

# ***Measurements of DMD-Challenged Fibers at 850nm and 2Gb/s Data Rate***

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January 10, 2001*

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# *Overview*

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- **Measurement setup and methodology**
- **Table of measured fibers**
- **Theoretical analysis of measurements**
- **Experimental results at 850nm (2Gb/s data rate)**

# ***Measurement Setup***

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- **Bit Error Rate Tester (BERT) generates a 127-bit pseudo-random binary sequence (PRBS) at 2Gb/s data rate**
- **Laser is a 850nm VCSEL in a connectorized module**
- **Photodetector is a commercial 10GHz optical receiver**
- **High-bandwidth (1.5GHz), high sampling rate (8GHz) oscilloscope (Agilent Infinium), captures blocks of 65K samples**
- **TIA DMD-challenged fibers per table of next viewgraph**
- **Fibers were shaken by hand during the measurements**
- **Measurements taken with a mode selective loss patchcord**

# Measurements

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CASE	FIBER	LENGTH[m]
1	Back-to-back	0
2	DEC Black	400
3	DEC Red	400
4	Fujikura	300

NOTE: all measurements done at 850nm using a  
mode selective patchcord

# *Processing of Measured Data*

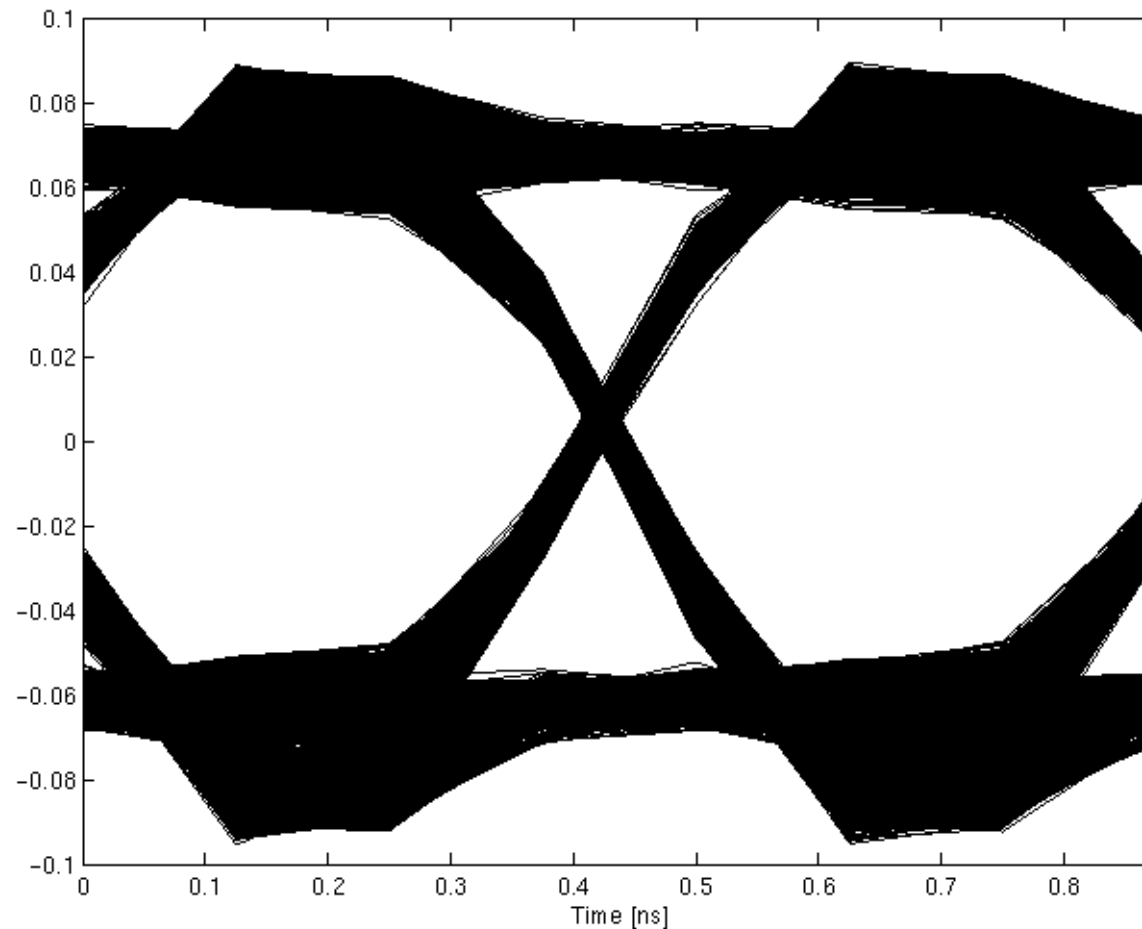
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- The measured data was processed as per the document *“Measurement of Non-Stationarity of 10Gb/s Multimode Fiber Links”*, by O.Agazzi and T.Lenosky, available from:

