Quantum™

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Ultra640 SCSI with Receiver Equalization, 25 meters into a Backplane with 6 loads

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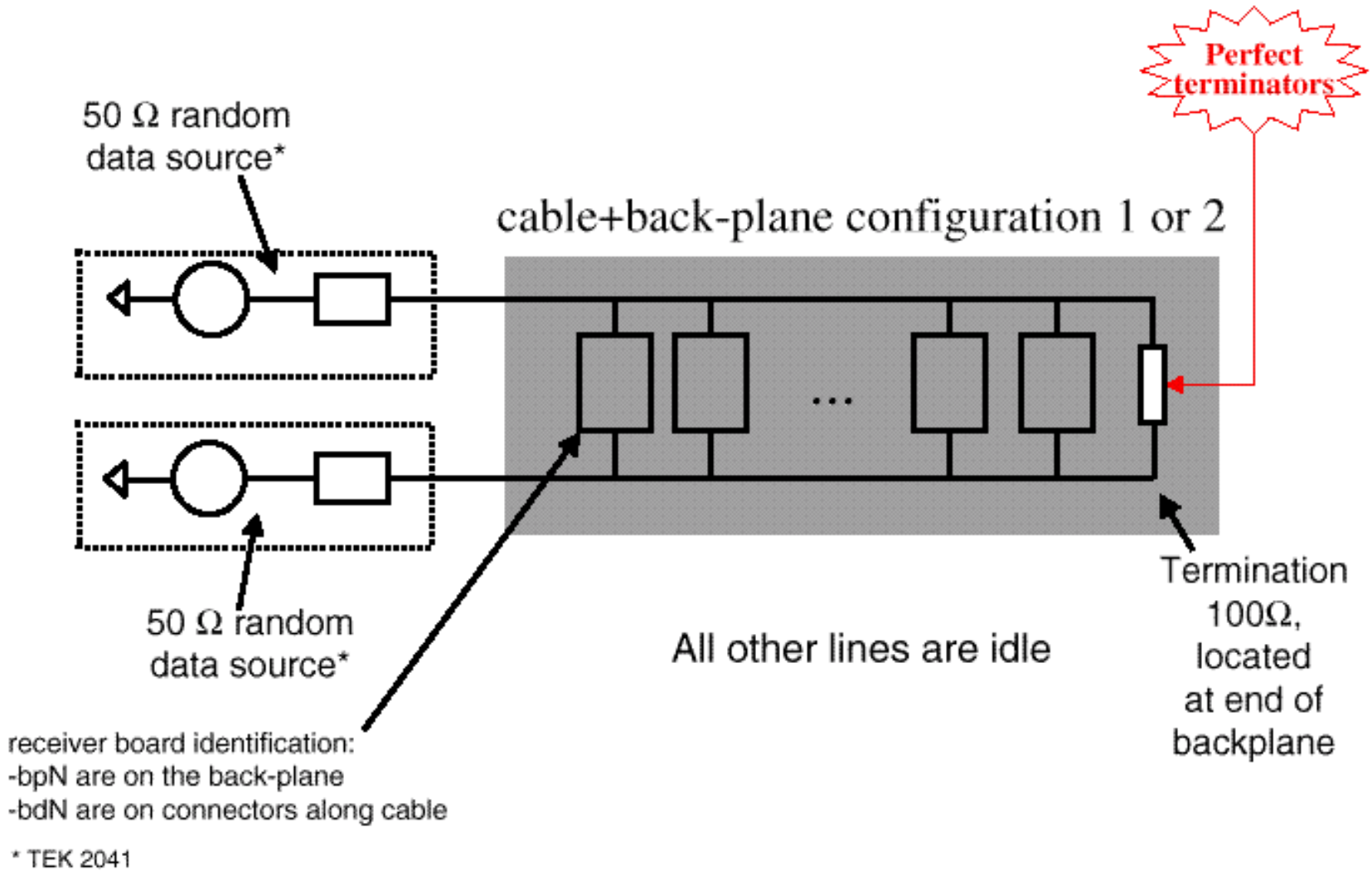
U640 25 Meter Cable Test Overview

- **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 second test was to use the same setup (25m round cable into a loaded 6-slot backplane) at U640 rates.**
- **The signals were measured to find the eye opening with ISI and reflections.**
- **The following describes the test and results.**

