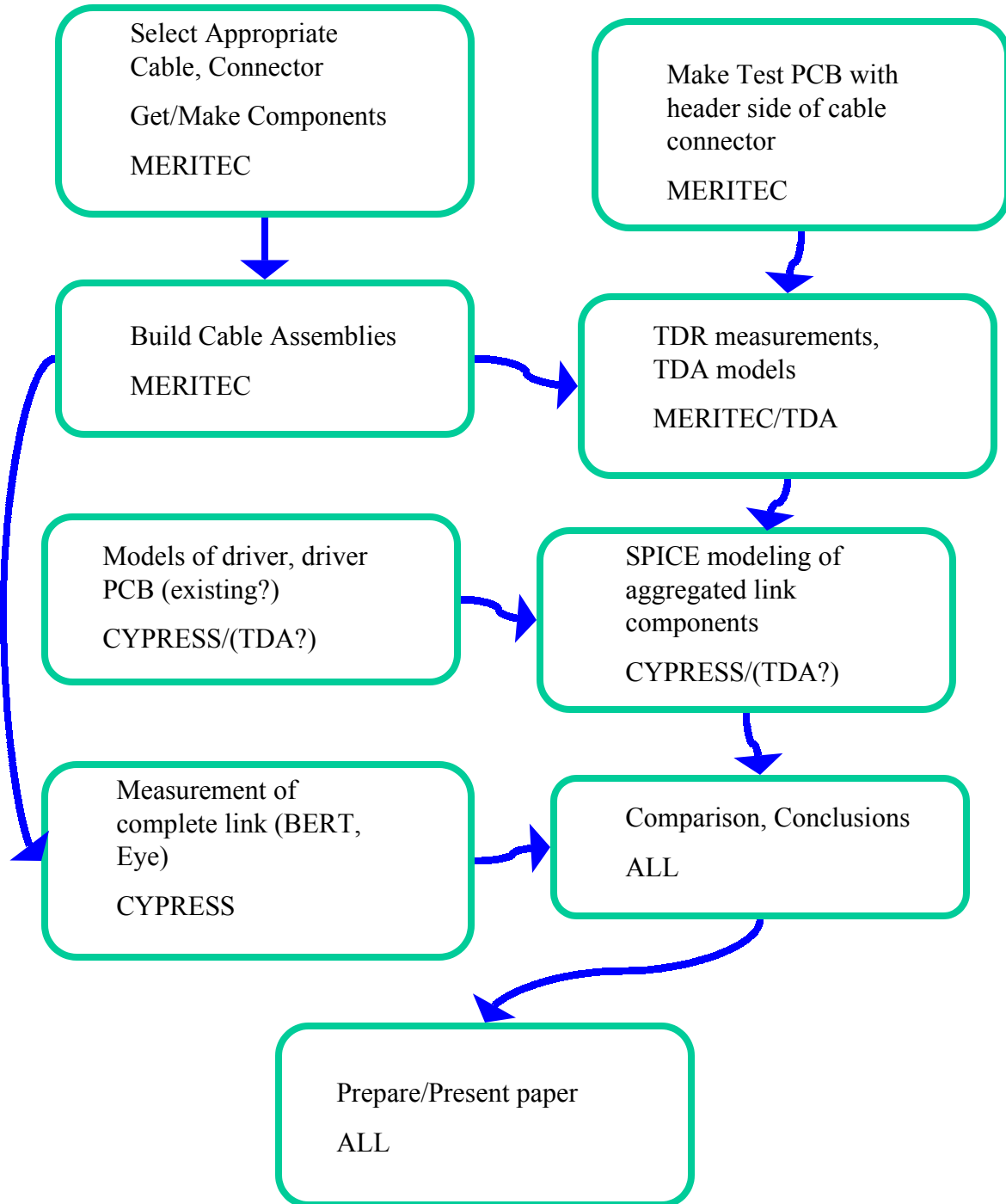
Modeling Study

- Purpose: To determine the viability of using TDR based measurements and software to extract SPICE models for use in running performance simulations of Gbit links.
 - Identify strengths and weaknesses of the approach
 - Determine what can be safely modeled and what must be measured
- Method:
 - Measurements of cable assemblies, test fixtures(TDR/TDT)
 - Extraction of SPICE models from measurements
 - Eye pattern measurements
 - Performance simulation using SPICE models
 - Comparison of results