<http://www.ieee802.org/3/ae/public/adhoc/equal/NonStationarity112200.pdf>

## *Eye Pattern for Non-Equalized System (Case 1)*

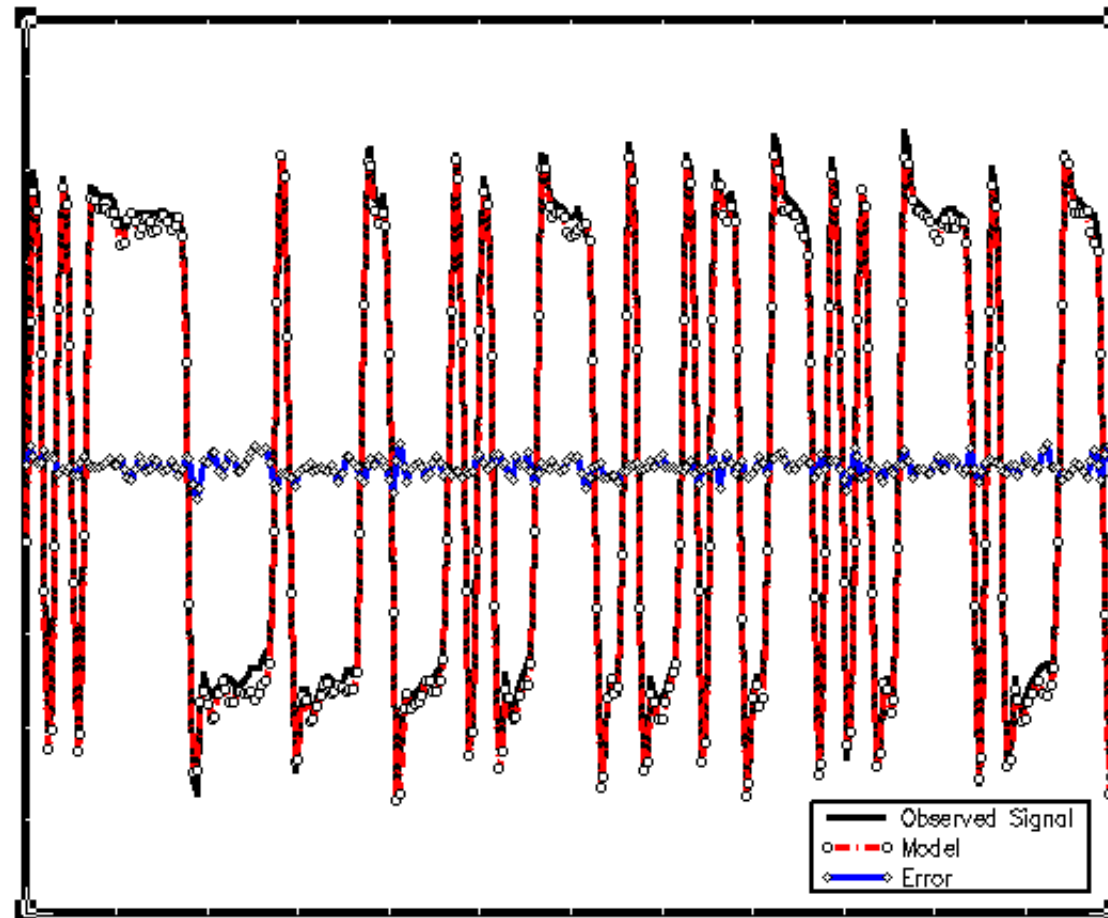
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

## *Measured Signal vs. Model and Error (Case 1)*

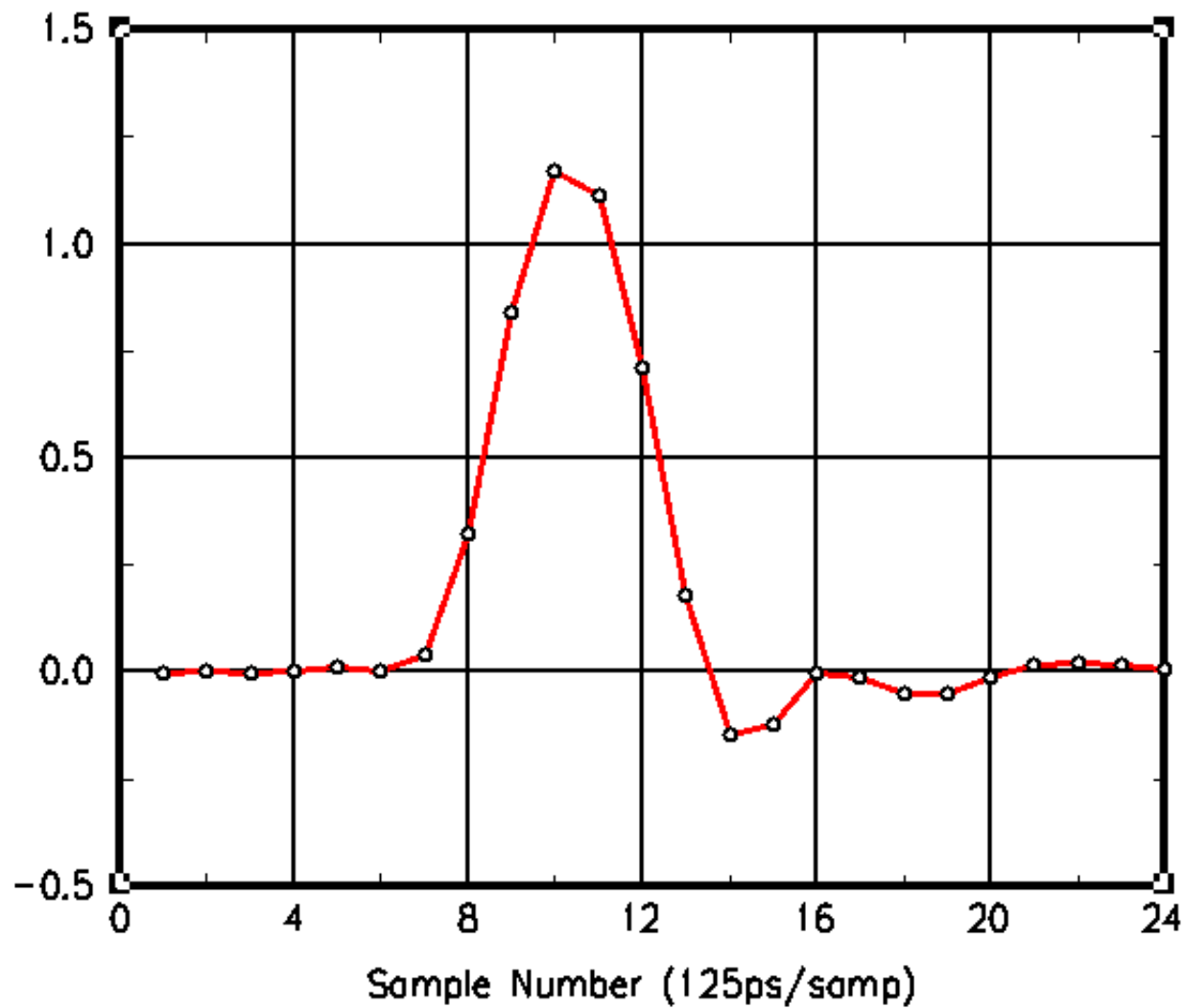
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

