Five Gb/s Multimode DMD at 850 nm:Real-Time Data and Equalizer Simulations

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March 11, 2001

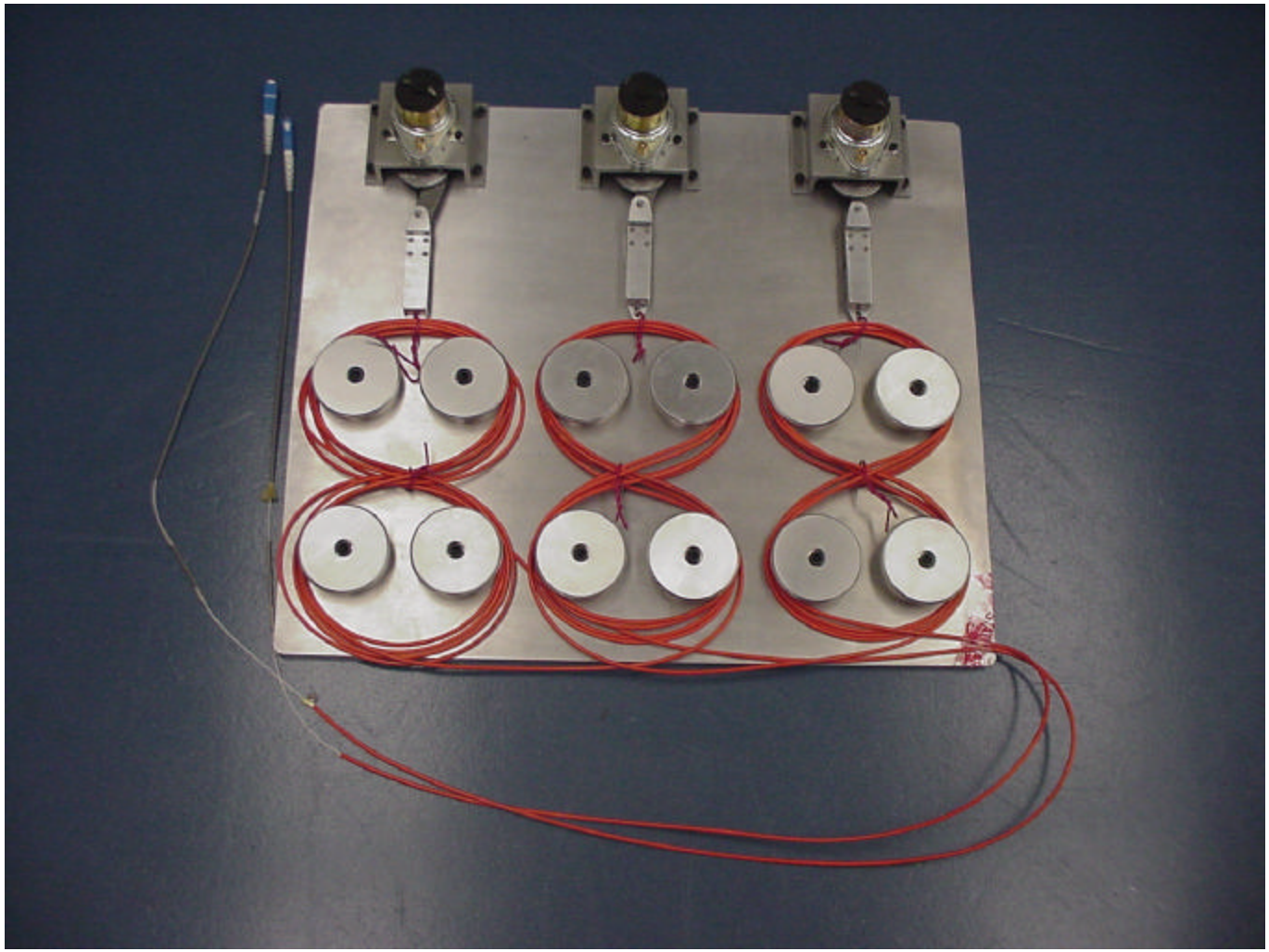
Overview

- Description of Equipment and Fiber Samples
- Description of Data Analysis Methodology
- Presentation of Results
- Summary Slide

Measurement Setup

- 127-bit PRBS at 5 Gb/s data rate.
- Laser is a 850 nm VCSEL
- Receiver is a commercial high-bandwidth device
- High-bandwidth (3 GHz), high sampling rate (10 Gs/s) real time oscilloscope, memory = 120000 samples
- Used fiber shaker with 1 dB mode selective loss element