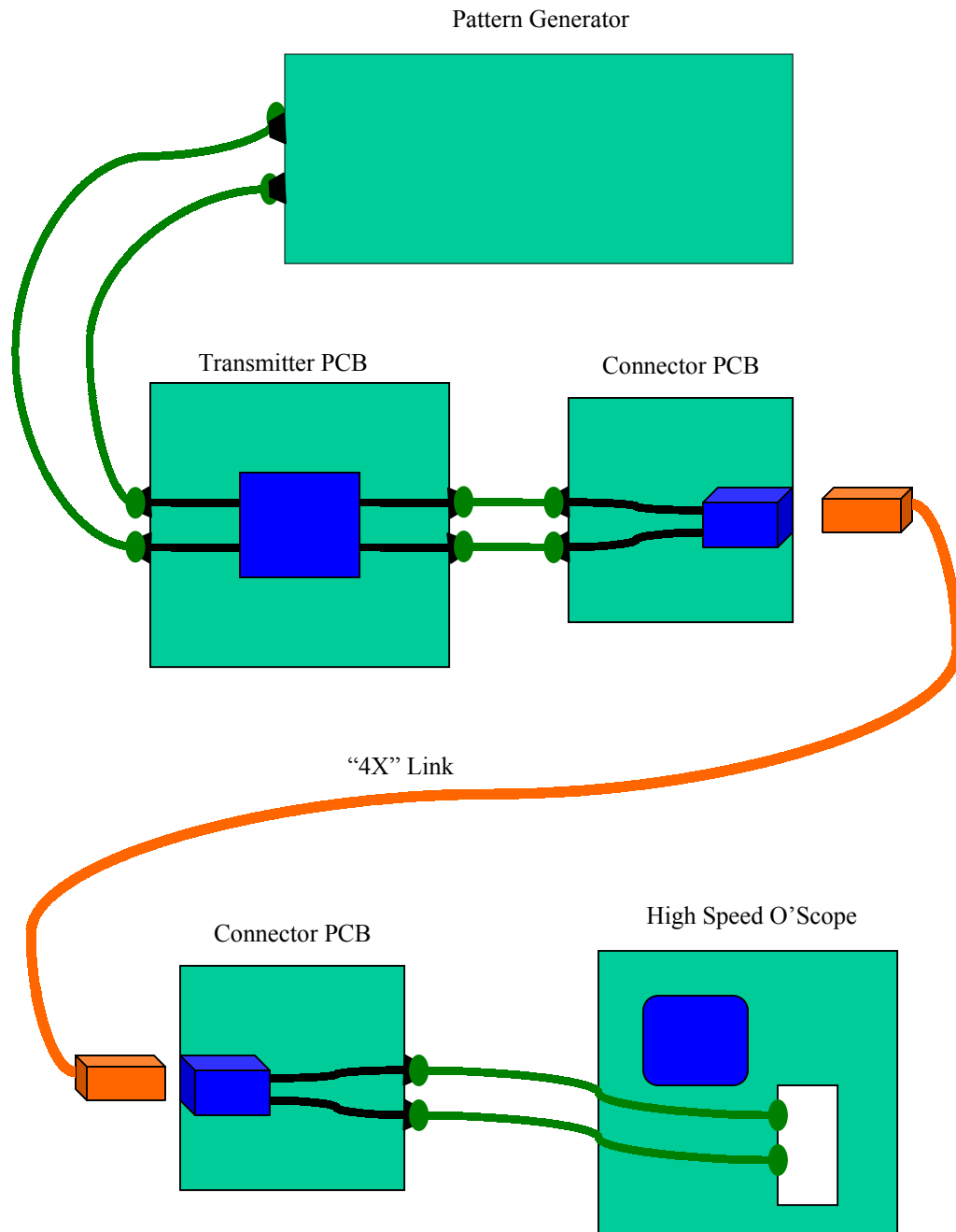
Modeling Study

- This is work in process
- Intent today is to show progress and gather input as to what other questions should be addressed through this exercise
- Joint effort of:
 - Mark Marlett Cypress Semiconductor
 - Dima Smolyansky TDA Systems
 - John Sawdy Meritec
 - Chris Shmatovich Meritec

