Quantum™

T10/00-153r0

Ultra320 SCSI with Receiver Equalization, 25 meters into a Backplane with 6 loads

Russ Brown

Quantum Corporation

SCSI Physical Working Group Meeting

07 March 2000

Dallas, TX

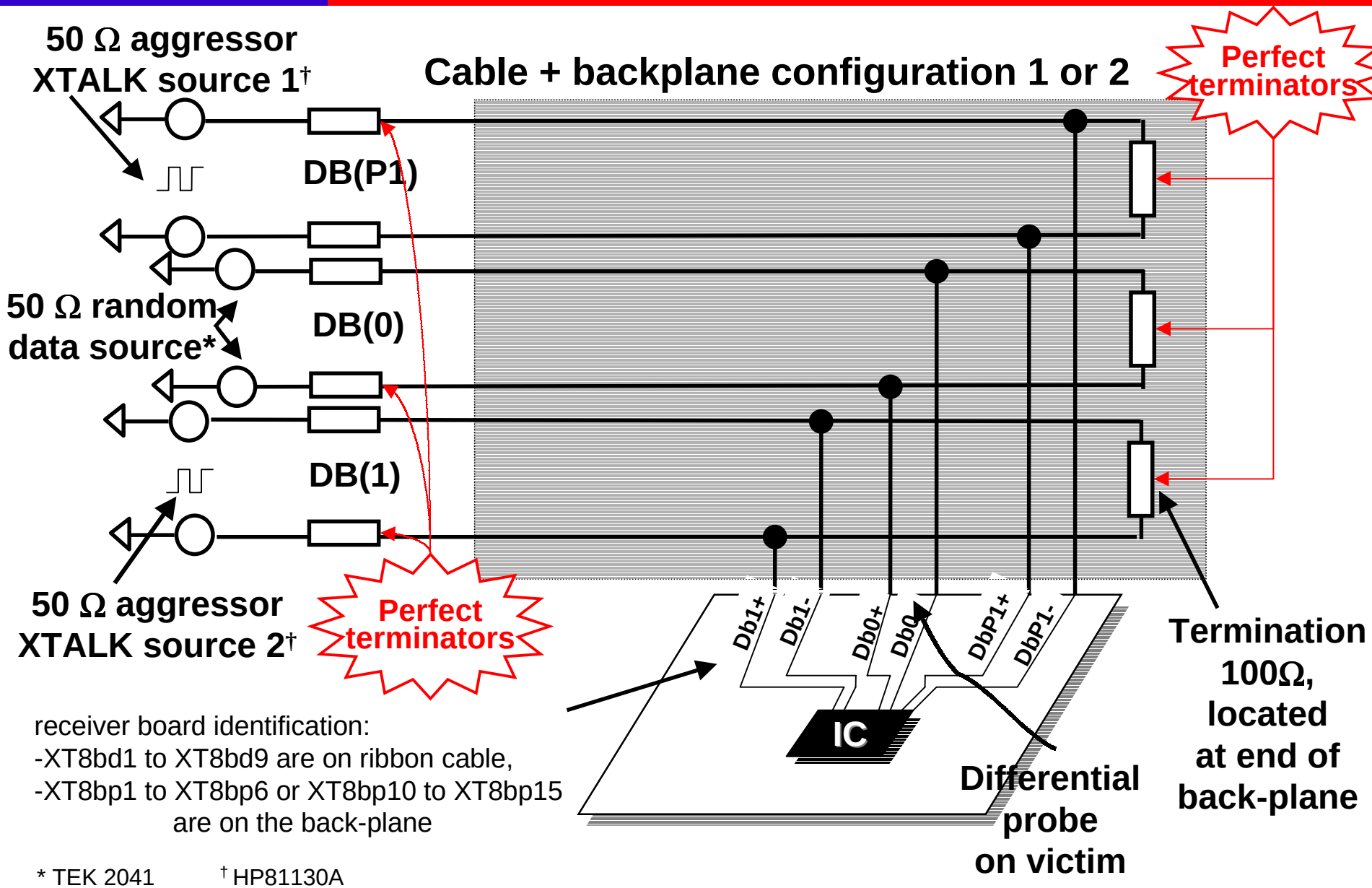
U320 25 Meter Cable Test Overview

- **Quantum's goal for Ultra 320 SCSI is to have a solution that is so robust it could be extensible to Ultra 640.**
- **In order to demonstrate that our Receiver Equalization scheme is extremely robust, we want to test it at conditions beyond the specified limits of Ultra 160.**
- **The first of these was to test U320 using a 25 meter round cable into a fully loaded 6-slot backplane.**
- **The signals were measured to find the eye opening with ISI, reflections and crosstalk including:**
  - **Amplitude errors;**
  - **Timing shift errors;**
  - **Miscellaneous noise.**
- **The following describes the test and results.**

U320 25m Cable Test Setup

- **Margins were evaluated with the same techniques as used for our other Ultra320 data:**
  - **Transmitter driving voltage: +/- 400mV.**
  - **Transmitted Pattern: 2μs of "101010..." training pattern followed by 8μs random data.**
  - **The equalizer input signals are captured differentially with a Tektronix TDS694C oscilloscope by probing at the backplane.**
  - **The equalizer output signal is generated by Spectre, simulating in transistor level models and using captured data as input stimulant.**
- **For the bit cell: the training pattern ("1010...") defines the cell boundary and cell center.**

