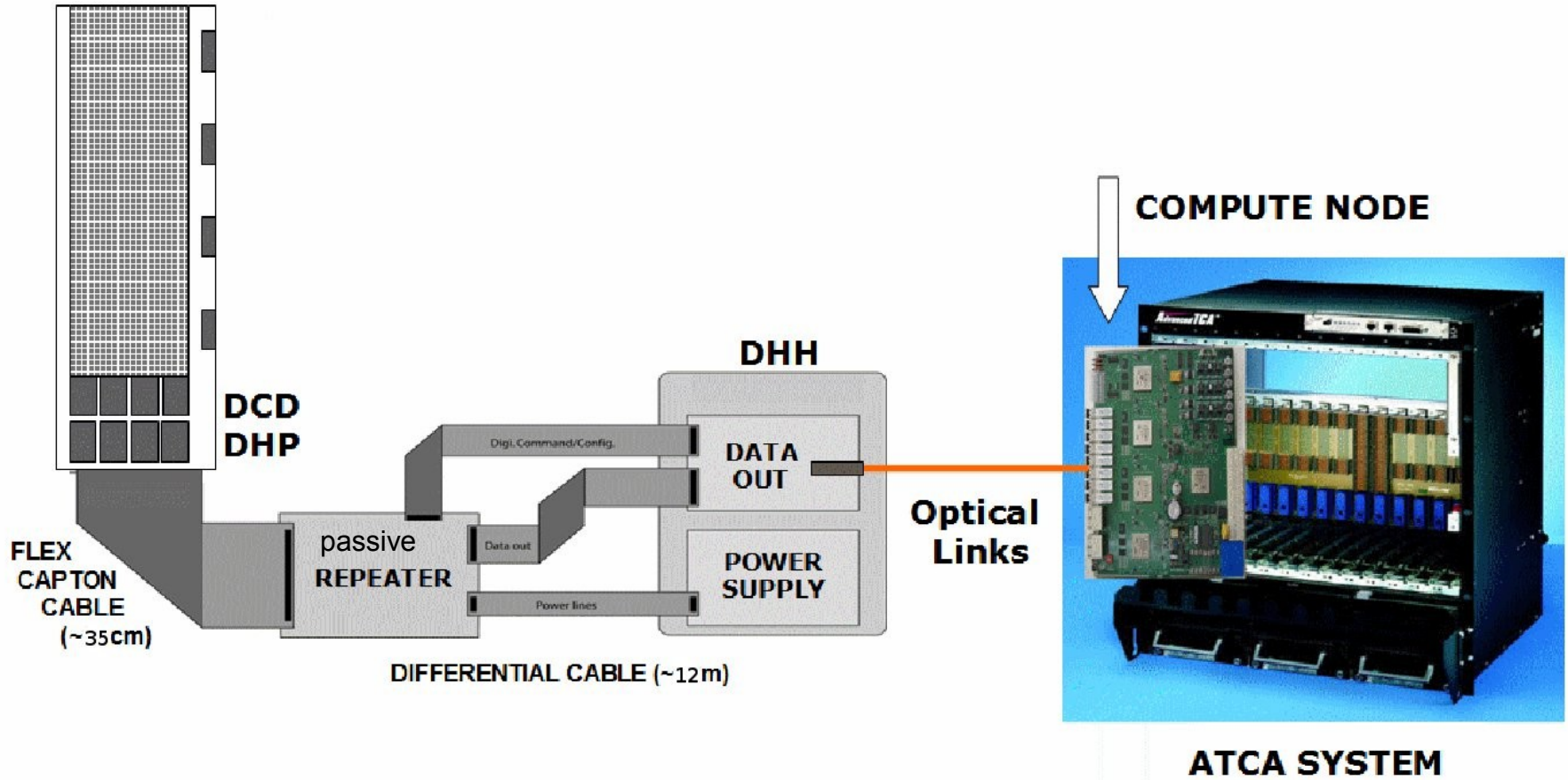# DHP-DHH Interconnect Characterisation

Results of Time Domain Reflectometry measurements

Philip Pütsch

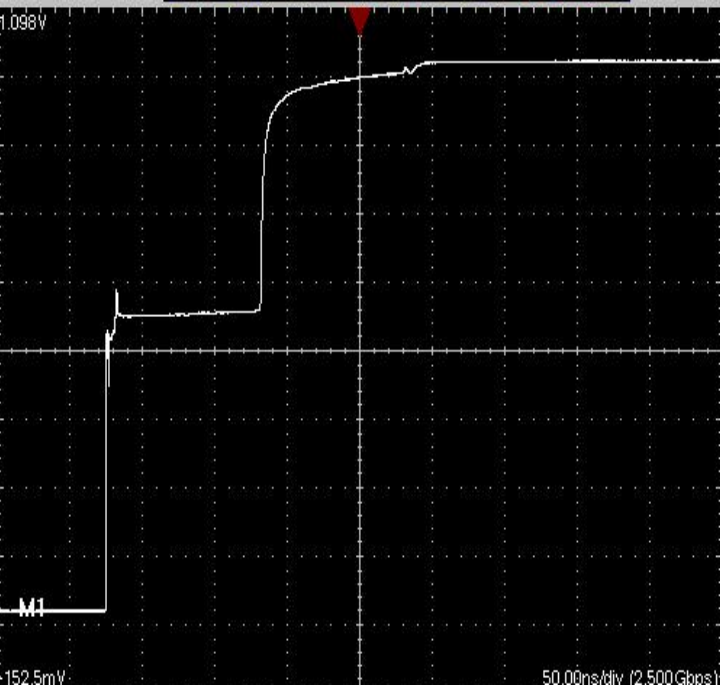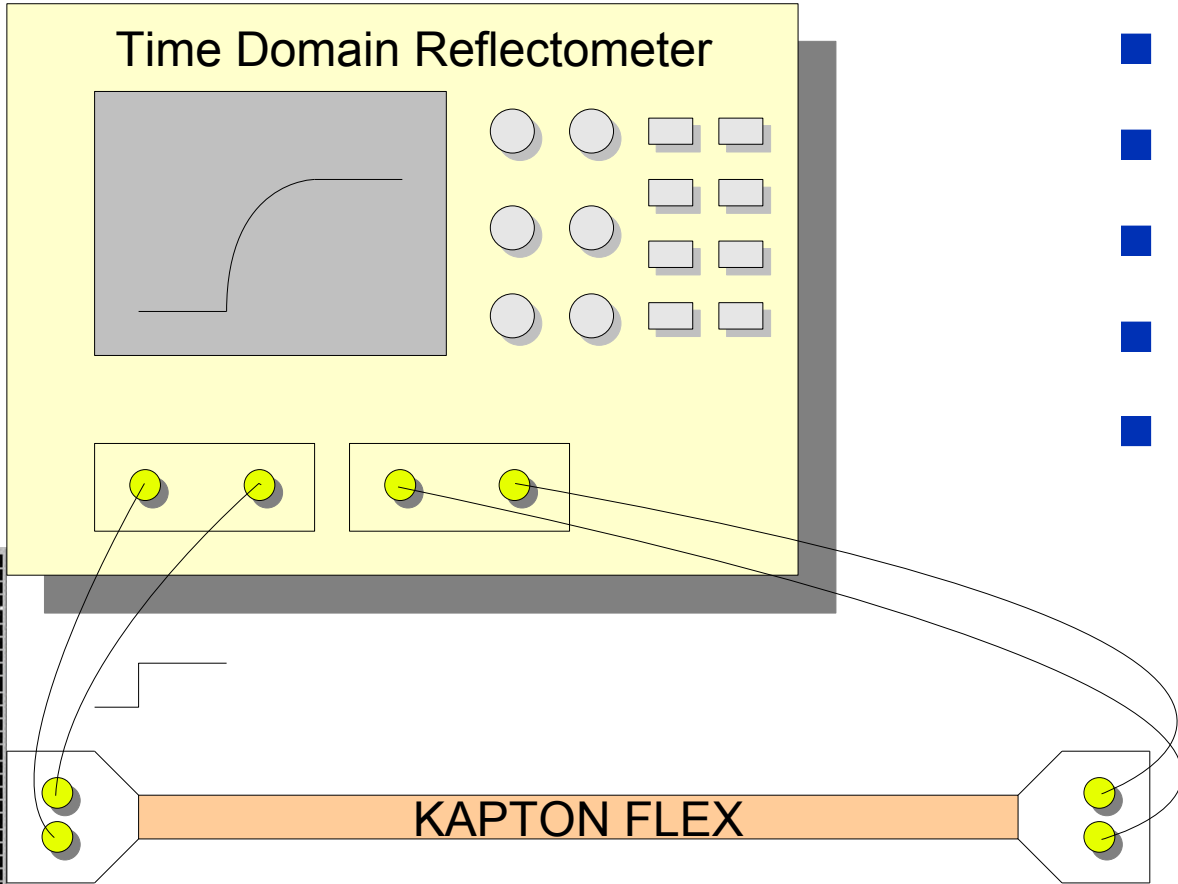# Interlink Design