## *Impulse Response (Case 1)*

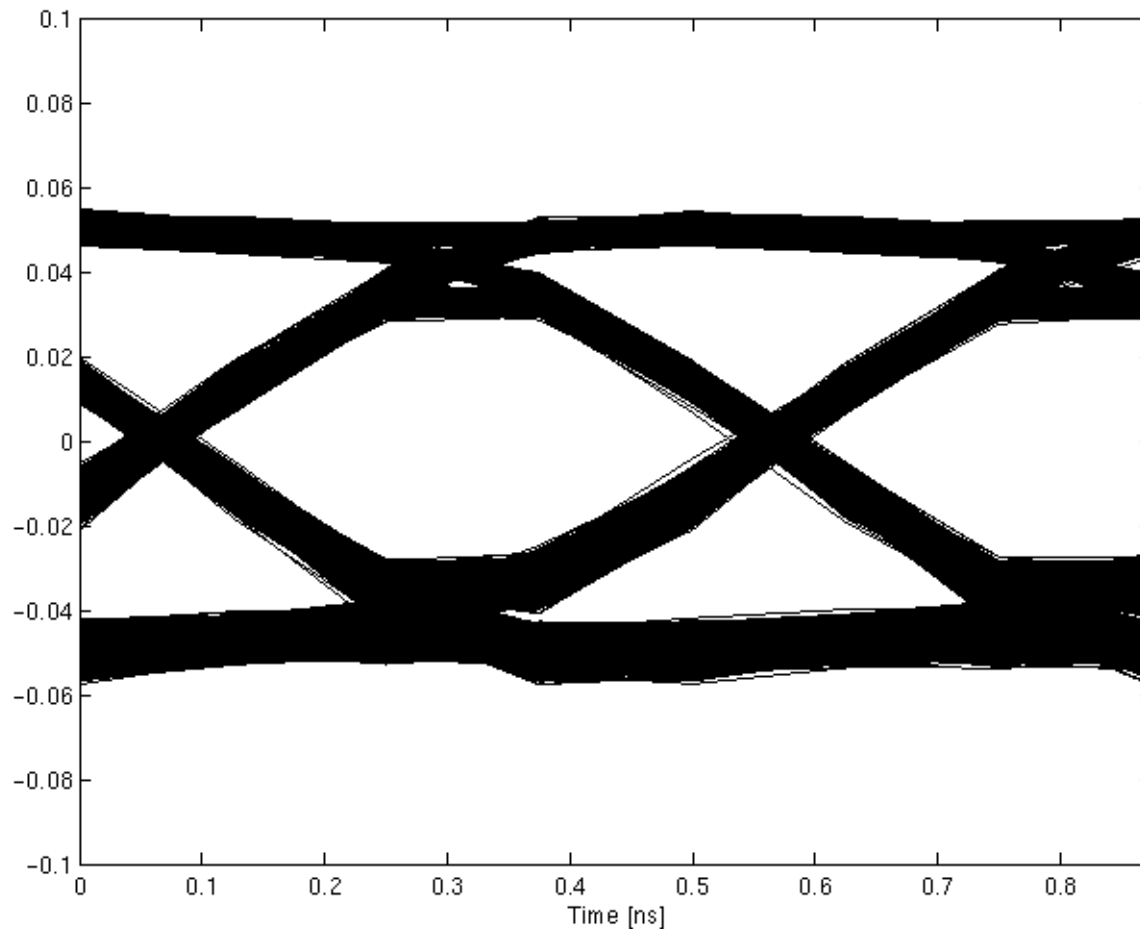
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## *Eye Pattern for Non-Equalized System (Case 2)*