Experiment Flowchart

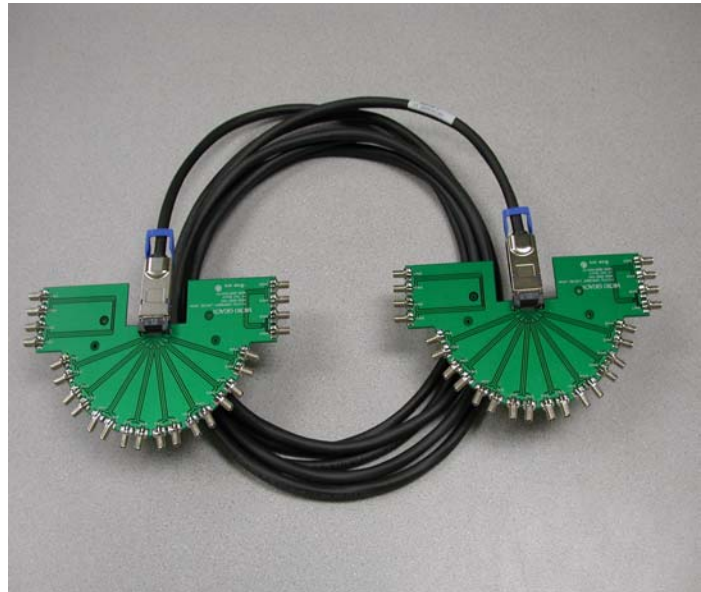


Physical Components

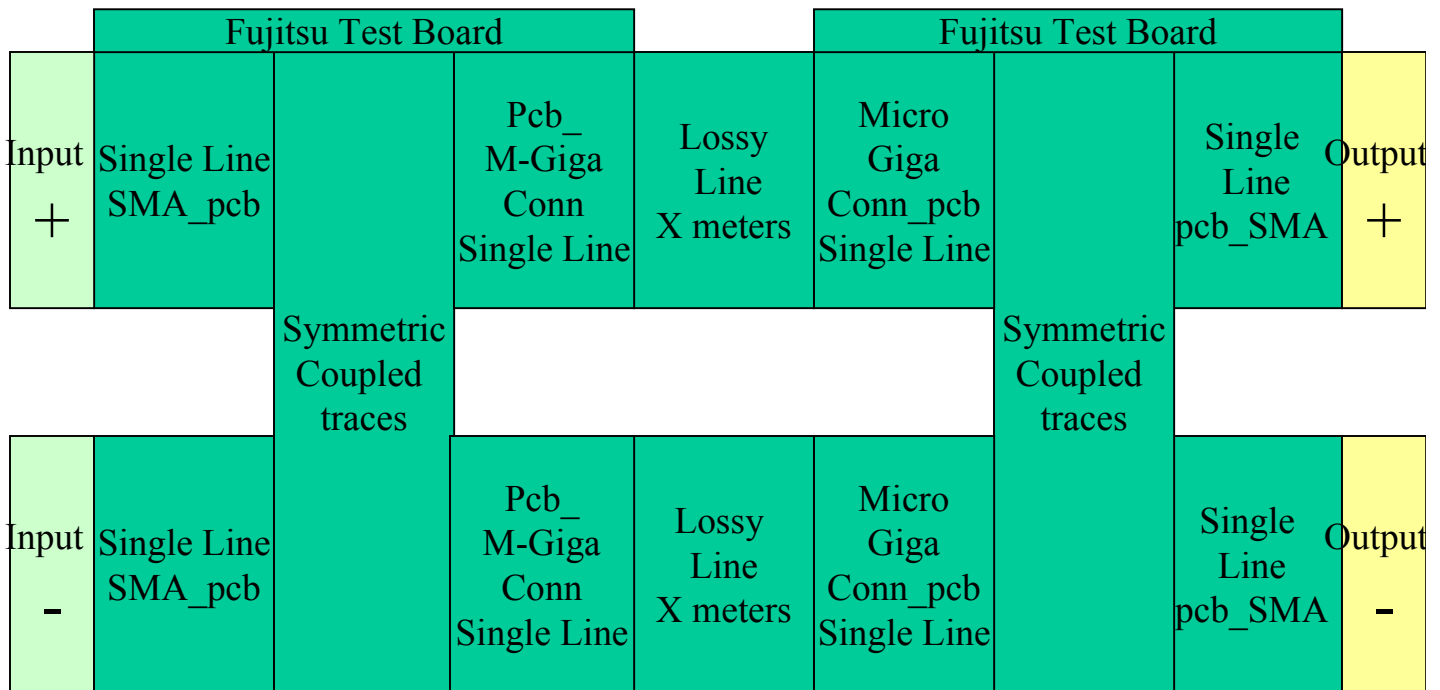


Modeling Study Cable Assemblies

- 2meter, 5 meter lengths
- MicroGiga connectors
- 24 awg conductors
- 100 ohms



Model Interconnections



John Sawdy
Meritec/Joy Signal
7/18/02

Modeling Study Spice Example

* Time Domain Analysis Systems: IConnect
* Version 2.0.1 (Internal Release)

* File Created: July 18, 2002 at 02:23PM
* Created By: JSAWDY

* Format: Model
* Type: Lossy Line

* == Begin Header ==

* Termination: Matched
* Reference Waveform: ..\Meri 2 meter\2ns_div\open.wfm
* Reflection Waveform: ..\Meri 2 meter\2ns_div\reflection.wfm
* Transmission Waveform: ..\Meri 2 meter\2ns_div\thru.wfm
* Parameters: Rdc=650m, Rac=30.7u, Linf=451n, Gdc=256n, Gac=9.01p, Cinf=169p
* Format: W-Element
* Length: 1
* Syntax: HSpice
* Name: Automatically Generated