Challenges of Datatransmission

- 4 Links per Module
  - 1.2 Gbit/s per Link, 8B10B encoded
    -> 1.6 GHz Clock
- Mechanical Situation: Tight constraints near Detector → KAPTON Flex
- Distance DHP-DHH ~15m
- At High Data Rates "Analogue" characteristics are important:
  - Impedance:
    - Driver
    - Transmission Line
    - Receiver (Termination)
  - Reflections at Discontinuities
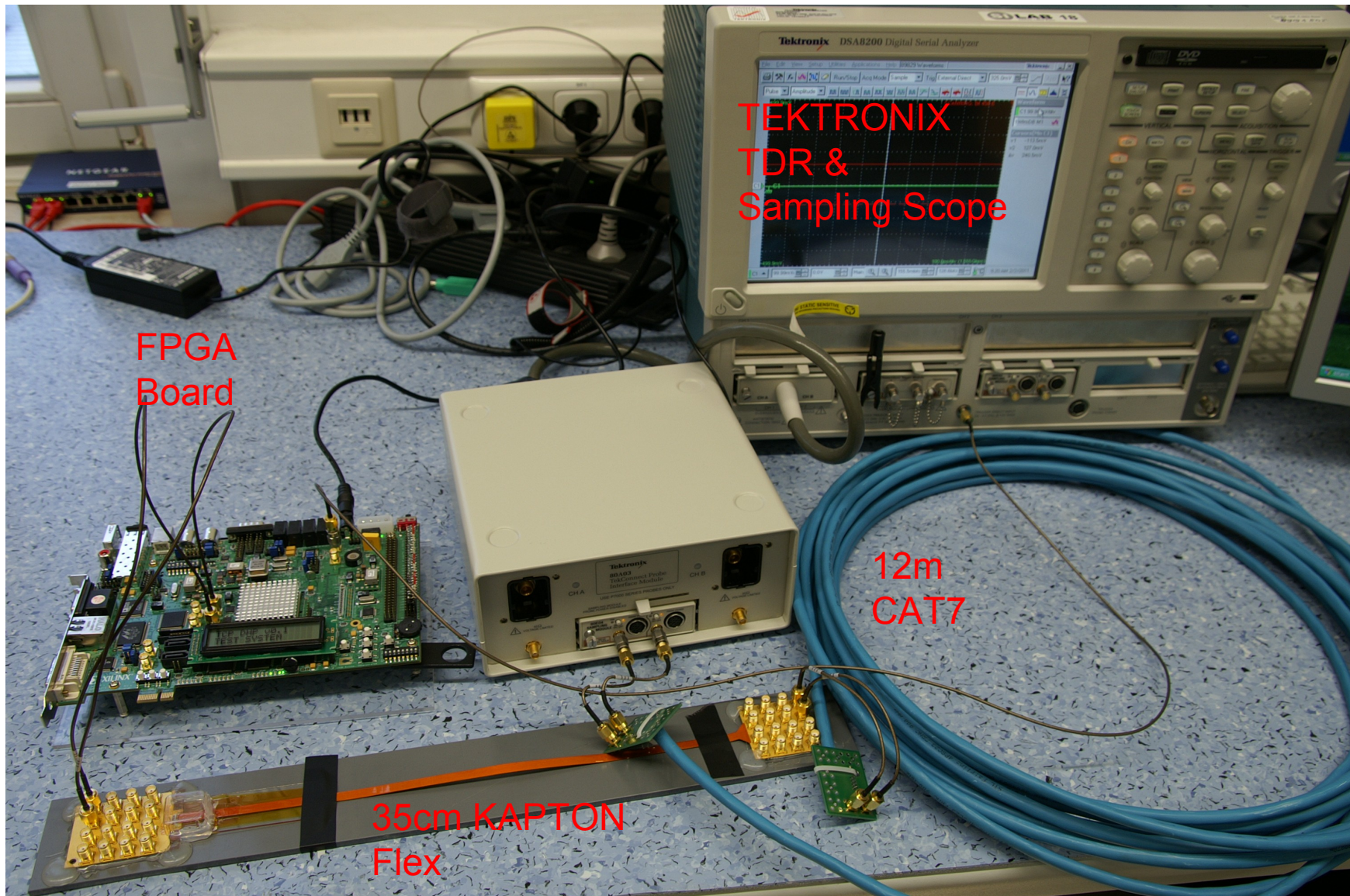 - Damping of Transmission Lines
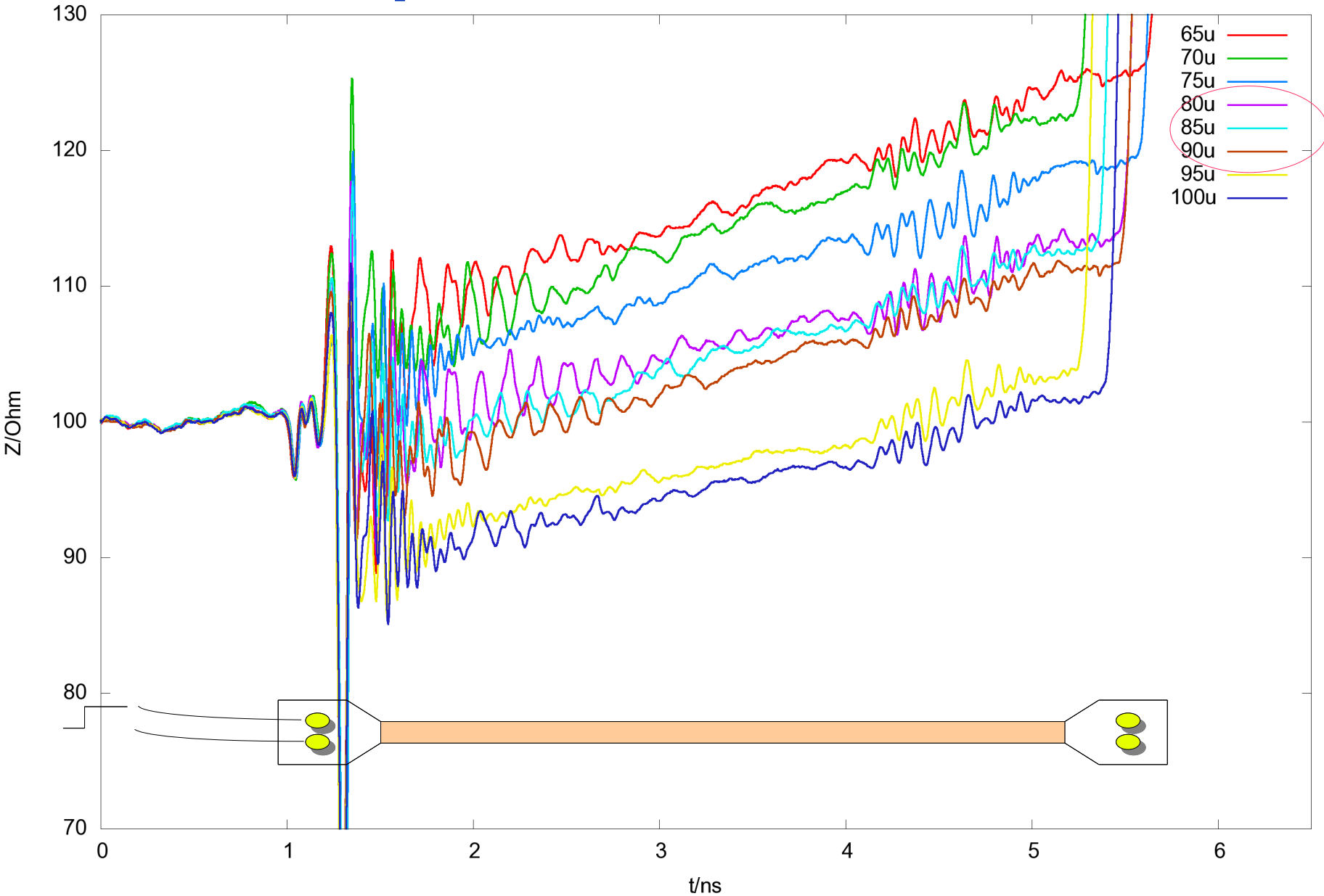 - Noise
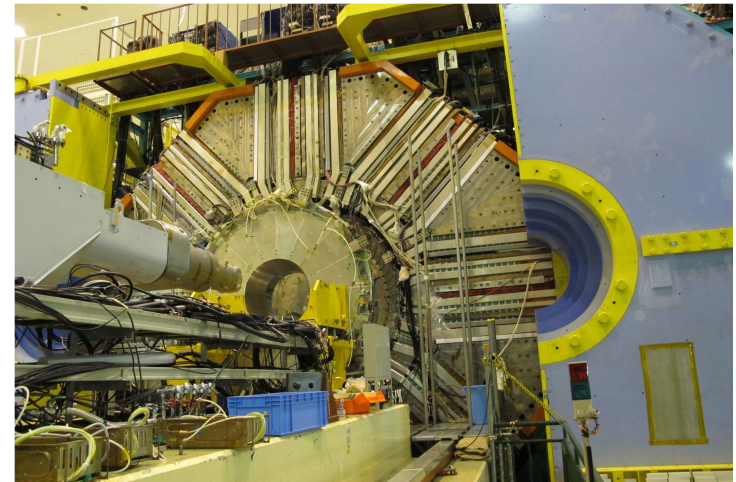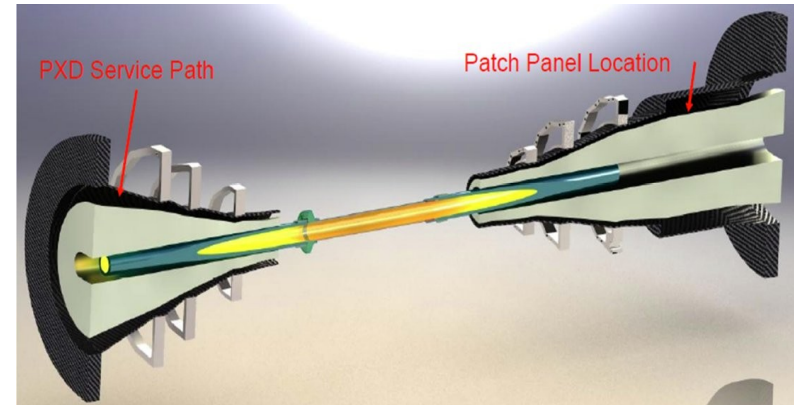
Measurement Setup