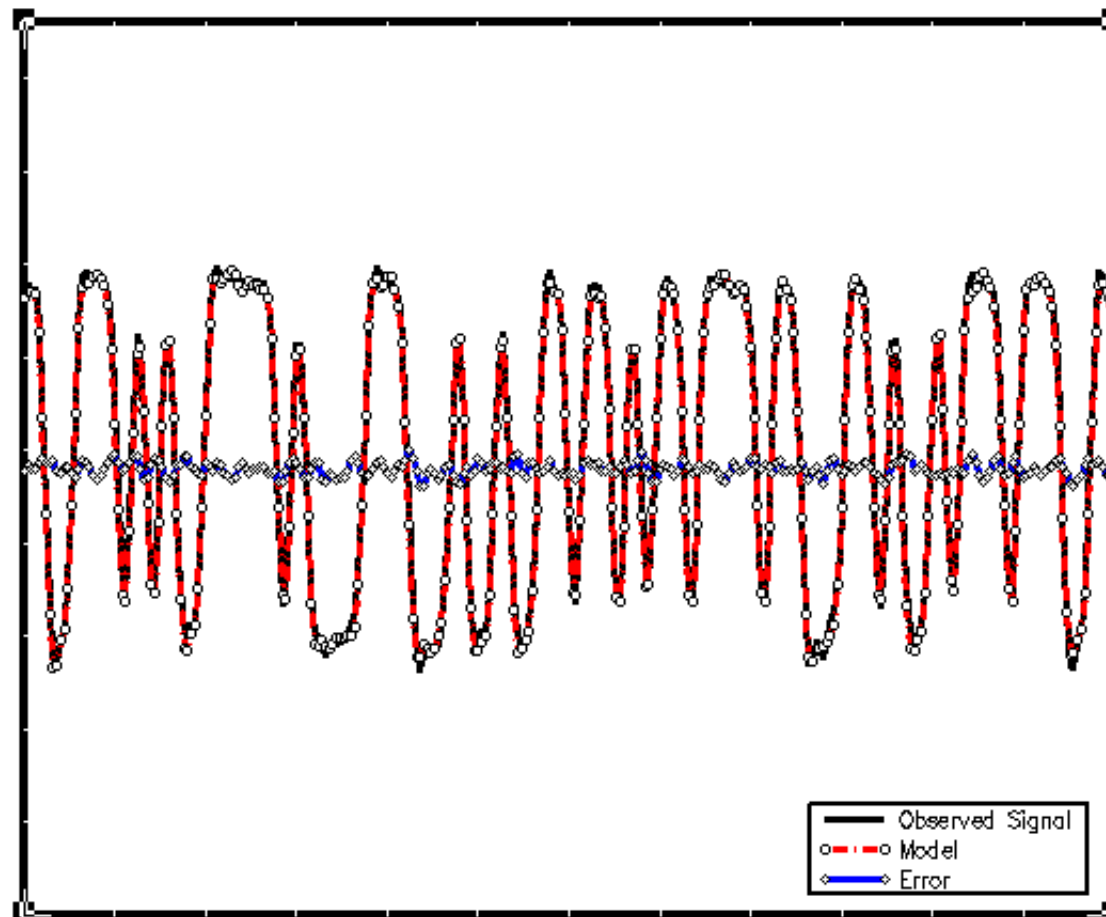
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

## *Measured Signal vs. Model and Error (Case 2)*

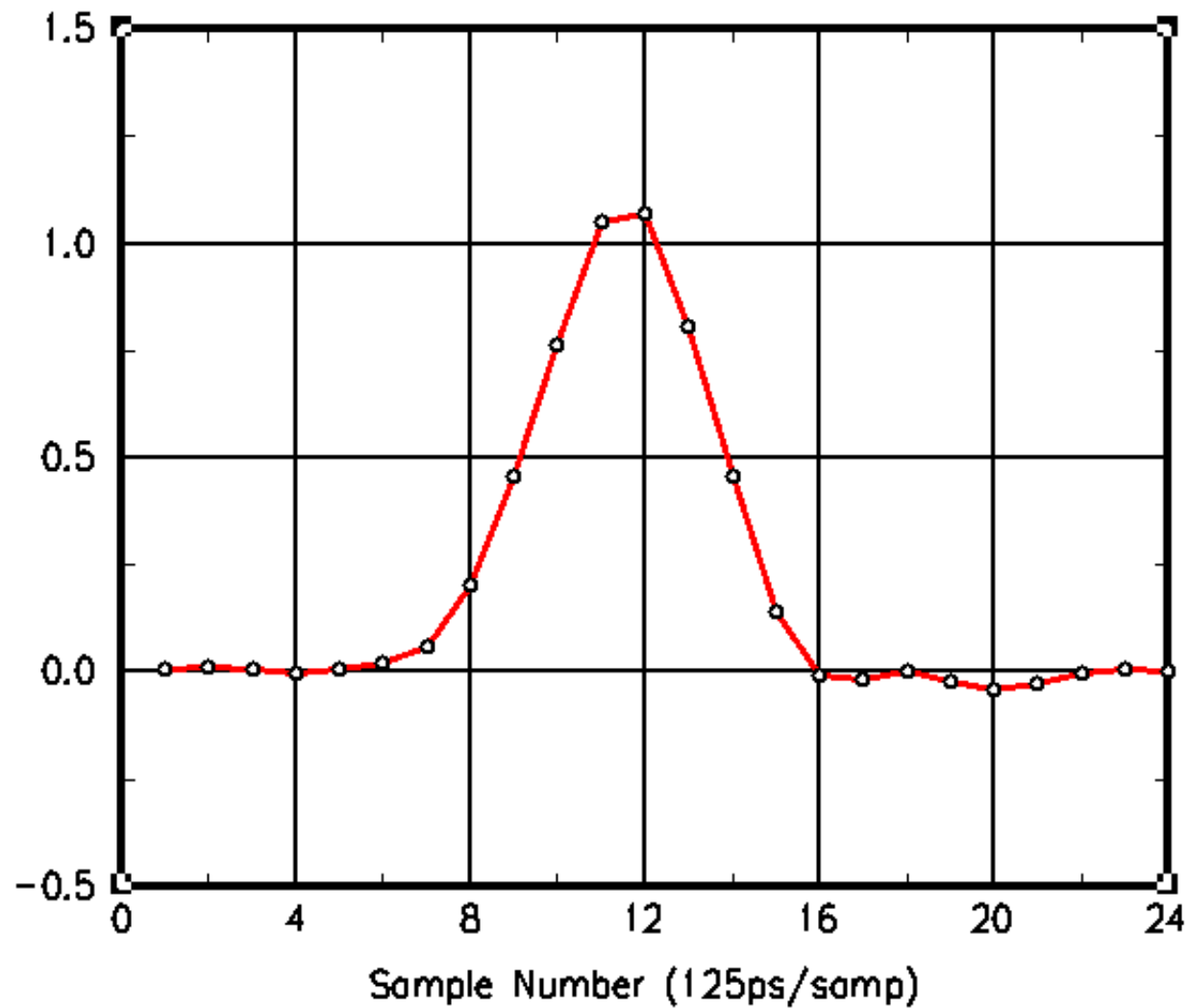
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