U320 25m Cable Test Schematic

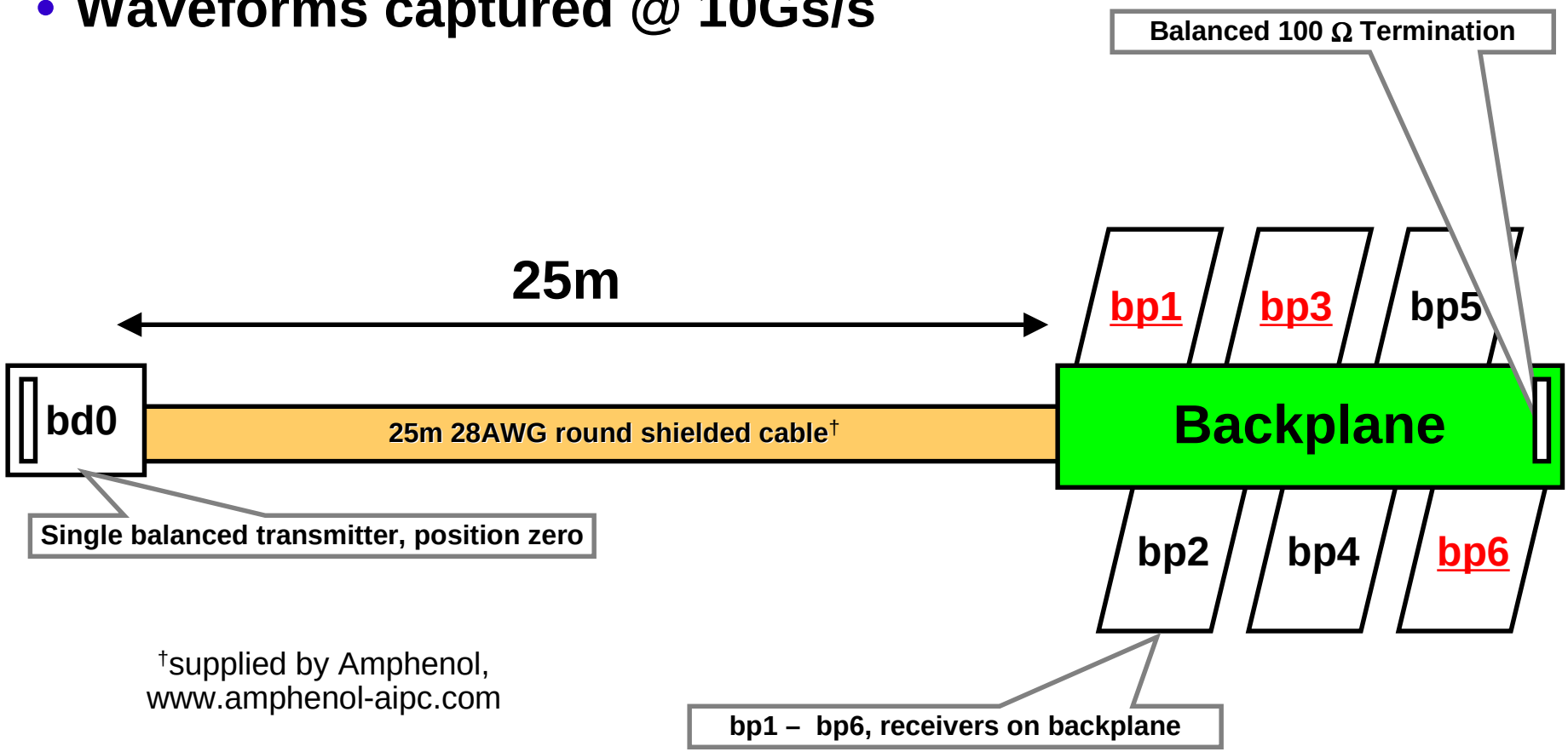


receiver board identification:
-XT8bd1 to XT8bd9 are on ribbon cable,
-XT8bp1 to XT8bp6 or XT8bp10 to XT8bp15 are on the back-plane

* TEK 2041 † HP81130A

U320 25m Cable Test Configuration

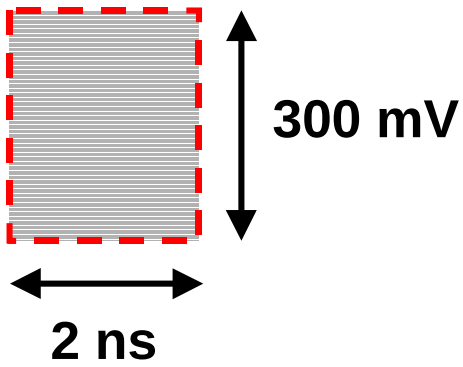
- **25 meter Amphenol cable assembly† using Madison 28AWG round shielded cable plus 6-slot backplane.**
- **Waveforms captured @ 10Gs/s**