- Time Domain Reflectometry
- Fast Rising/Falling Edge sent to DUT
- Reflected/Transmitted Waveform recorded
- DUT: KAPTON Test Figure, 8 differential Lines, different Trace Width 65u-100u
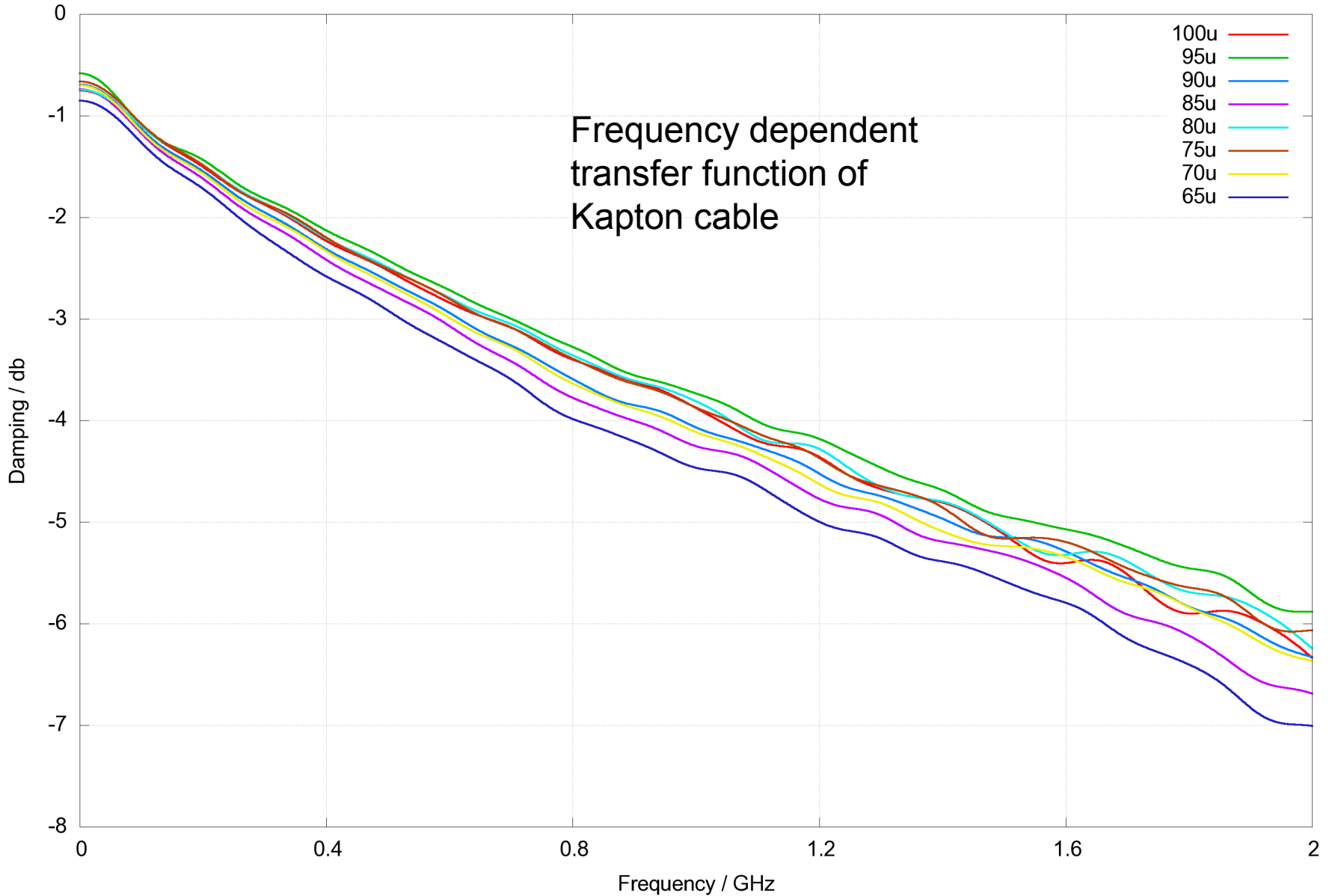
Time Domain Reflectometer
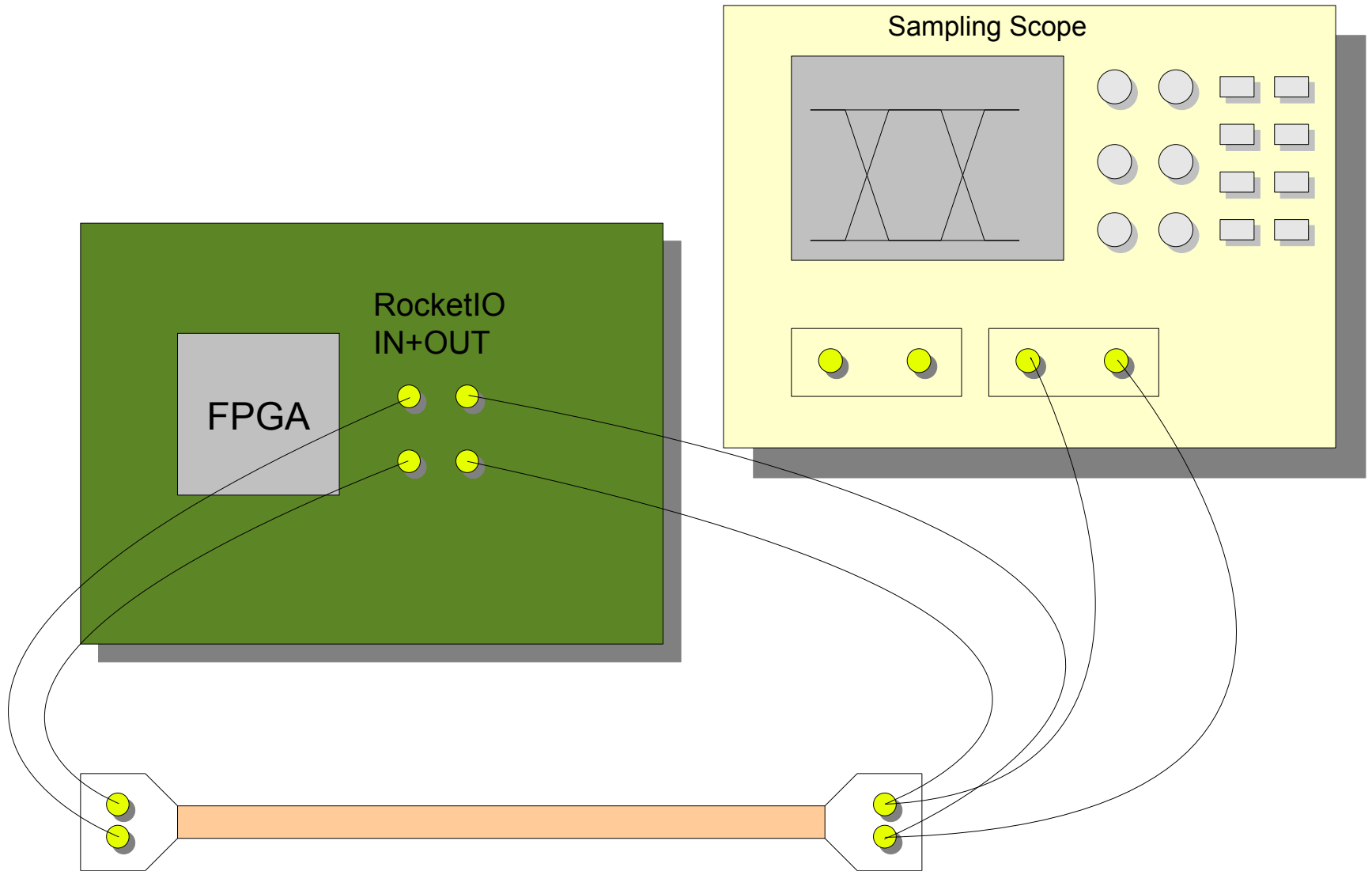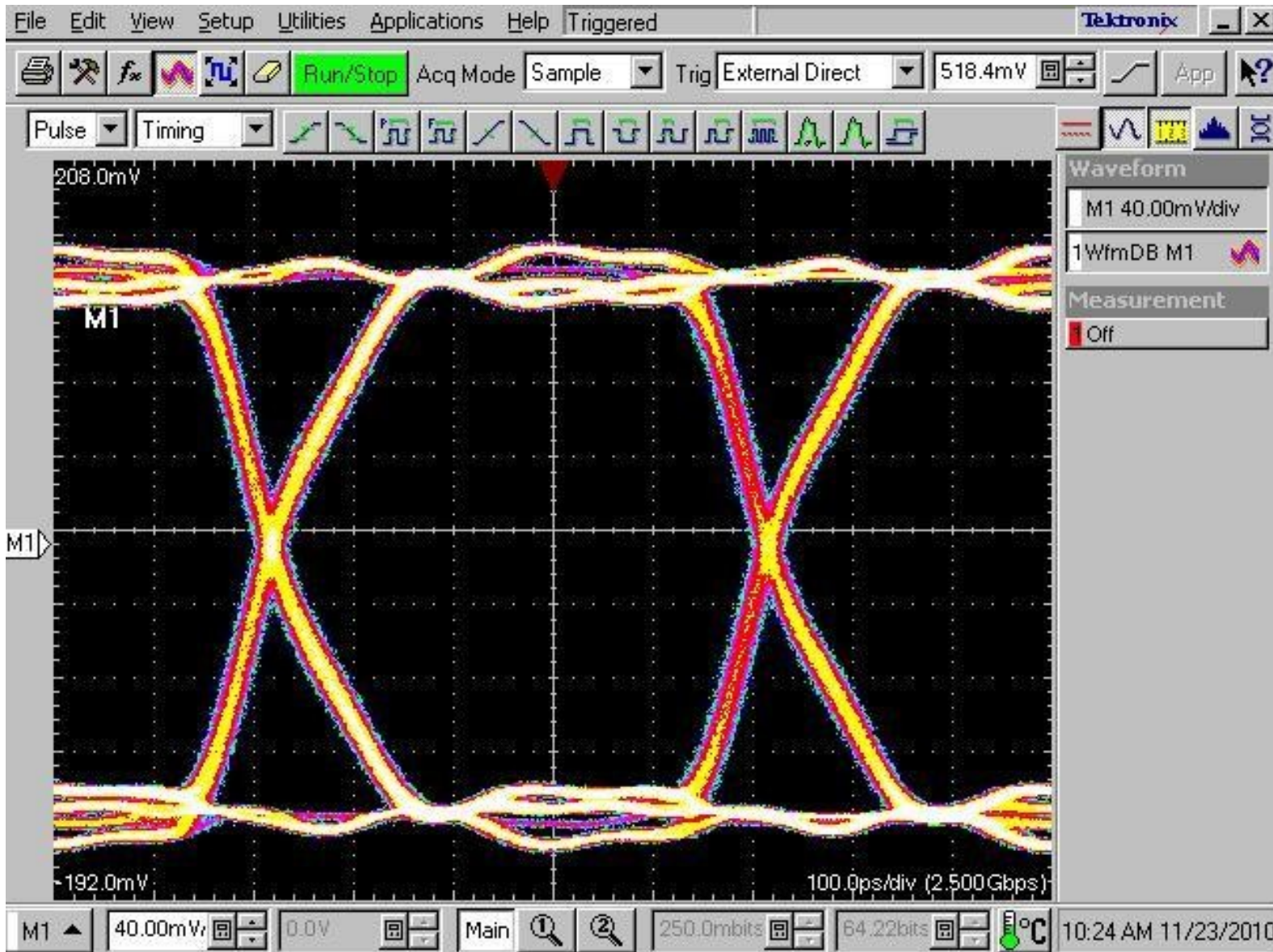
KAPTON FLEX