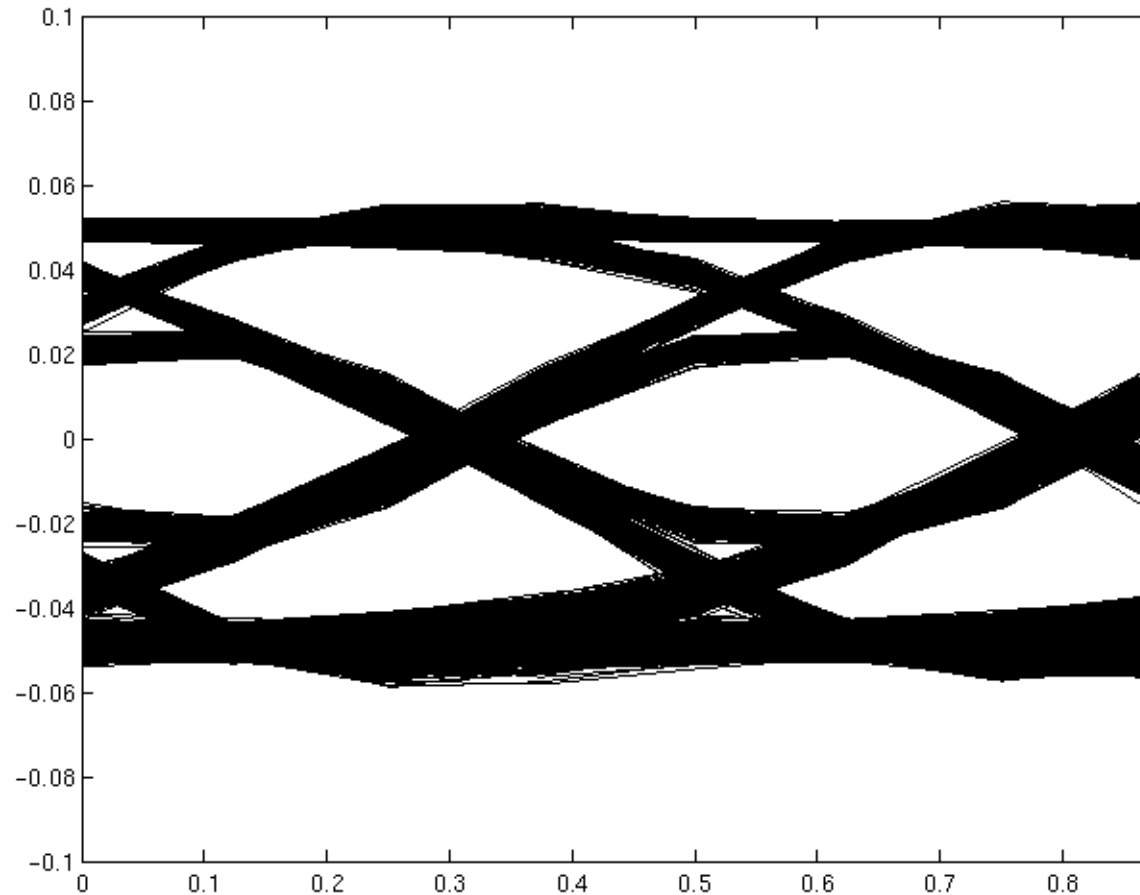
## *Impulse Response (Case 2)*

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## *Eye Pattern for Non-Equalized System (Case 3)*

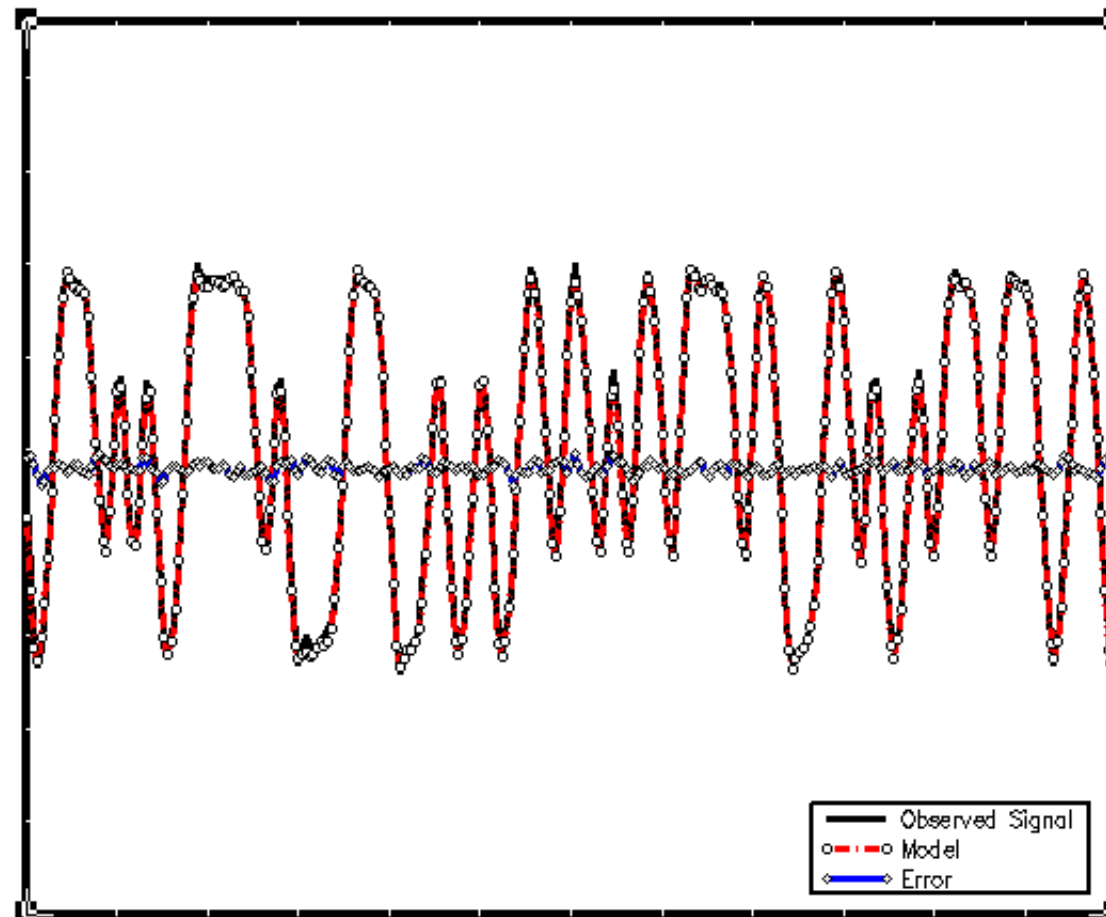
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