Finisar Fiber Shaker



TIA DMD-Challenged Fibers

Fiber	Length[m]
Back-to-back	~0
Fiber 1, no shaker	150
Fiber 2, no shaker	150
Fiber 2, with shaker	150 (+10 for shaker fiber)

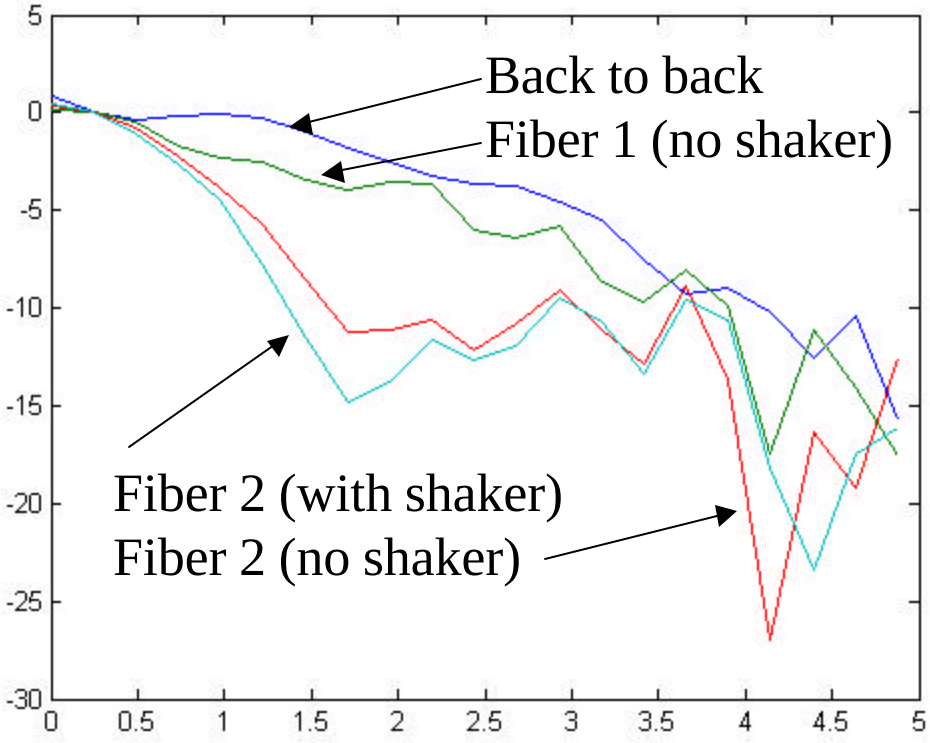
Fiber is 62.5 micron multimode; fiber 1 and fiber 2 are two halves of duplex reel supplied by David Hyer.

Processing of Measured Data

- The measured data was processed as per the document “Measurement of Non-Stationarity of 10 Gb/s Multimode Fiber Links,” by O. Agazzi and T. Lenosky, available from:
- http://www.ieee802.org/3/ae/public/adhoc/equal/NonStationarity112200.pdf

- We also applied a decision feedback equalizer (DFE) algorithm to the measured data, using a large number of taps. This is a standard equalizer architecture described in many textbooks, e.g. Lee and Messerschmitt, “Digital Communication”, second edition.