* == End Header ==

.subckt Lossy_Line_2_meter port1 port2 gnd_

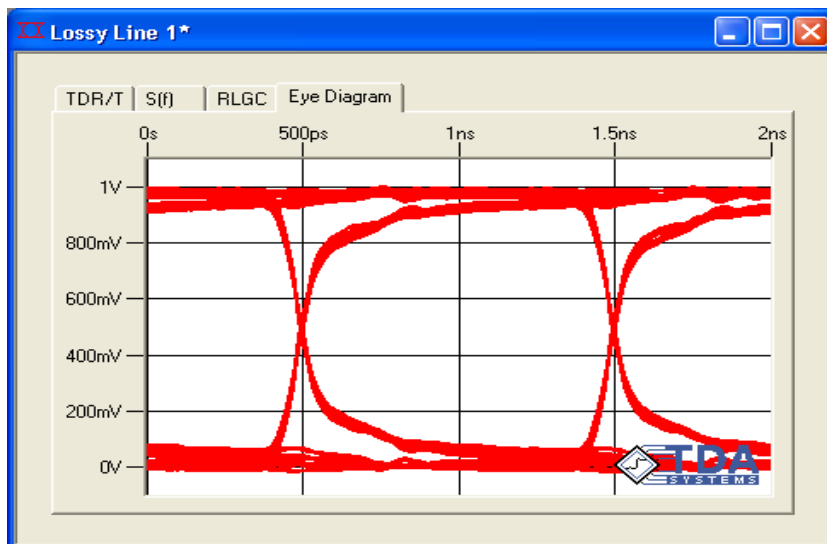
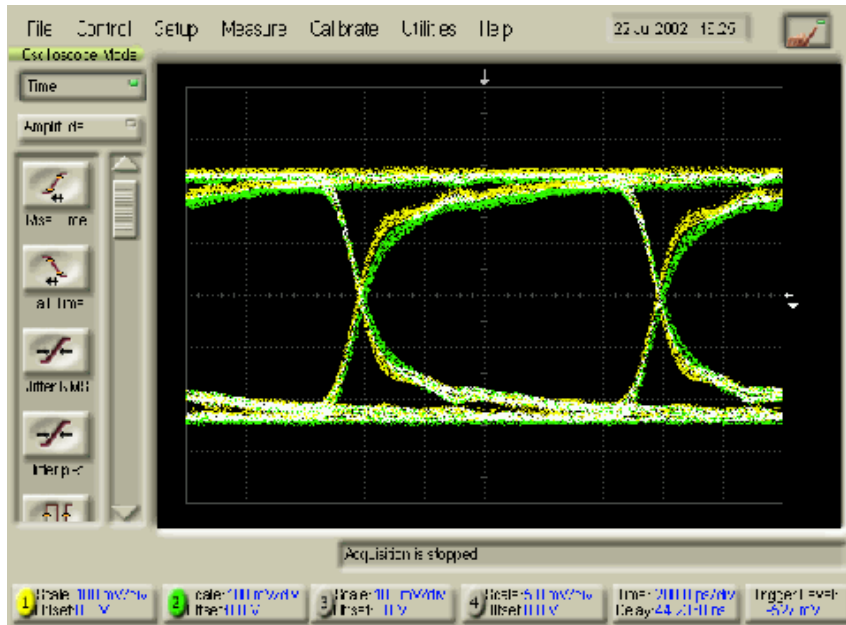
W1 N=1 port1 gnd_ port2 gnd_ RLGCMODEL=Lossy_Line_2_meter_Model L=1