## *Measured Signal vs. Model and Error (Case 3)*

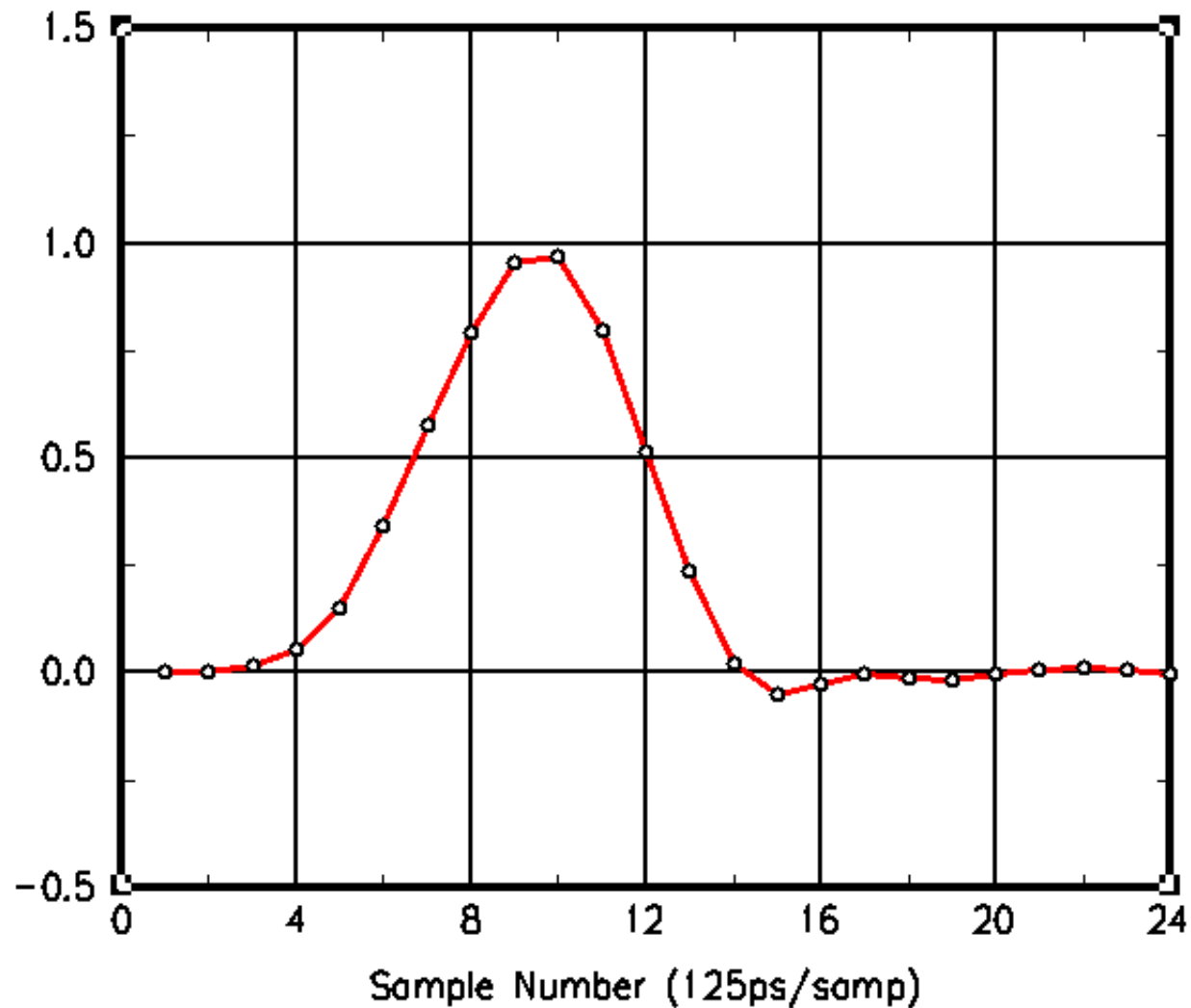
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