†supplied by Amphenol,
www.amphenol-aipc.com

Error Sources

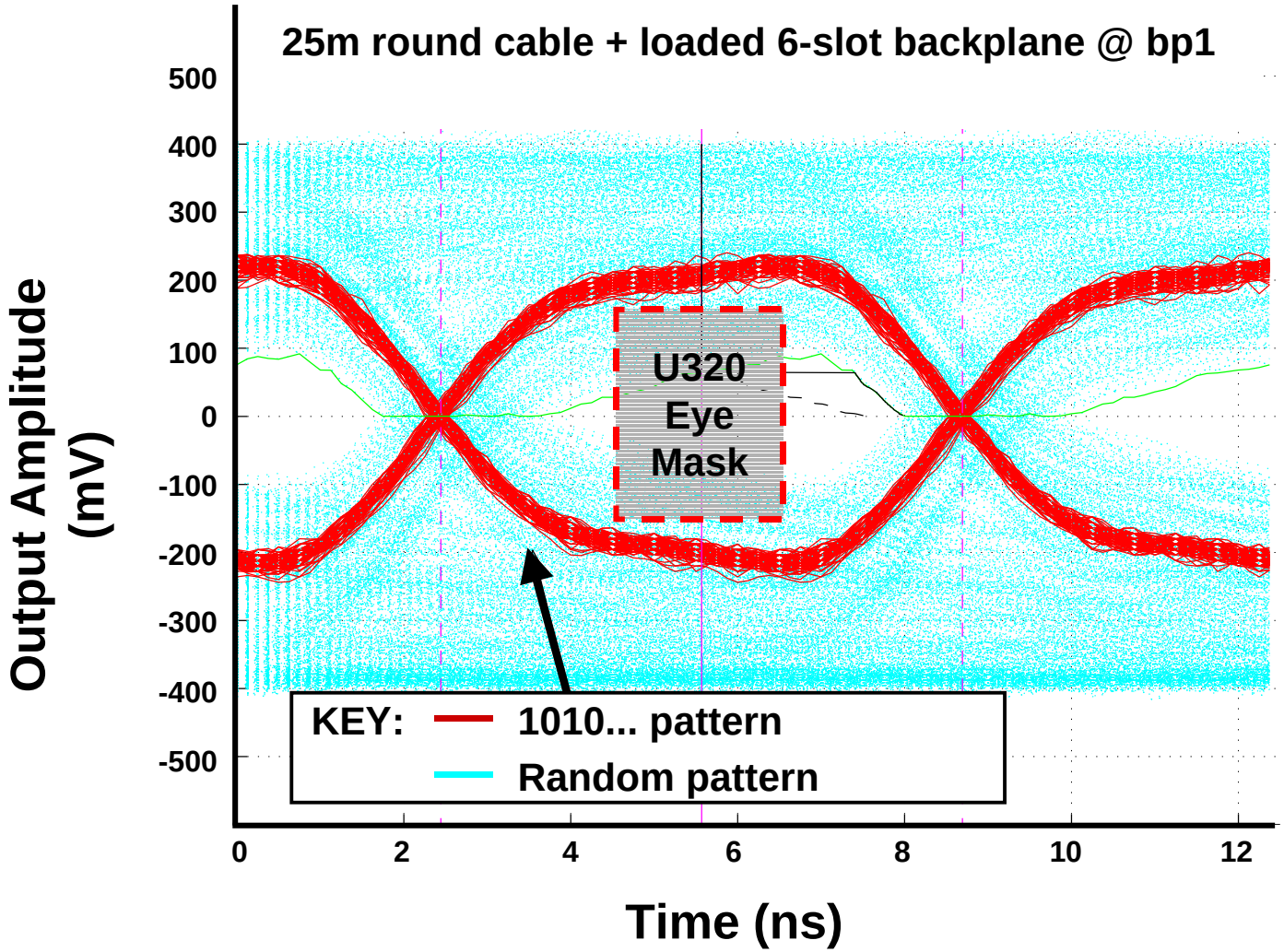
- **Error sources are used to define the range over which a receiver characteristic may typically vary from the ideal sample point, i.e., the actual sample point may lie anywhere within a box defined by 2 times 0-to-peak height and 2 times 0-to-peak width of the errors.**



U320 Eye Mask

- **Amplitude error sources define height, and timing error sources define width, e.g., set-up time margin is measured as the distance from the eye diagram waveform to the box.**