U640 25m Cable Test Setup

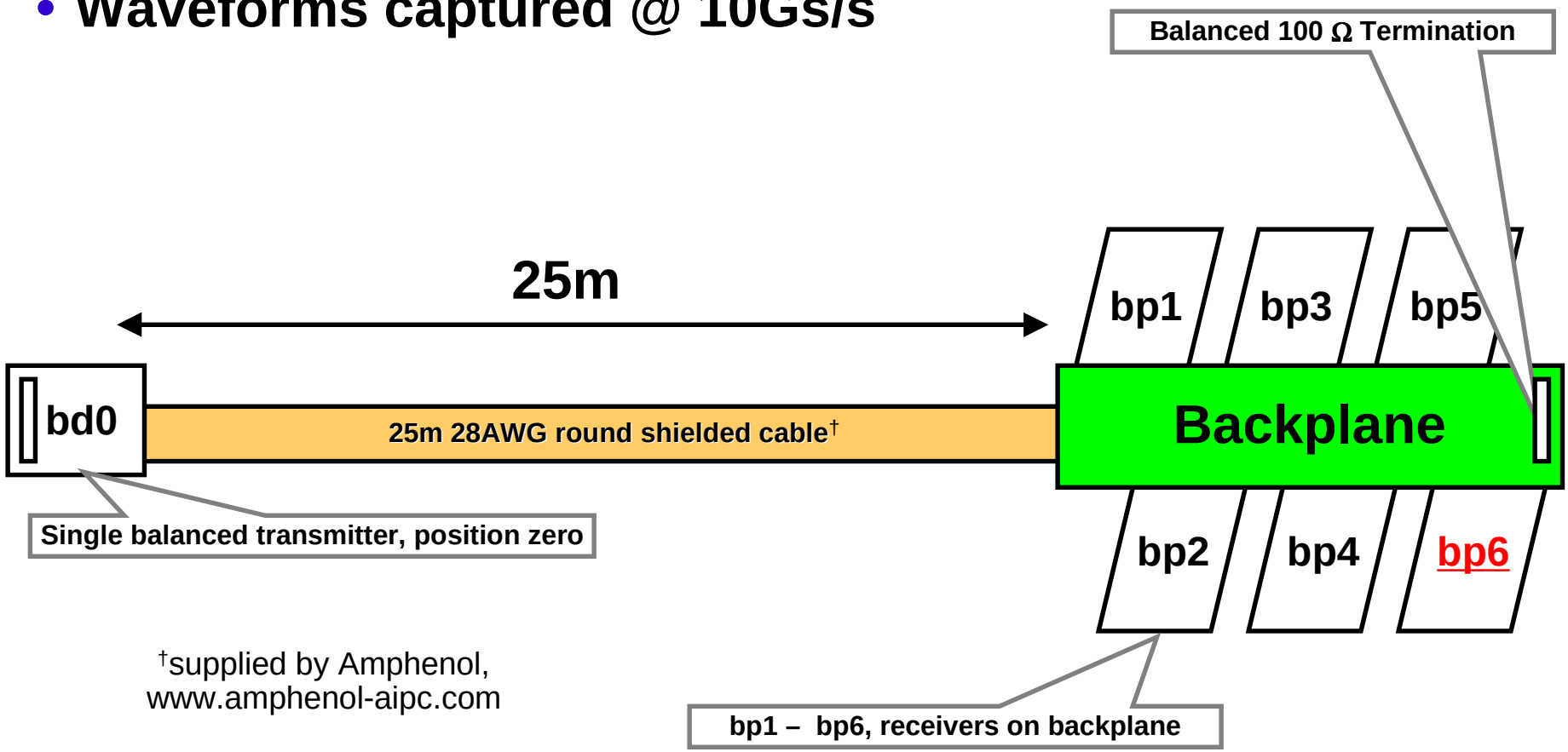
- **Margins were evaluated with the same techniques as used for our other Ultra320 data:**
  - **Transmitter driving voltage: +/- 400mV.**
  - **Because of the higher frequency the transmitted pattern was 1μs of a"101010..." training pattern followed by 4μs random data.**
  - **The equalizer input signals were captured differentially with a Tektronix TDS694C oscilloscope by probing at the backplane.**
  - **The equalizer output signal is generated by Spectre, simulating linear models and using captured data as the input stimulant.**
- **The boost used for the equalizer simulation was 3x**
- **Crosstalk could not be measured for this test as our current pulse generator cannot generate a synchronized clock at 320MHz.**