1.098V

M1

-152.5mV

50.00ns/div (2.500Gbps)

Measurement Setup II

TEKTRONIX
TDR &
Sampling Scope

FPGA
Board

12m
CAT7

35cm KAPTON
Flex

Impedance Measurement

universität**bonn**

Damping Measurement

Frequency dependent transfer function of Kapton cable

universität**bonn**

Sampling Scope
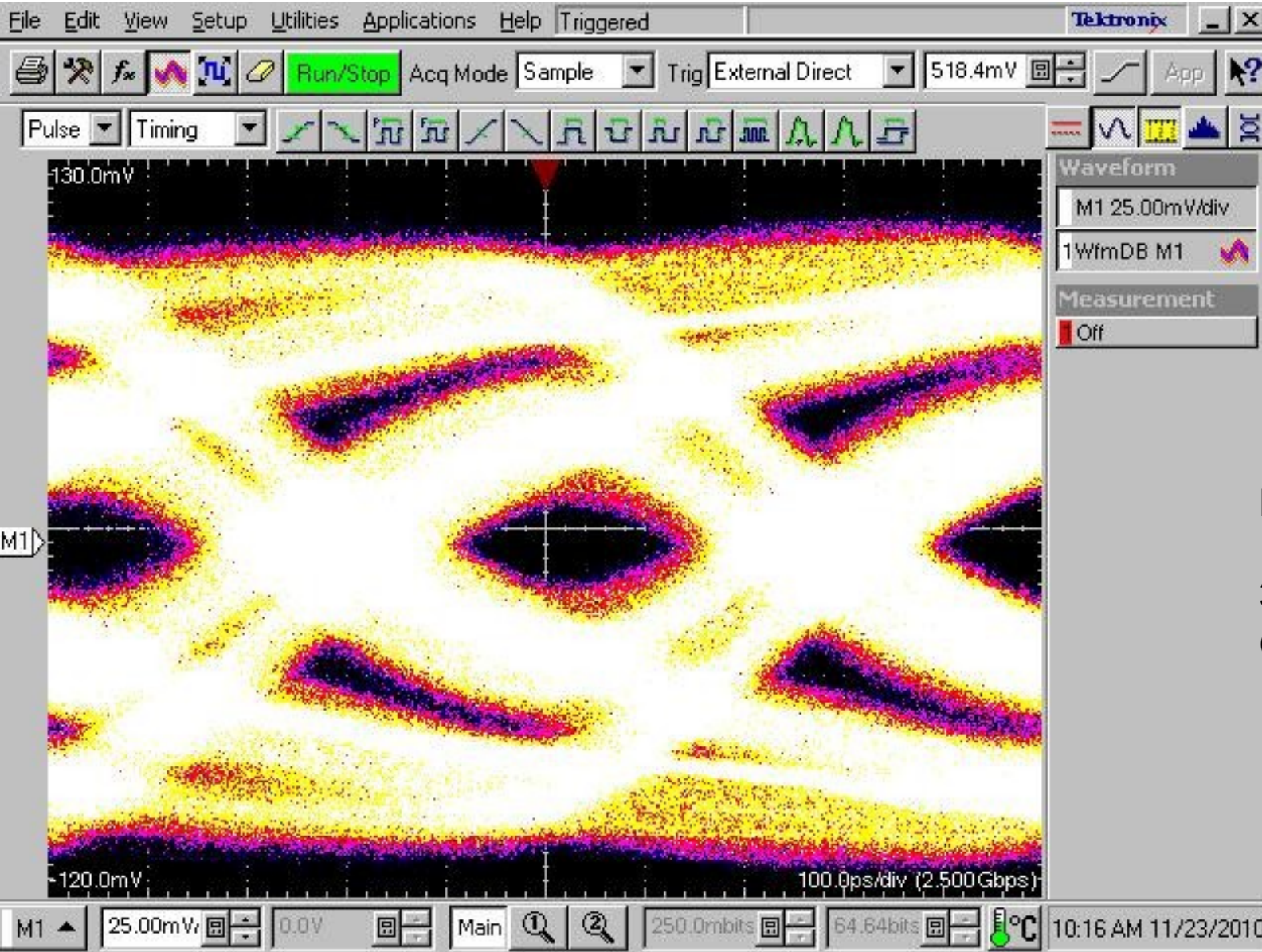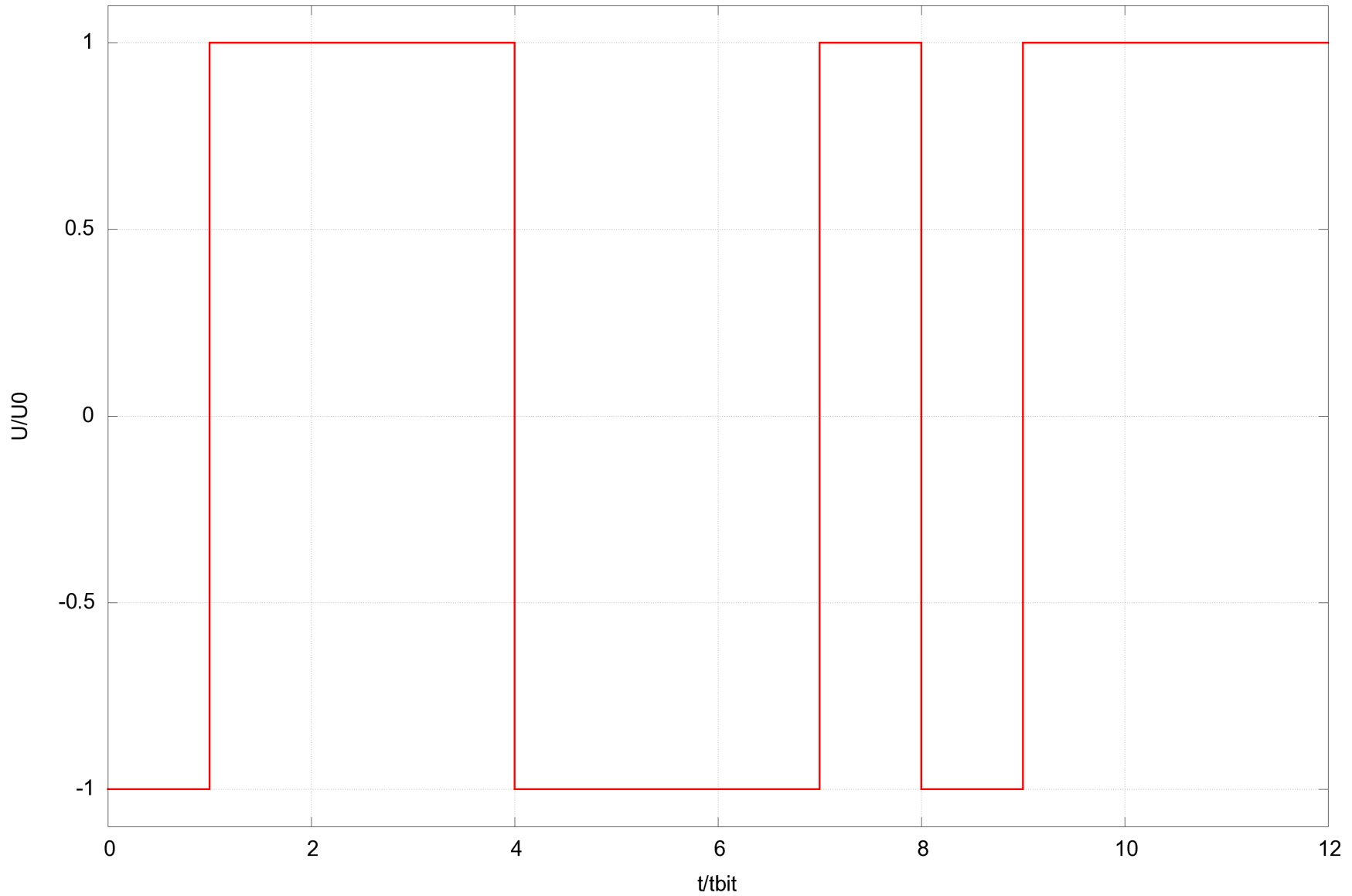
RocketIO
IN+OUT