* RLGC values for W element

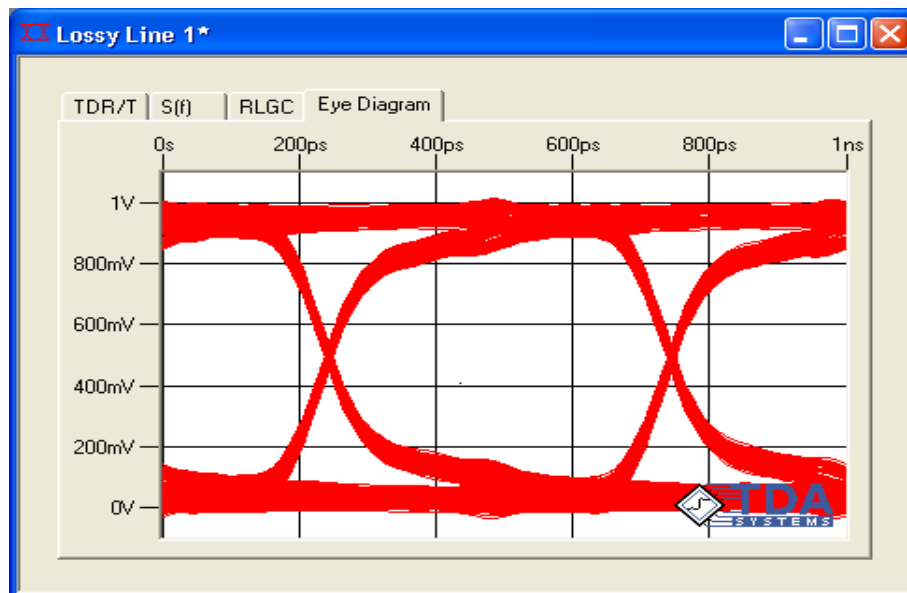
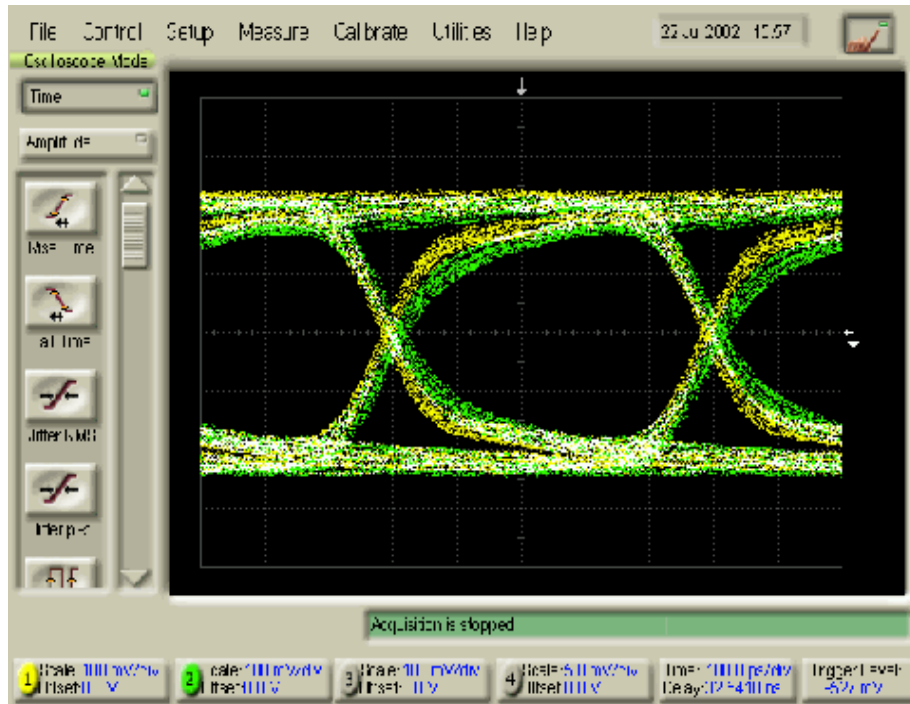
.MODEL Lossy_Line_2_meter_Model W MODELTYPE=RLGC N=1
+ Lo=4.51e-007
+ Co=1.72003e-010
+ Ro=0.65
+ Go=0
+ Rs=3.07e-005
+ Gd=1.20133e-011