Channel Bandwidth

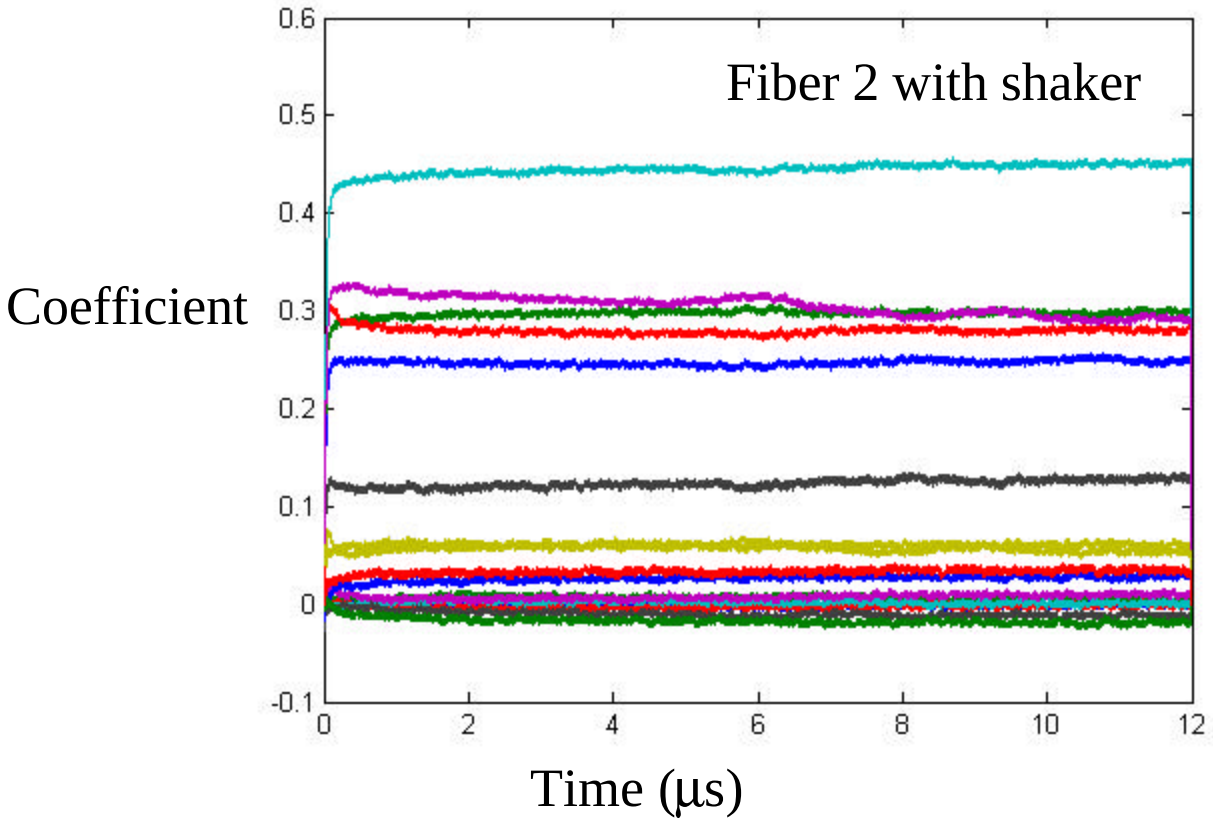


Estimated fiber bandwidth is ~160 MHz/km for fiber 2

Estimated Error Rates for DFE Simulation

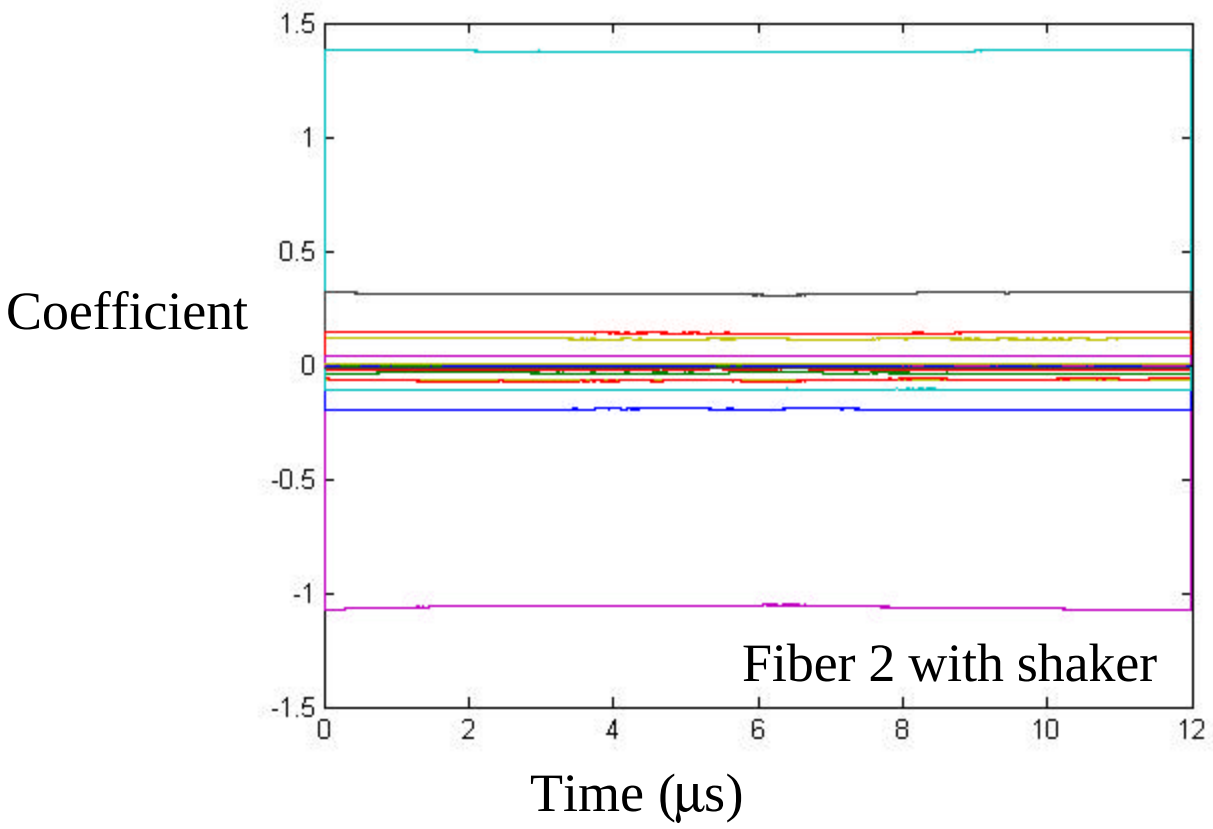
Case	Bit Error Rate
Back to Back	$2.6\ 10^{-102}$
Fiber 1, no shaker	$4.7\ 10^{-66}$
Fiber 2, no shaker	$3.3\ 10^{-23}$
Fiber 2, with shaker	$1.9\ 10^{-20}$