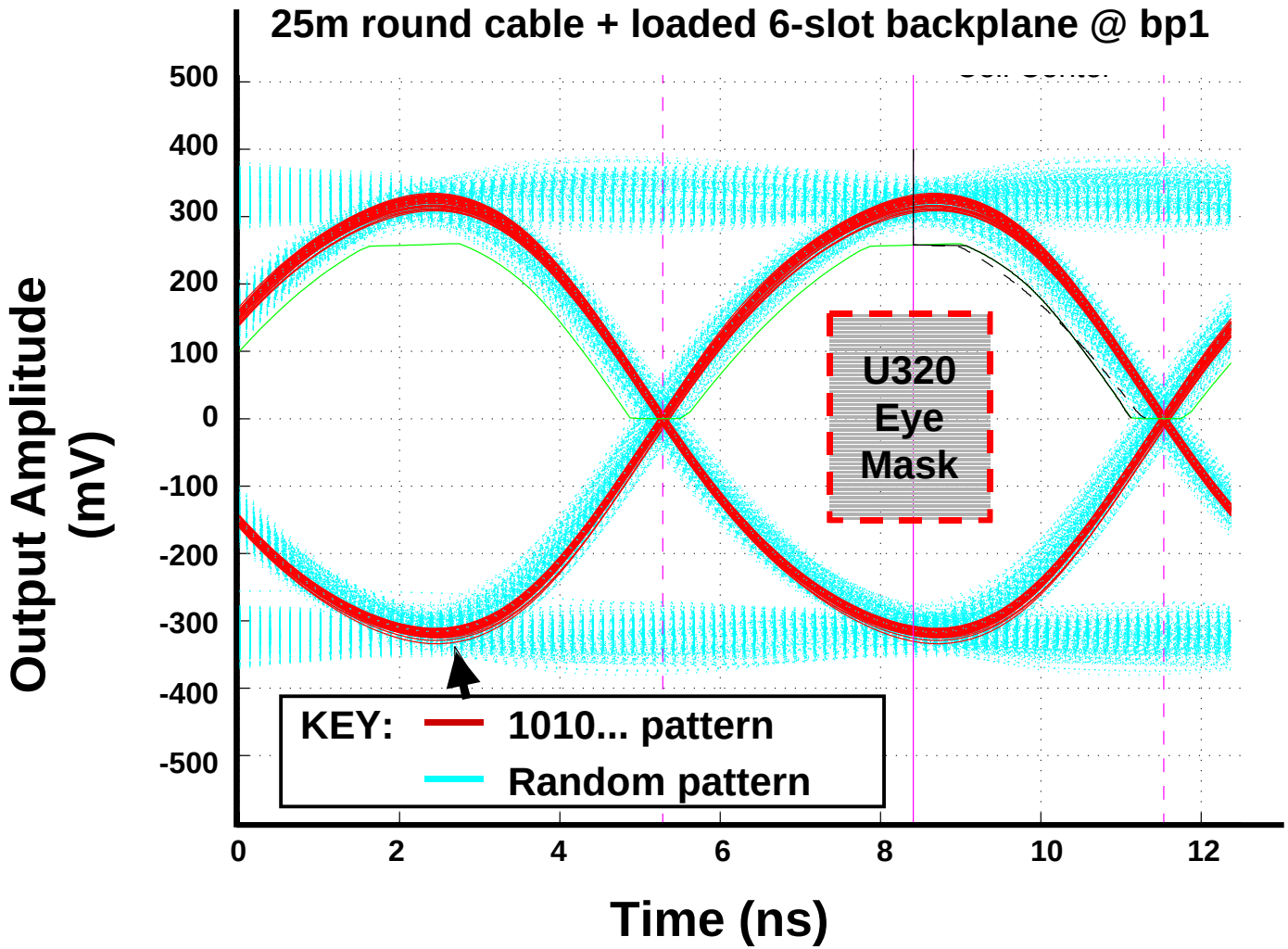
U320, Eq Input, 25m Cable, bp1



Conclusion: Failing Margin

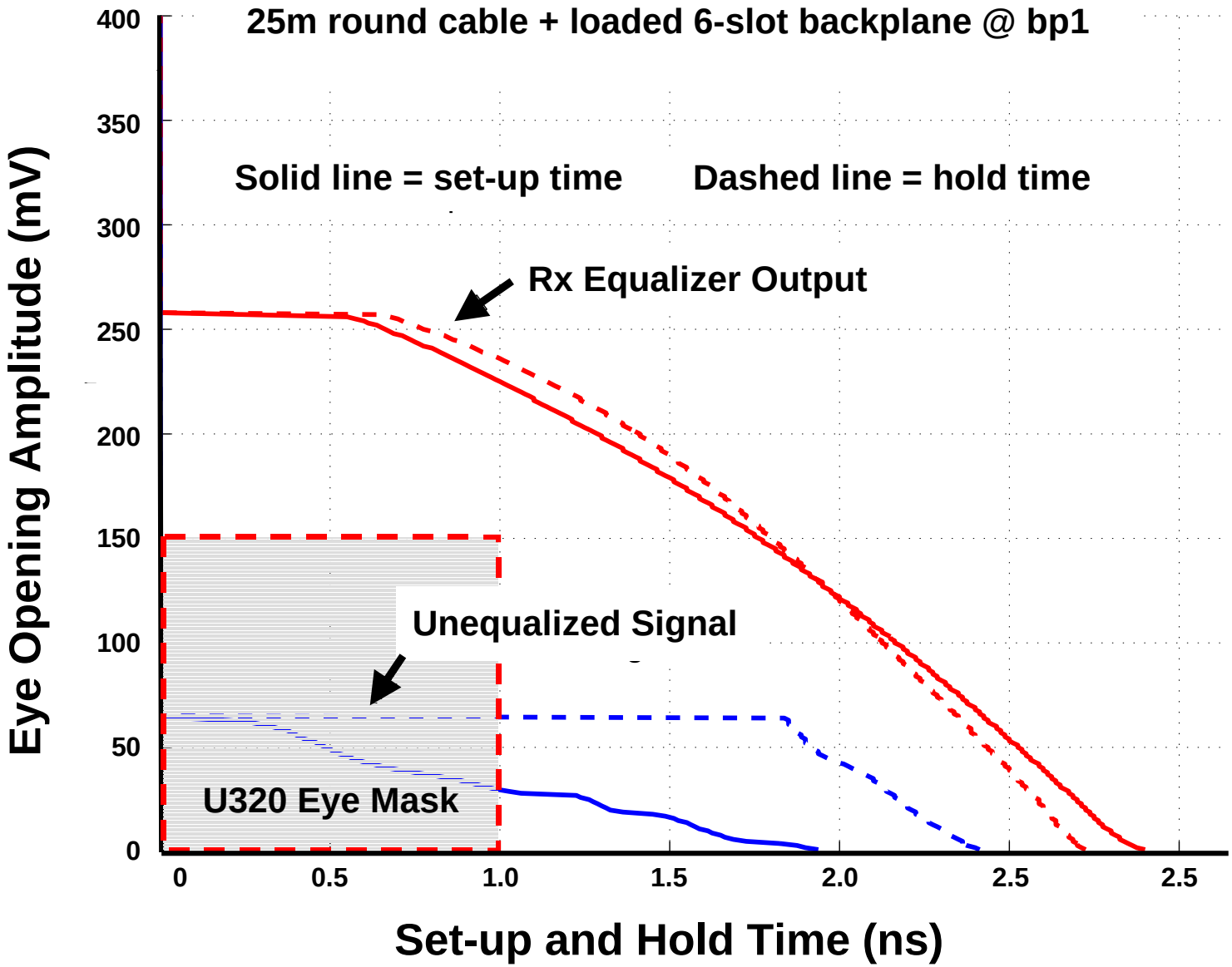
(Increasing amplitude would still fail)