.ends

2 Meters, 1 Gbit



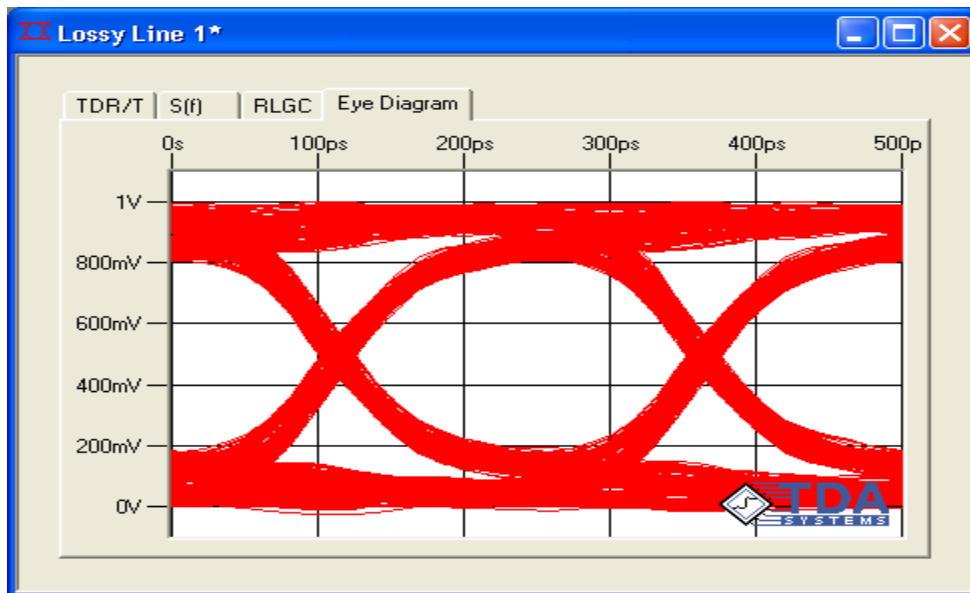
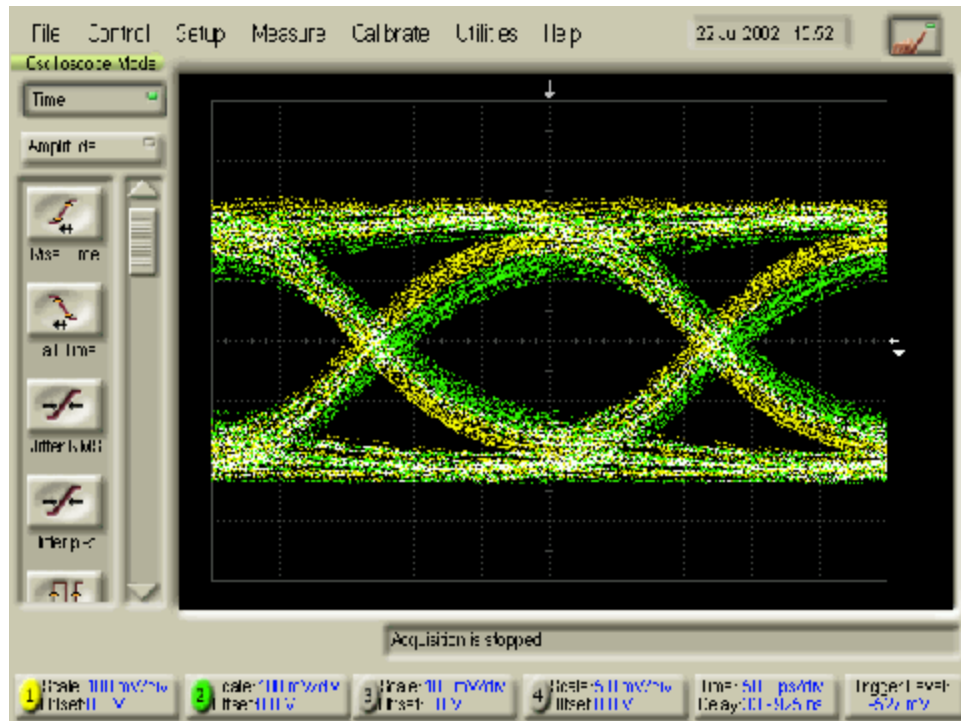
2 Meters, 2 Gbit