Impulse Coefficients Versus Time



Minimal Time Variance

DFE Coefficients Versus Time

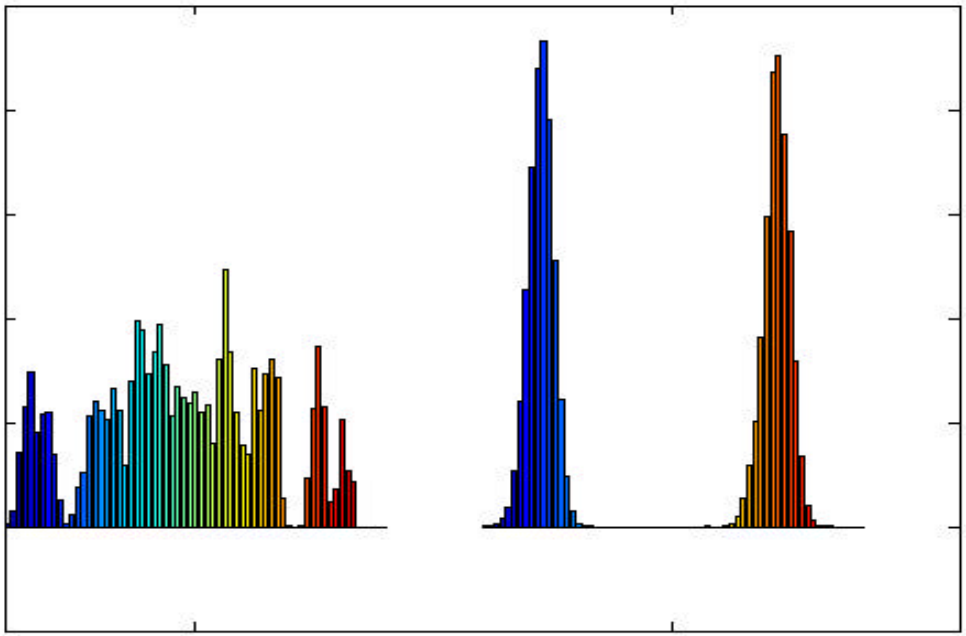


DFE coefficients are slowly varying

Effect of Equalization

Completely Closed Eye is Opened

Occurrence
Frequency



Histogram:
Input to Equalizer

Histogram:
Equalized Signal
At DFE Slicer

Summary

- 5 Gb/s channel is time-invariant over 12 microsecond time scale
- Successful equalization in completely closed eye case
- Transmission of data at 5 Gb/s over 160 m of 160 MHz km multimode fiber
- Pulse splitting was not observed in impulse responses

Acknowledgements

The authors would like to thank David Hyer (Compaq) for providing the fibers used in these measurements.