U320, Rx Equalized, 25m Cable, bp1

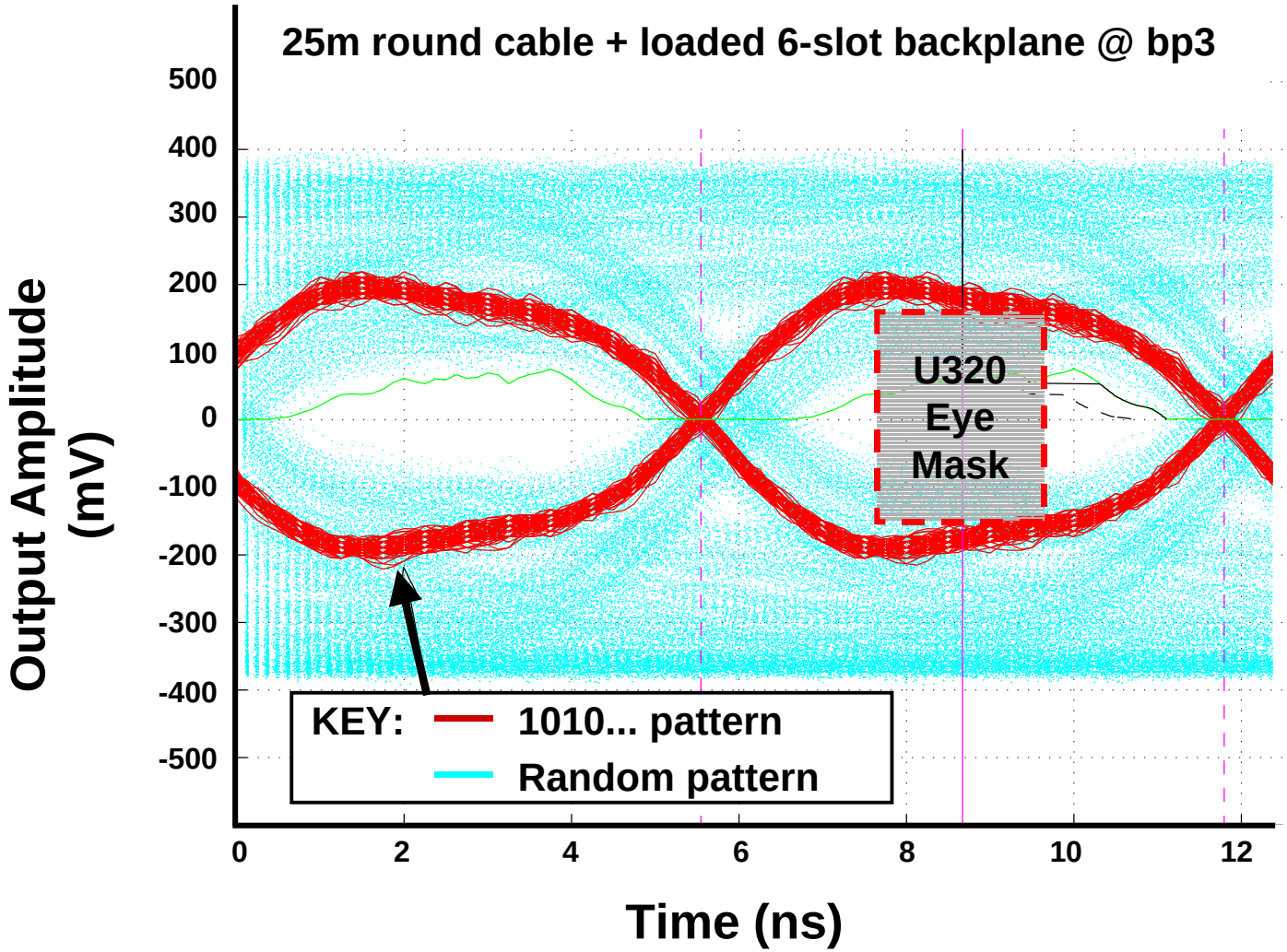


Conclusion: Excellent Margin

Quantum™ Set-up and Hold vs Eye Opening, bp1