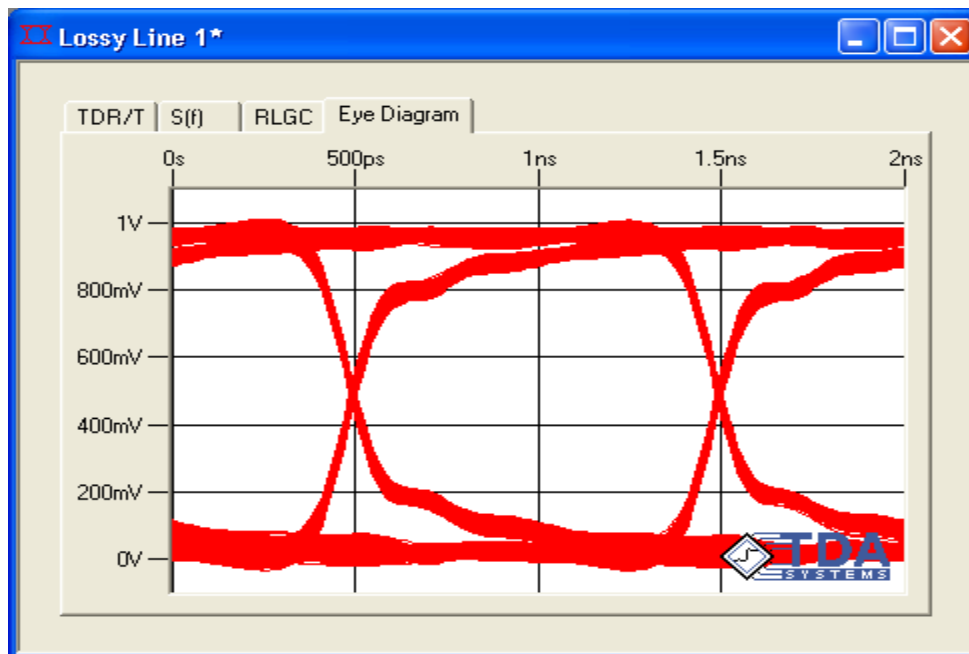
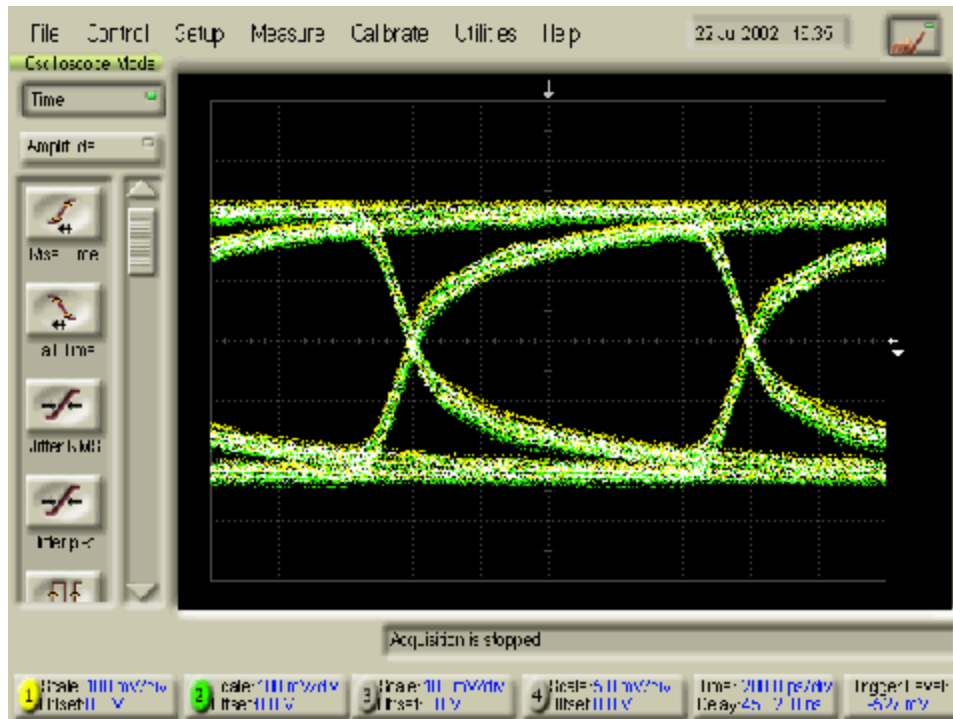
8/2/02

Modeling Study

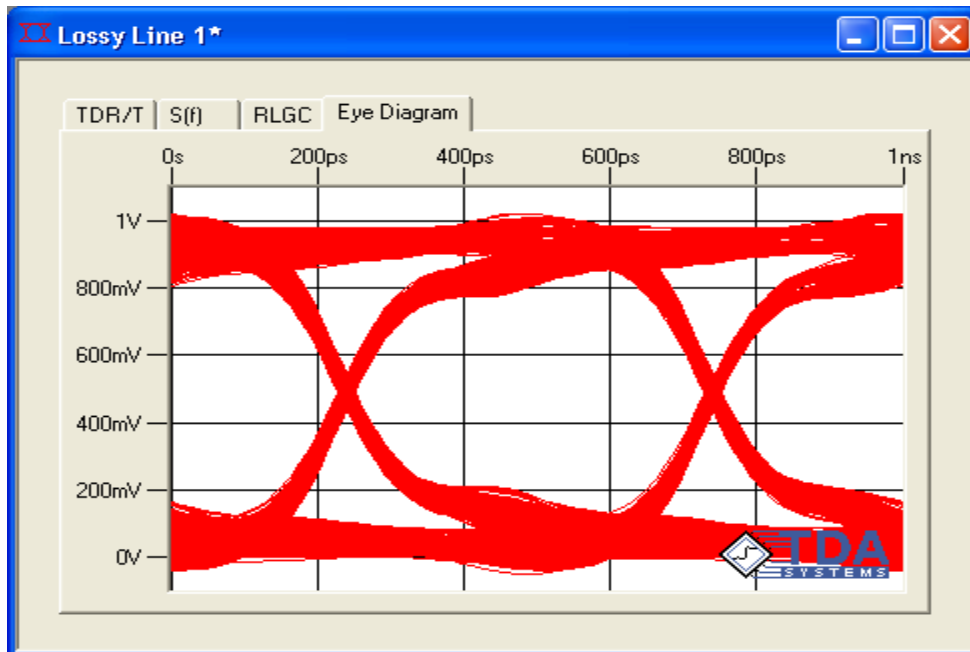
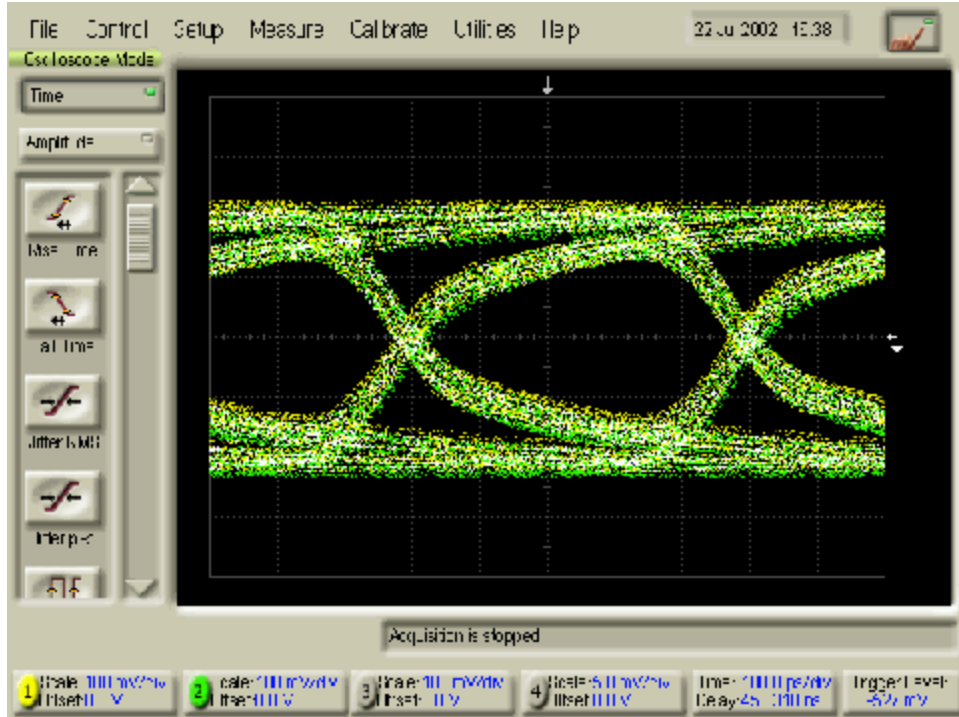
2 Meters, 4 Gbit