FPGA

Eye Diagram – RocketIO Output

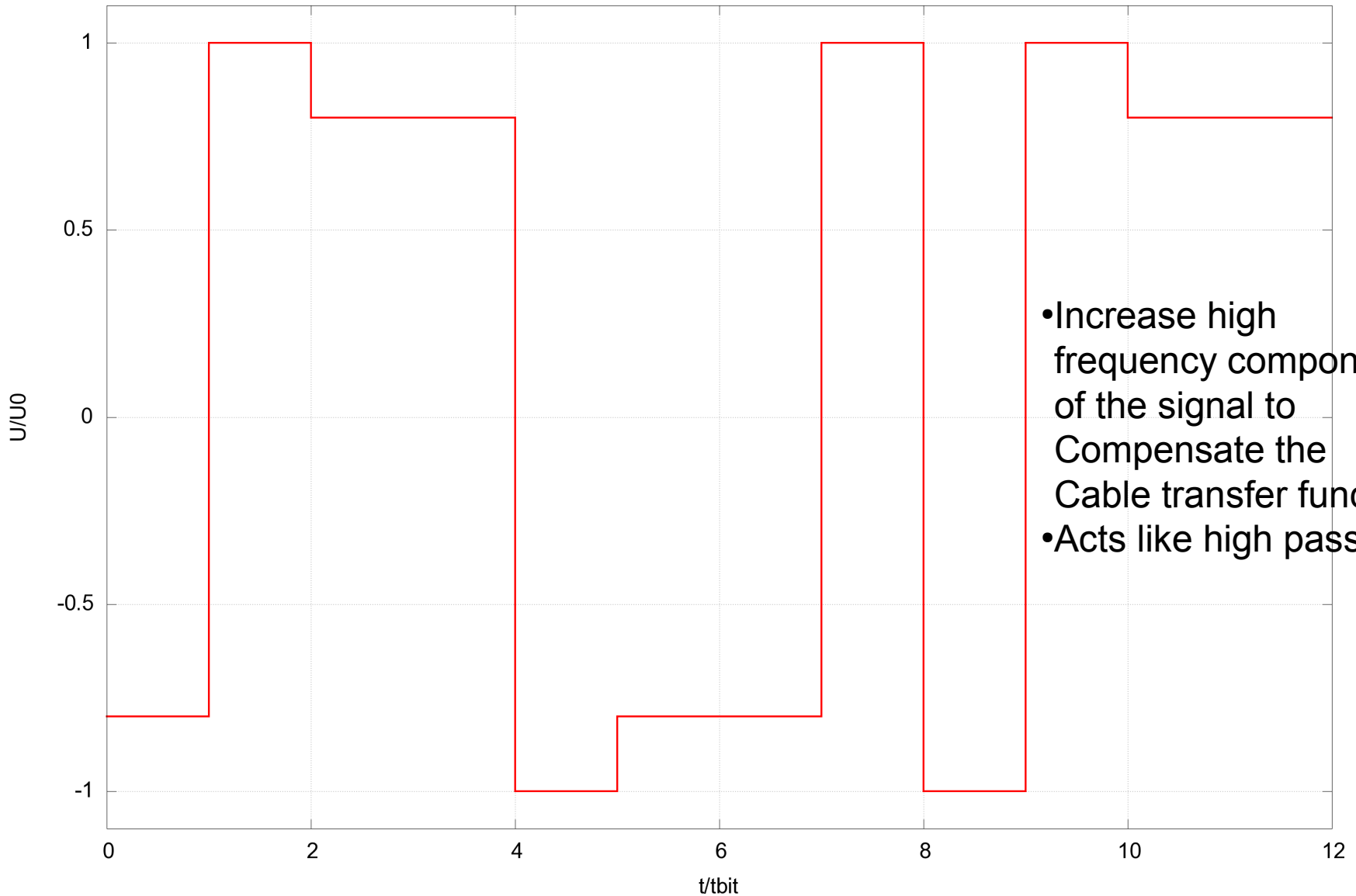

RocketIO driver at the output @2GHz

12m CAT7 + 35cm KAPTON

RocketIO driver
12m CAT7 +
35cm Kapton
@2GHz

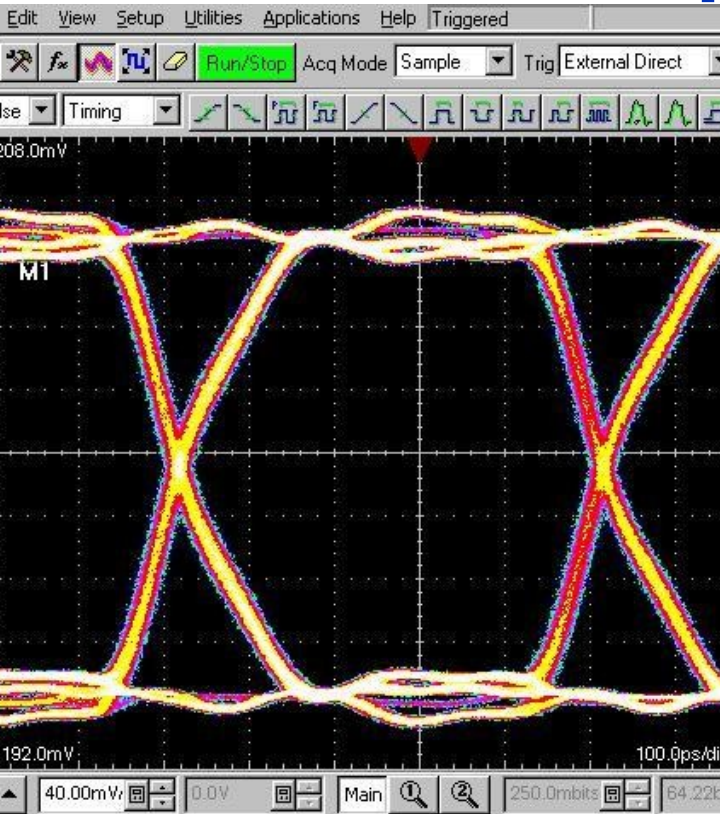# Preemphasis

Preemphasis

- Increase high frequency component of the signal to Compensate the Cable transfer function
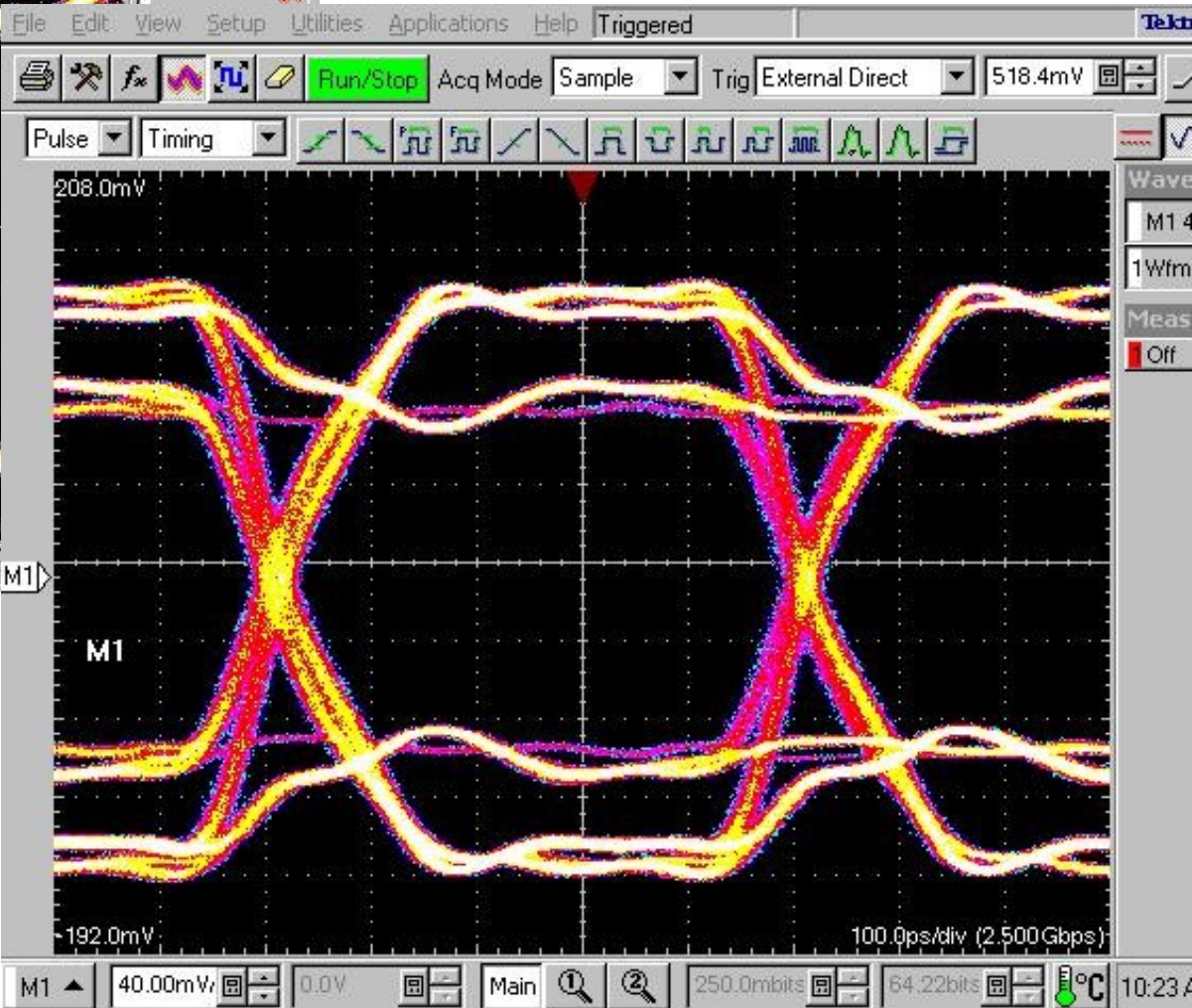- Acts like high pass