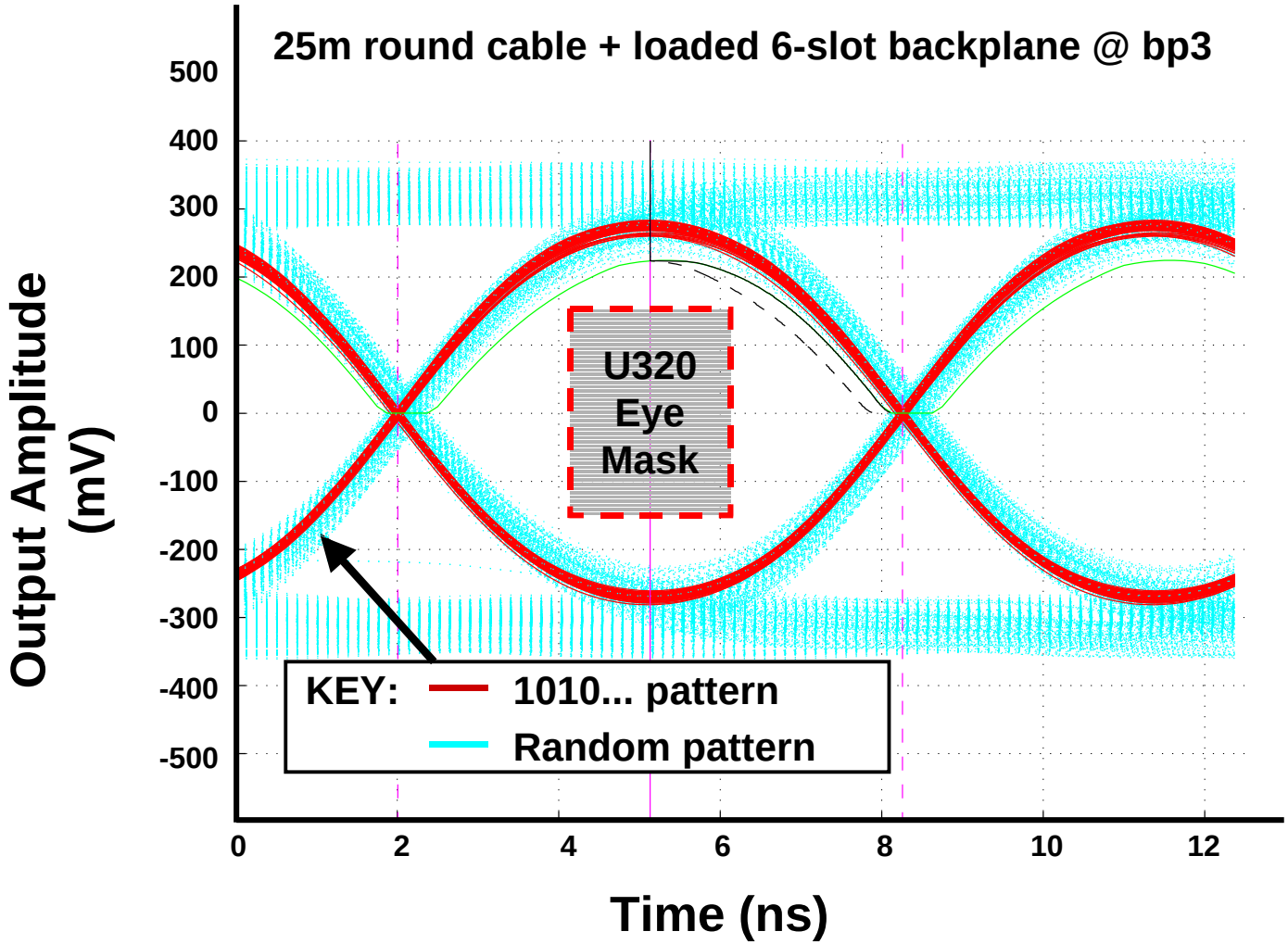
U320, Eq Input, 25m Cable, bp3



Conclusion: Failing Margin

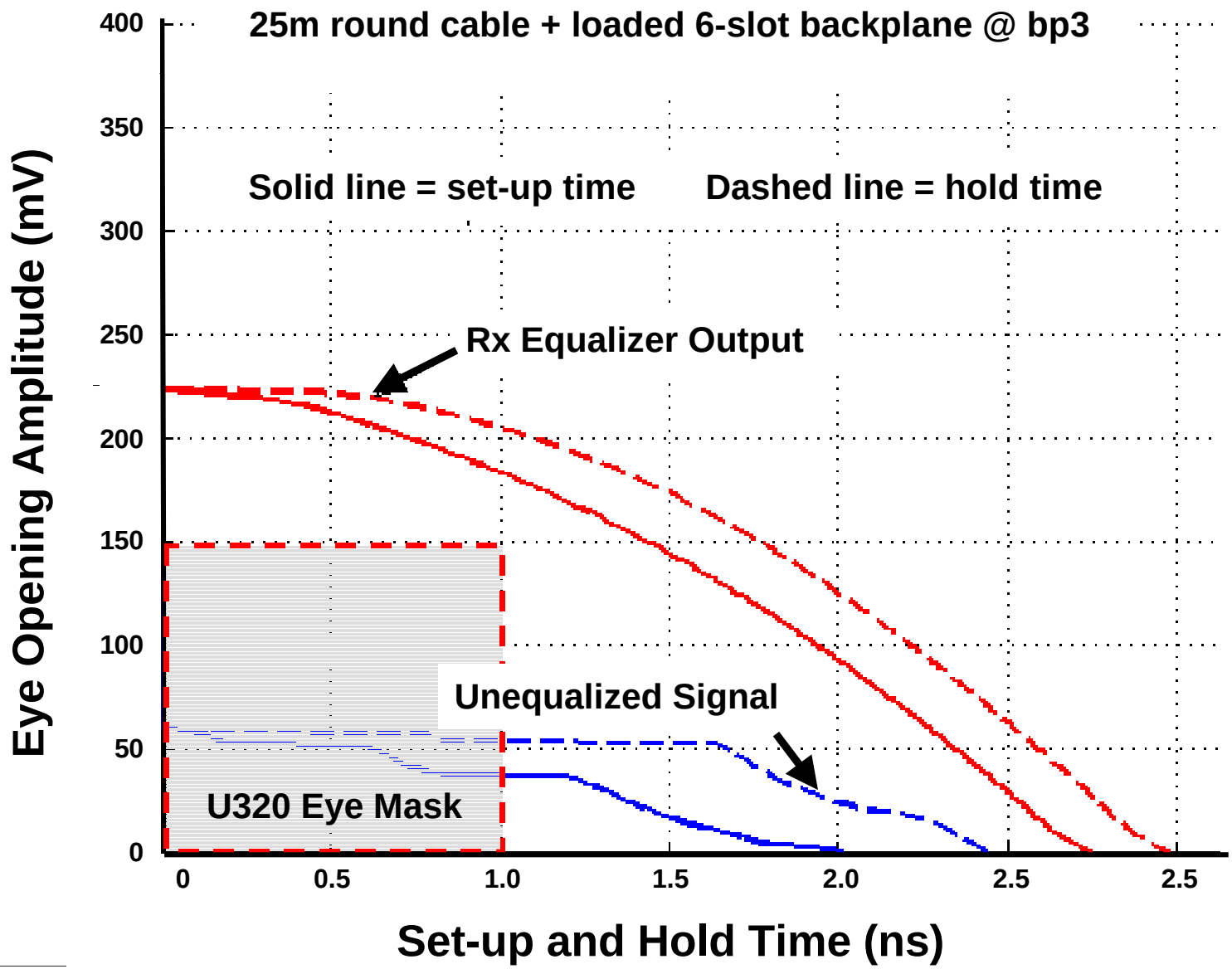
(Increasing amplitude would still fail)