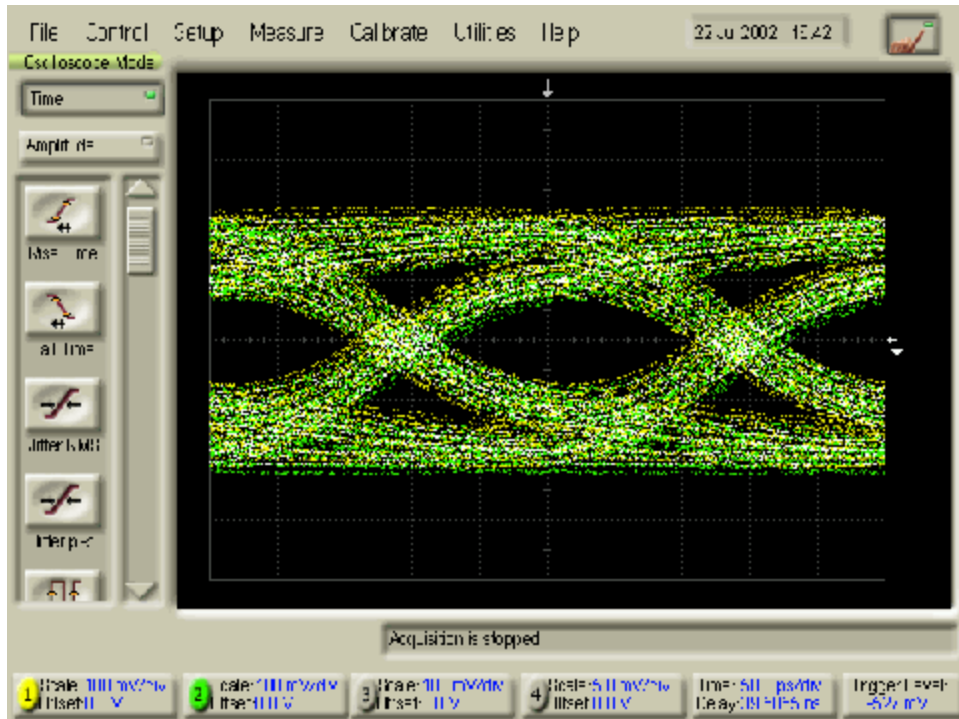
5 Meters, 1 Gbit



5 Meter, 2 Gbit



5 Meter, 4 Gbit



Modeling Study

Next Actions

- Include Silicon in measurements and models
- SPICE simulations including the active devices
- Quantify degree of correlation between measurements and simulations
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- -
- -
- -