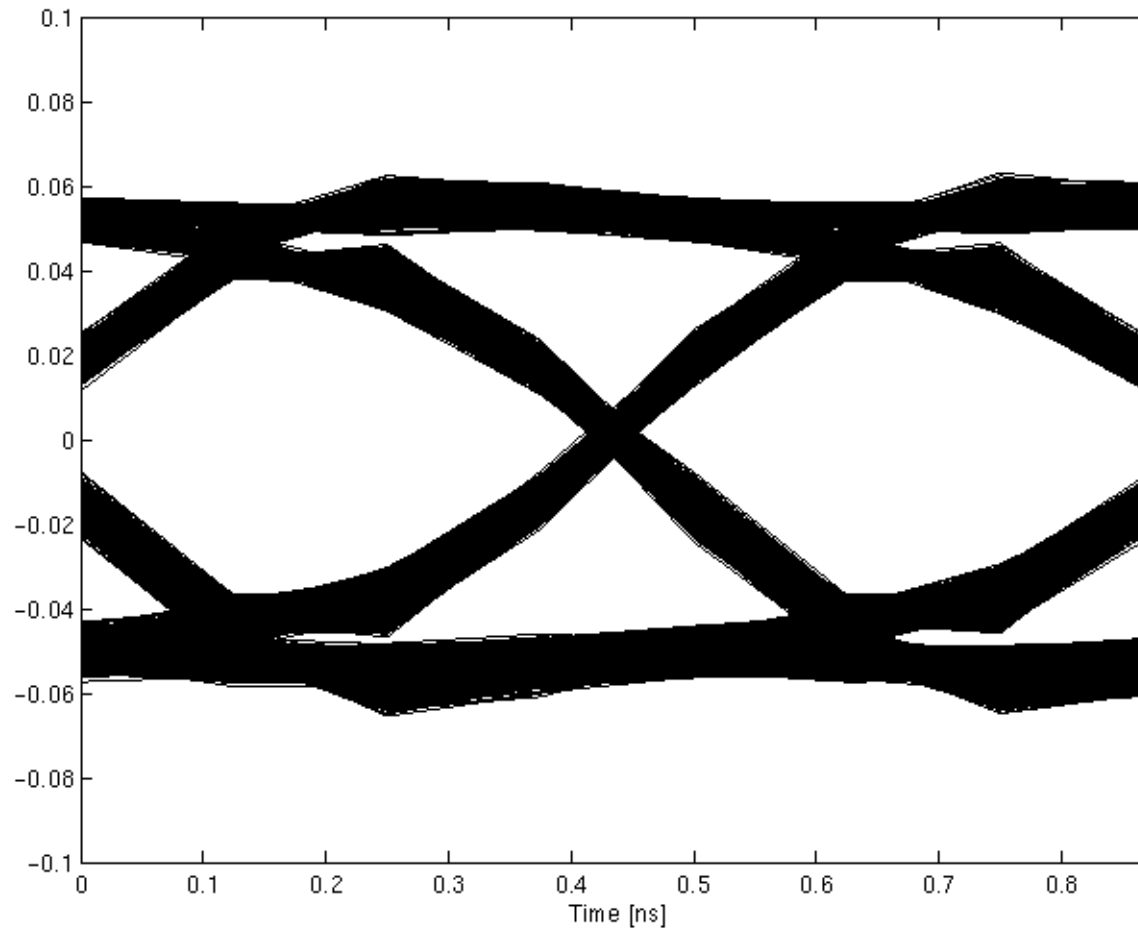
## *Impulse Response (Case 3)*

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## *Eye Pattern for Non-Equalized System (Case 4)*

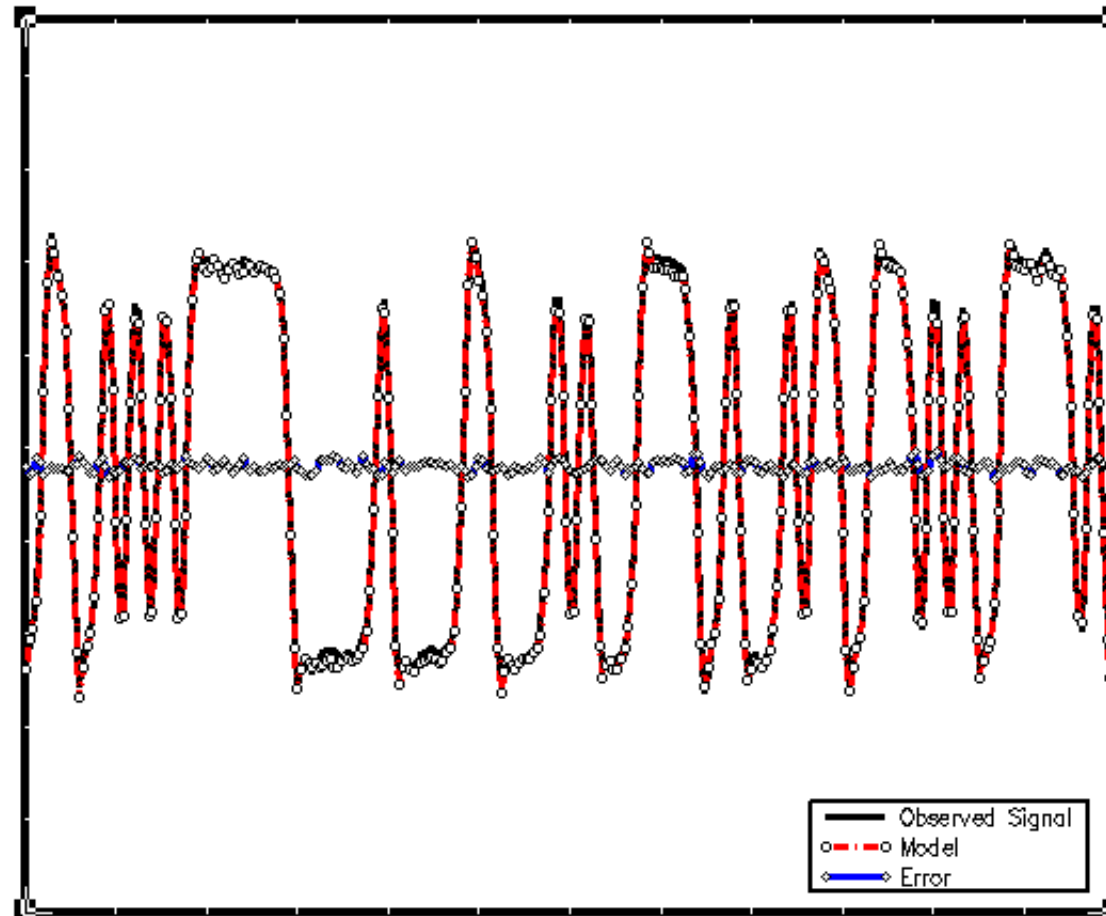
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Bit Rate = 2Gb/s, Sampling Rate = 8GHz