U320, Rx Equalized, 25m Cable, bp3

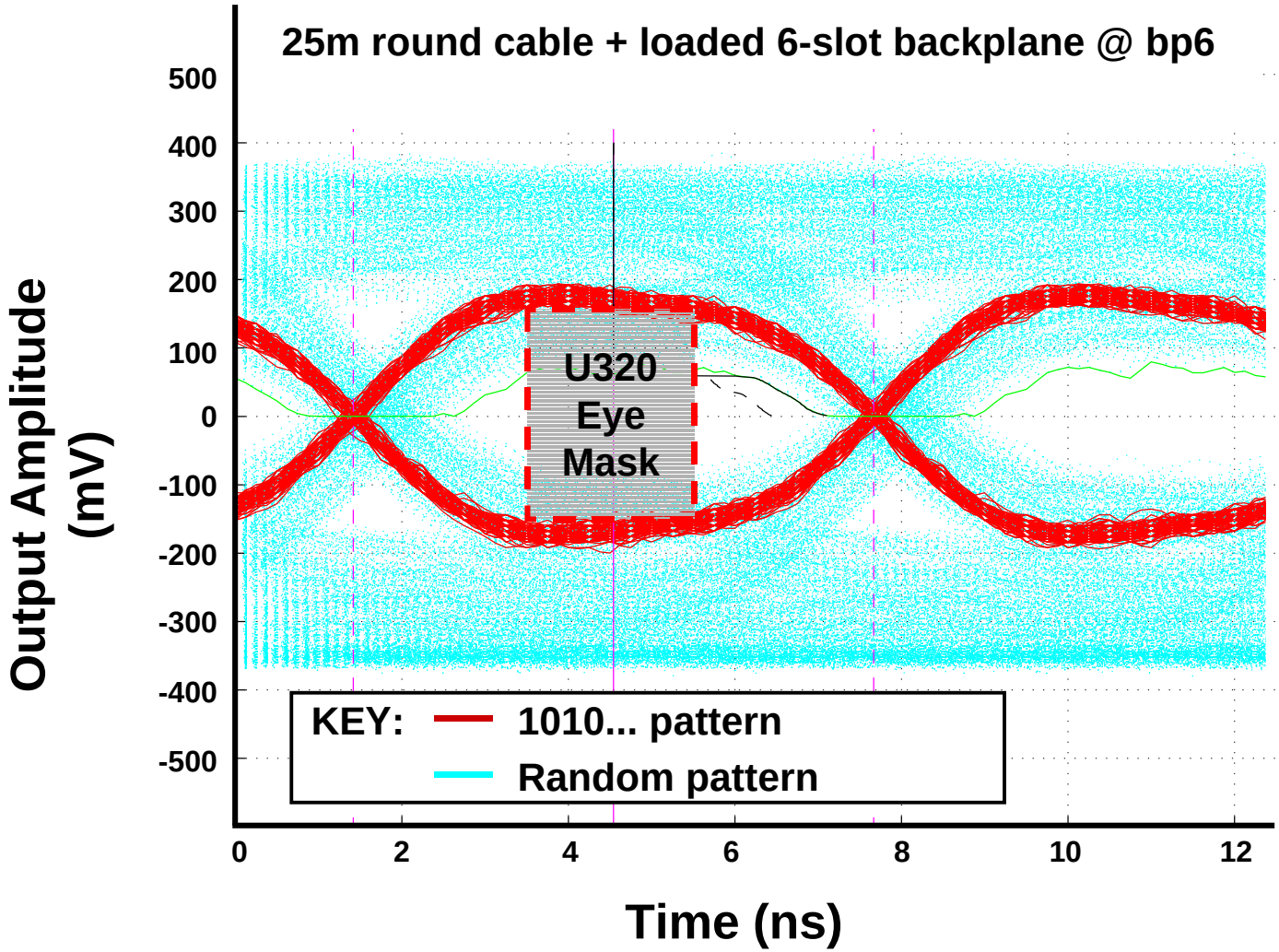


Conclusion: Excellent Margin

Quantum™ Set-up and Hold vs Eye Opening, bp3



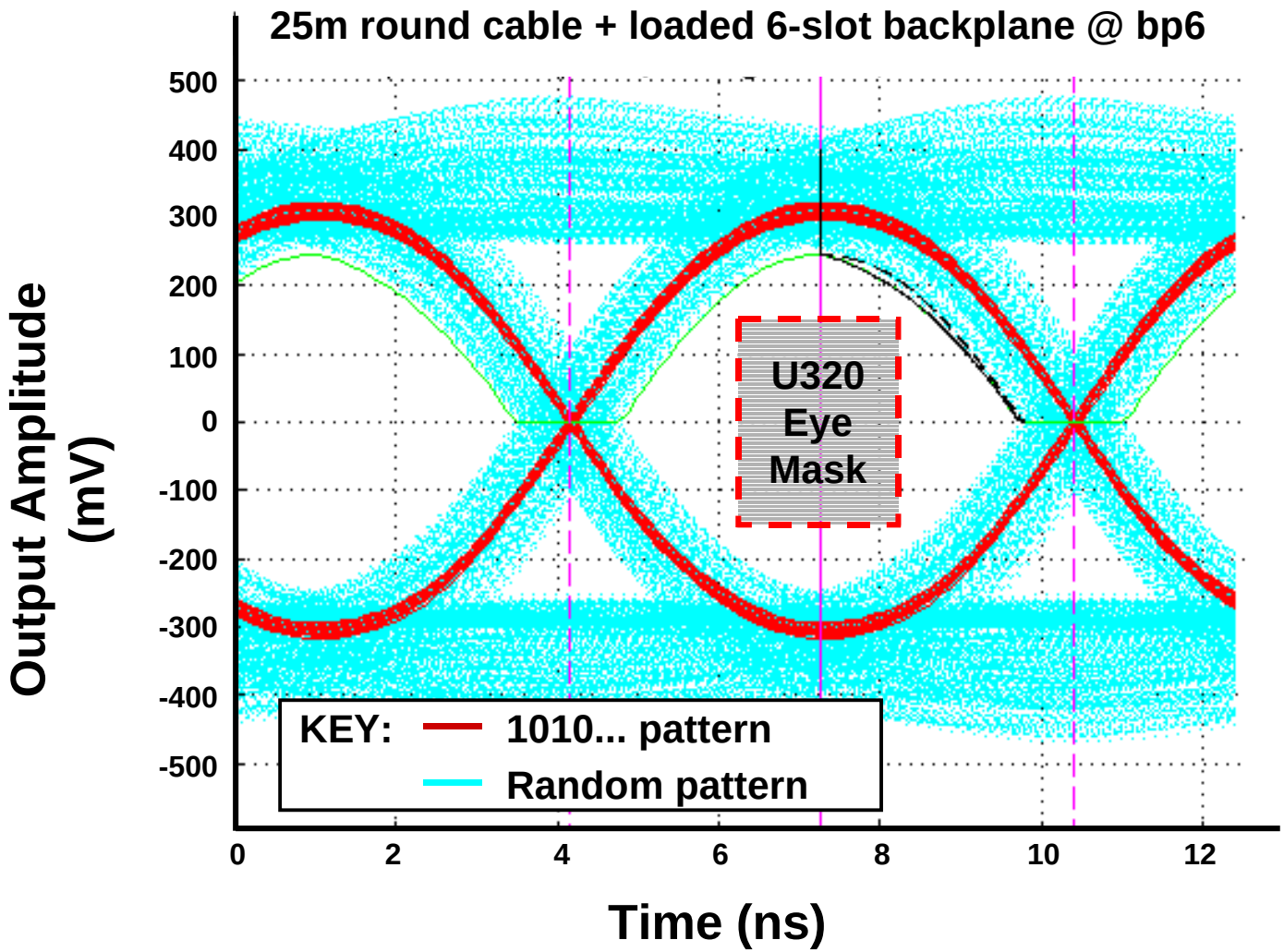
U320, Eq Input, 25m Cable, bp6



Conclusion: Failing Margin

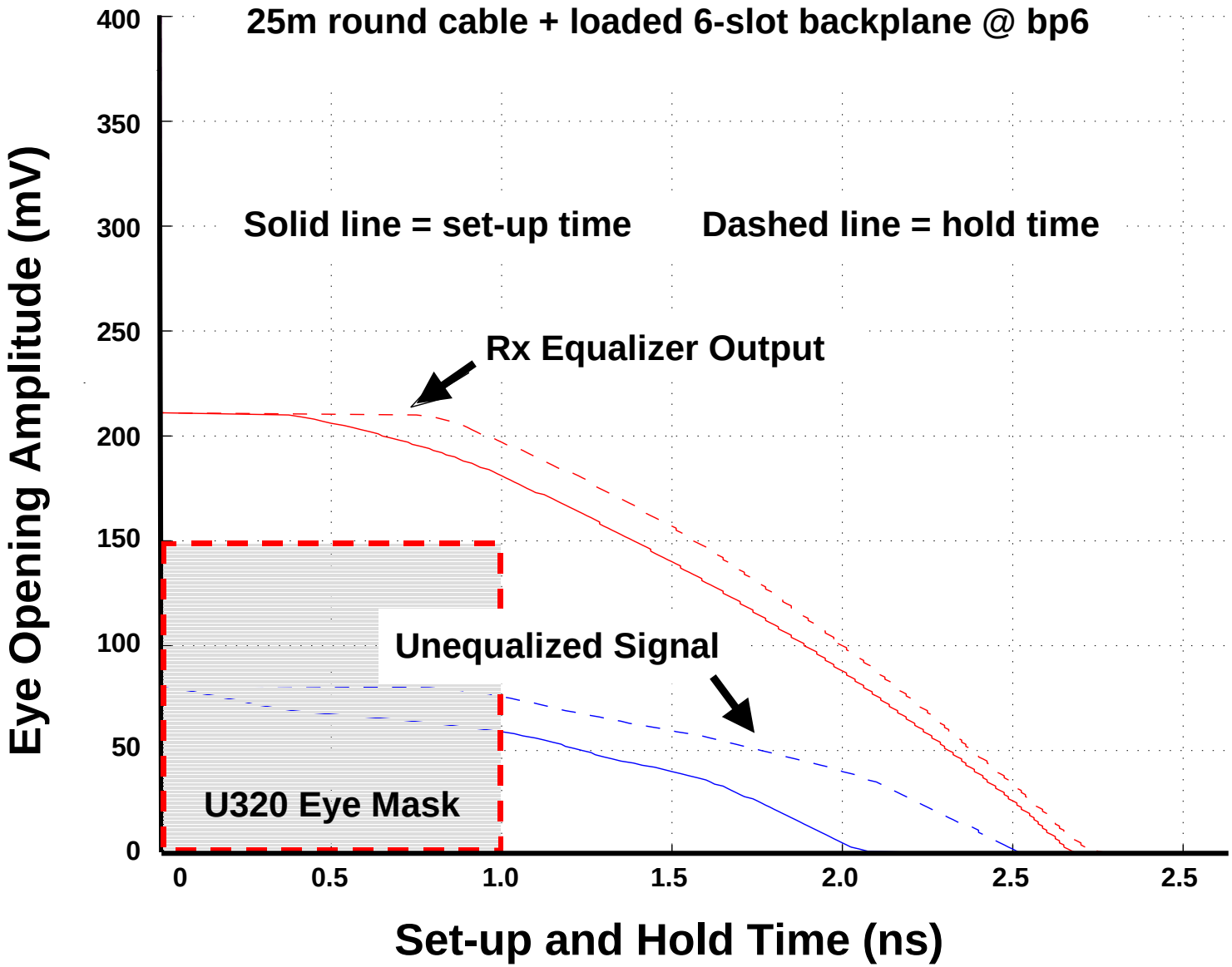
(Increasing amplitude would still fail)

U320, Rx Equalized, 25m Cable, bp6



Conclusion: Excellent Margin

Quantum™ Set-up and Hold vs Eye Opening, bp6



U320 25m Cable Test Conclusions

- **A Receiver Equalization scheme is extremely robust, capable at operating beyond the specified limits for Ultra 160.**
- **The specification for the maximum bus path length between terminators (25 meters point-to-point and 12 meters multidrop interconnect) does not need to be changed for U320 in SPI-4.**