Preemphasis II

RocketIO driver
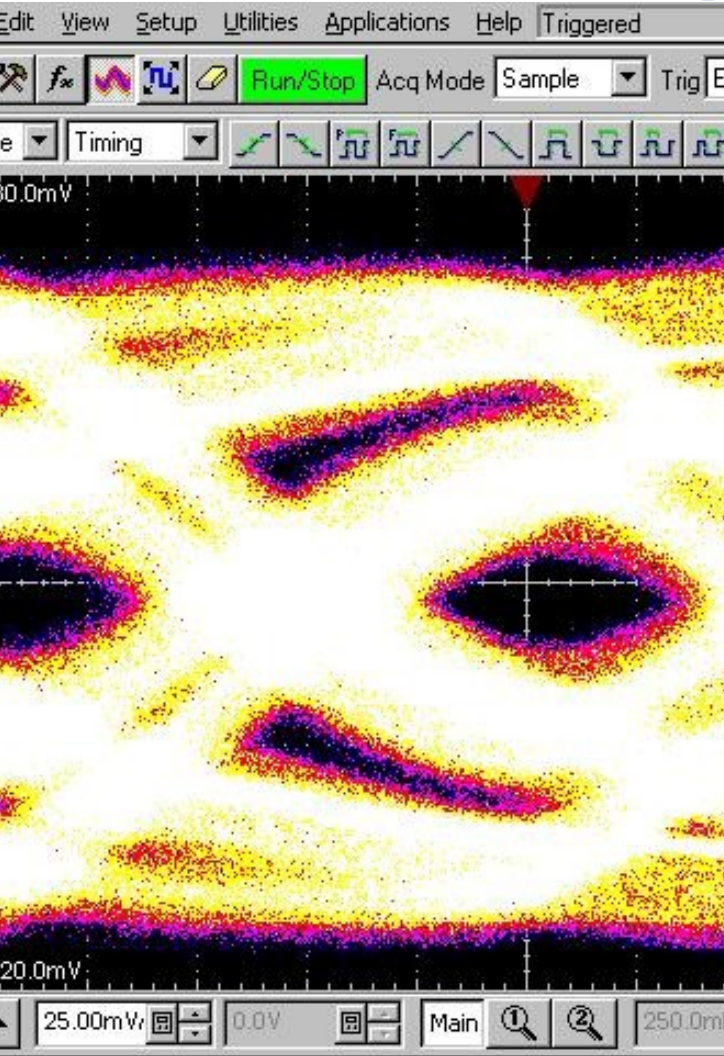at the output
@2GHz

Preemphasis
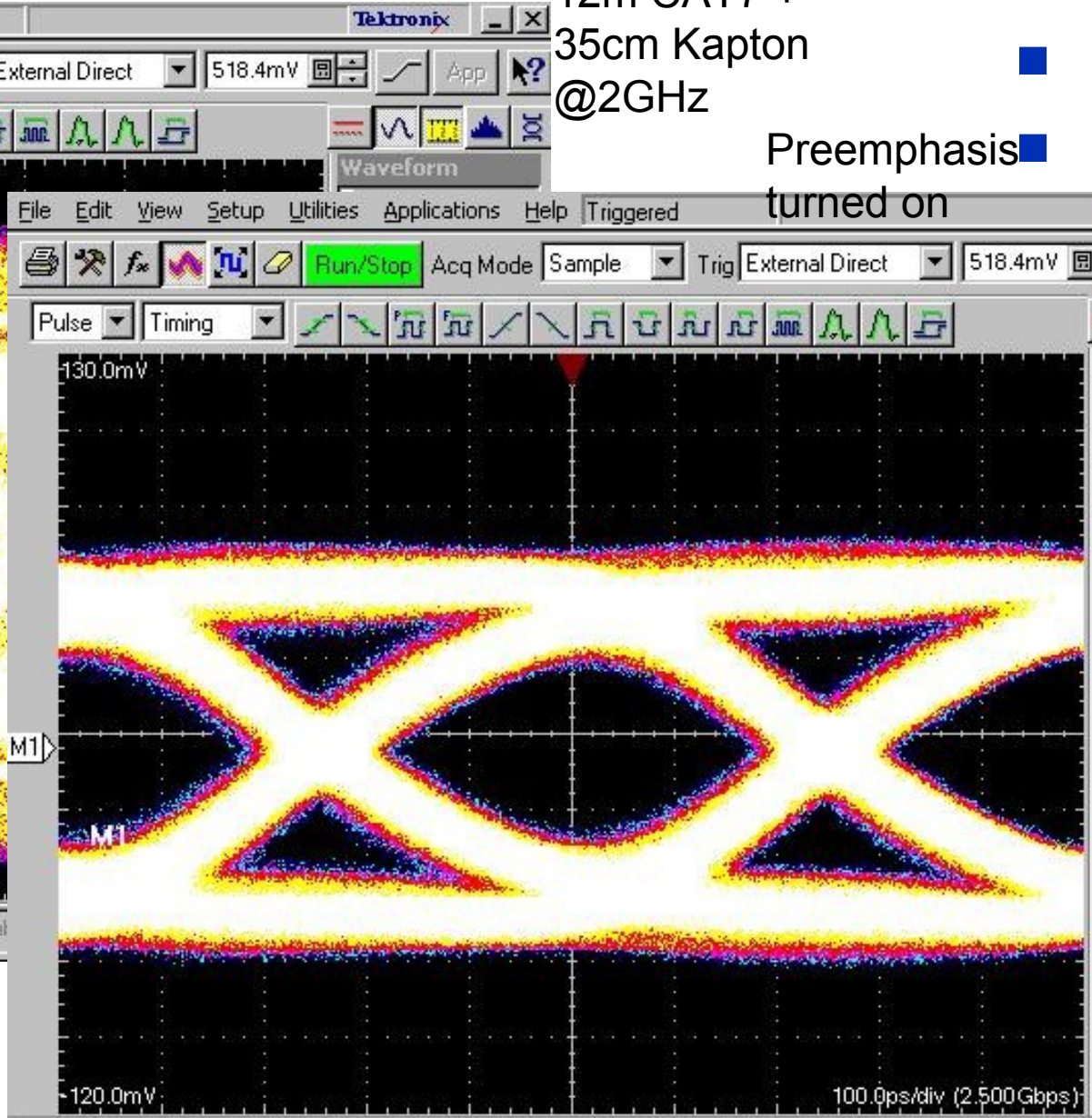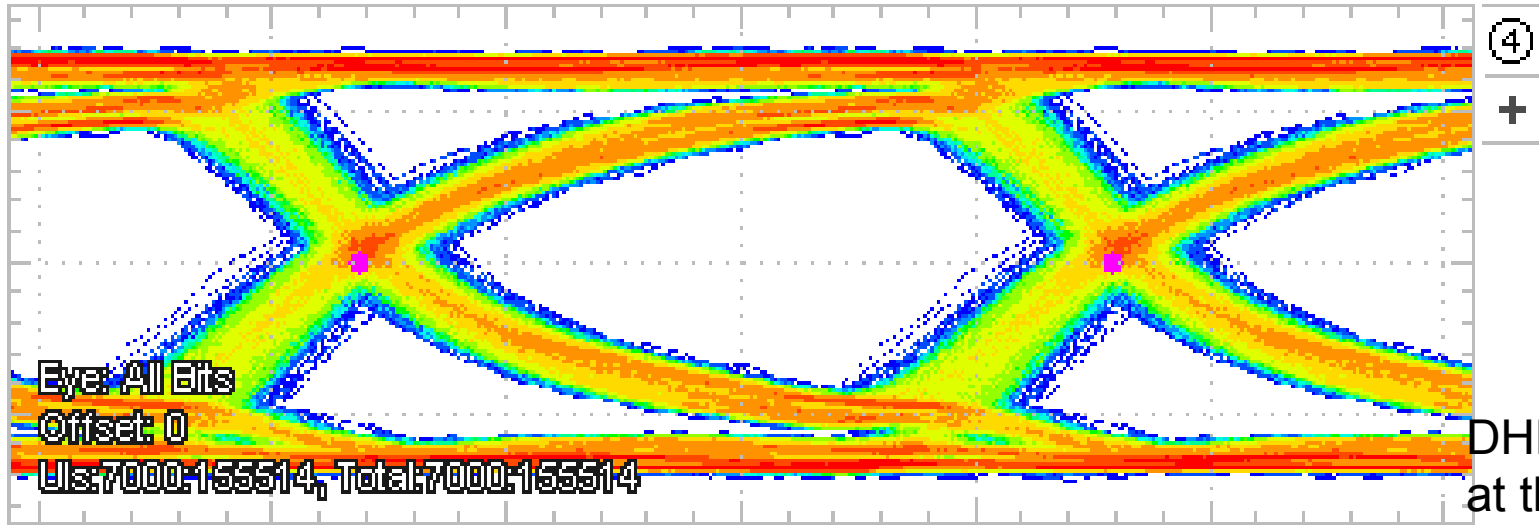turned on

Preemphasis
turned off

Preemphasis III

RocketIO driver
12m CAT7 +
35cm Kapton
@2GHz

Preemphasis
turned on

Preemphasis
turned off

Eye DHP

DHP 0.1 Driver
at the output