## *Measured Signal vs. Model and Error (Case 4)*

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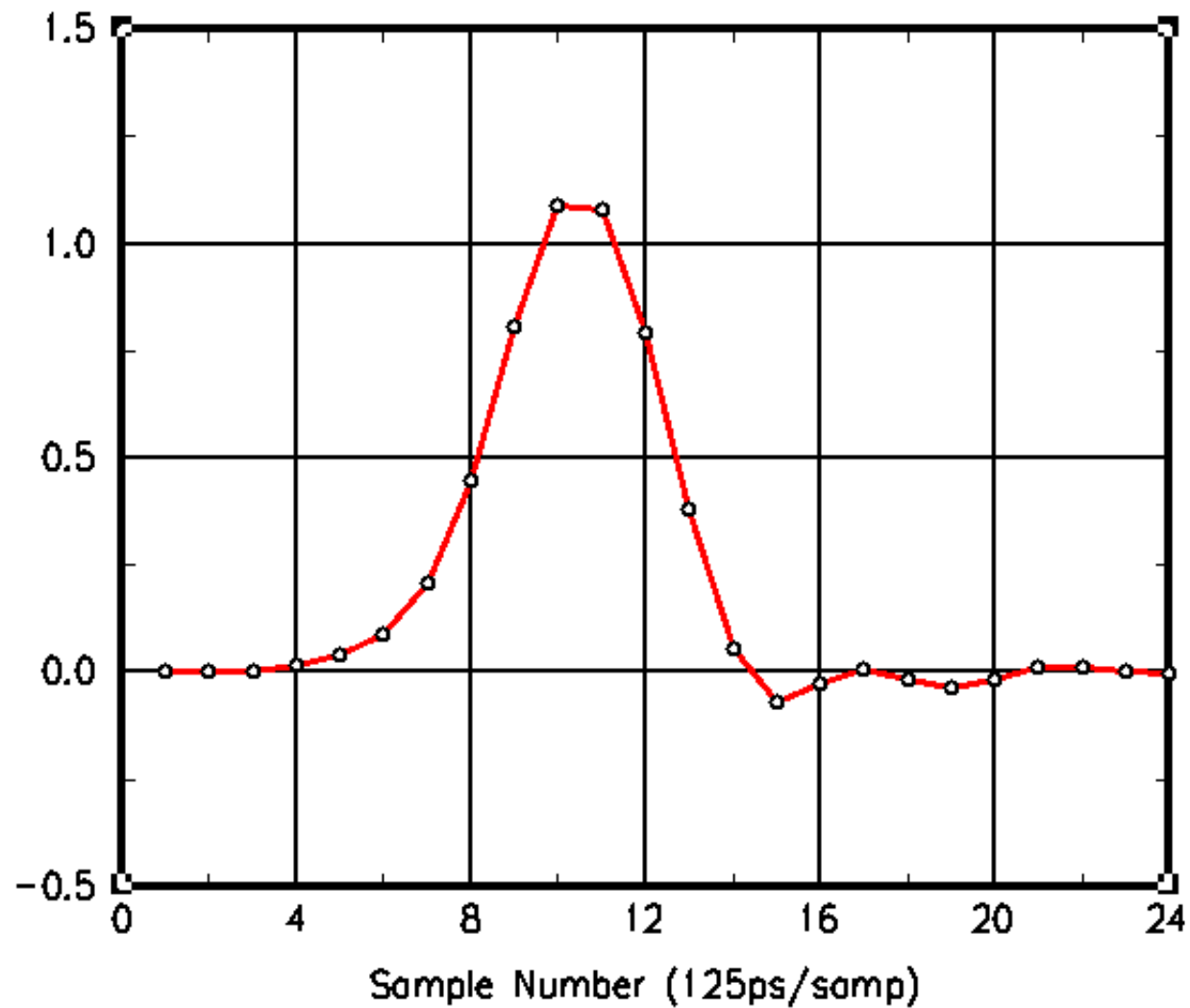


Bit Rate = 2Gb/s, Sampling Rate = 8GHz



## *Impulse Response (Case 4)*

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# Signal to Noise Ratios

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CASE	FIBER	LENGTH [m]	SNR [dB]
1	None (Back to back)	0	27.75
2	DEC Black	400	26.64
3	DEC Red	400	27.19
4	Fujikura	300	28.69

**NOTE:** SNR is defined as  $10 \log_{10}(\text{Signal Power}/\text{Error Power})$ , and it does not necessarily coincide with the slicer SNR of a receiver

# ***Conclusions From Measurements***

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- **No evidence of non-stationarity was found in these measurements**
- **Limited ISI and very high SNRs were observed**

## ***Future Work***

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- **Measurements at higher data rates, up to 10Gb/s**
- **Collect a more complete database of DMD-challenged fibers**

# ***Acknowledgements***

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- **The authors would like to thank Mike Hackert (Corning), David Hyer (Compaq), and Joe Gwynn (Raytheon) for providing the fibers used in these measurements**