@ 1.555GHz

After
35cm
KAPTON

Summary
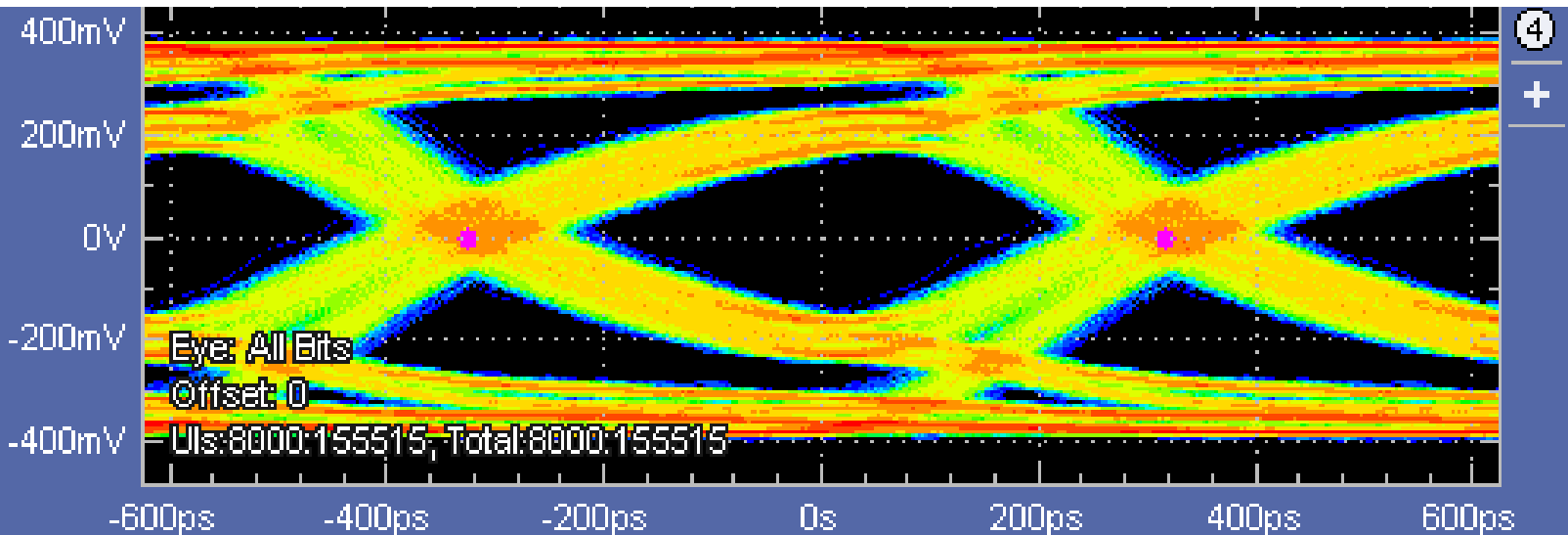
- TDR Setup to characterise differential electrical Transmission Lines working
- Design and Measurements (Impedance, Damping) match
- Final geometry defined
- 35cm Kapton+12m CAT7 together with preemphasis works
- DHP 0.2 will have preemphasis
- Only passive repeater (Patch Panel) will be needed