U640 25m Cable Test Schematic



U640 25m Cable Test Configuration

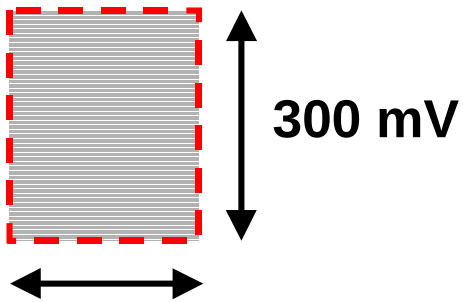
- **25 meter Amphenol cable assembly† using Madison 28AWG round shielded cable plus 6-slot backplane.**
- **Waveforms captured @ 10Gs/s**



†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.**

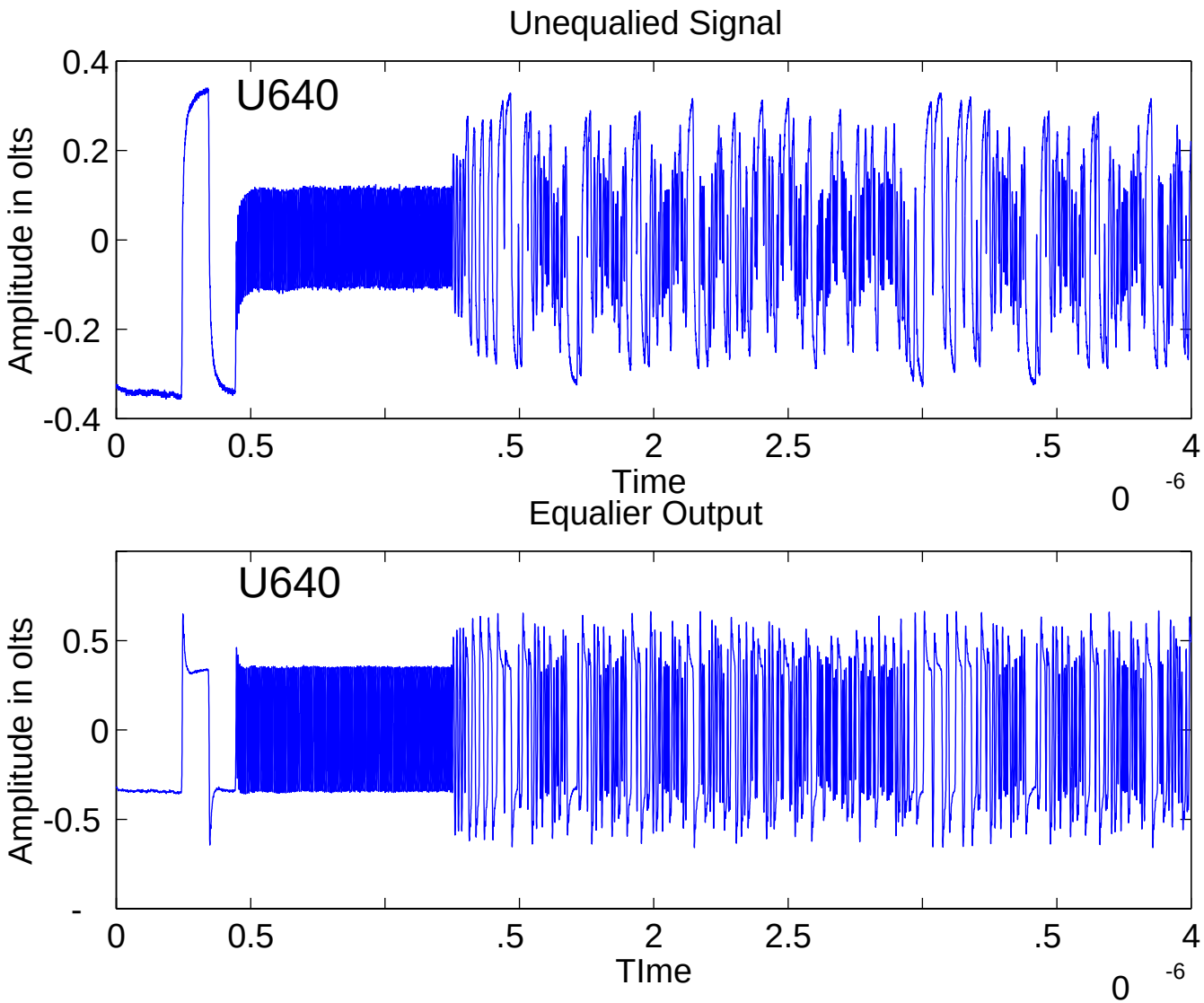


U640 Eye Mask

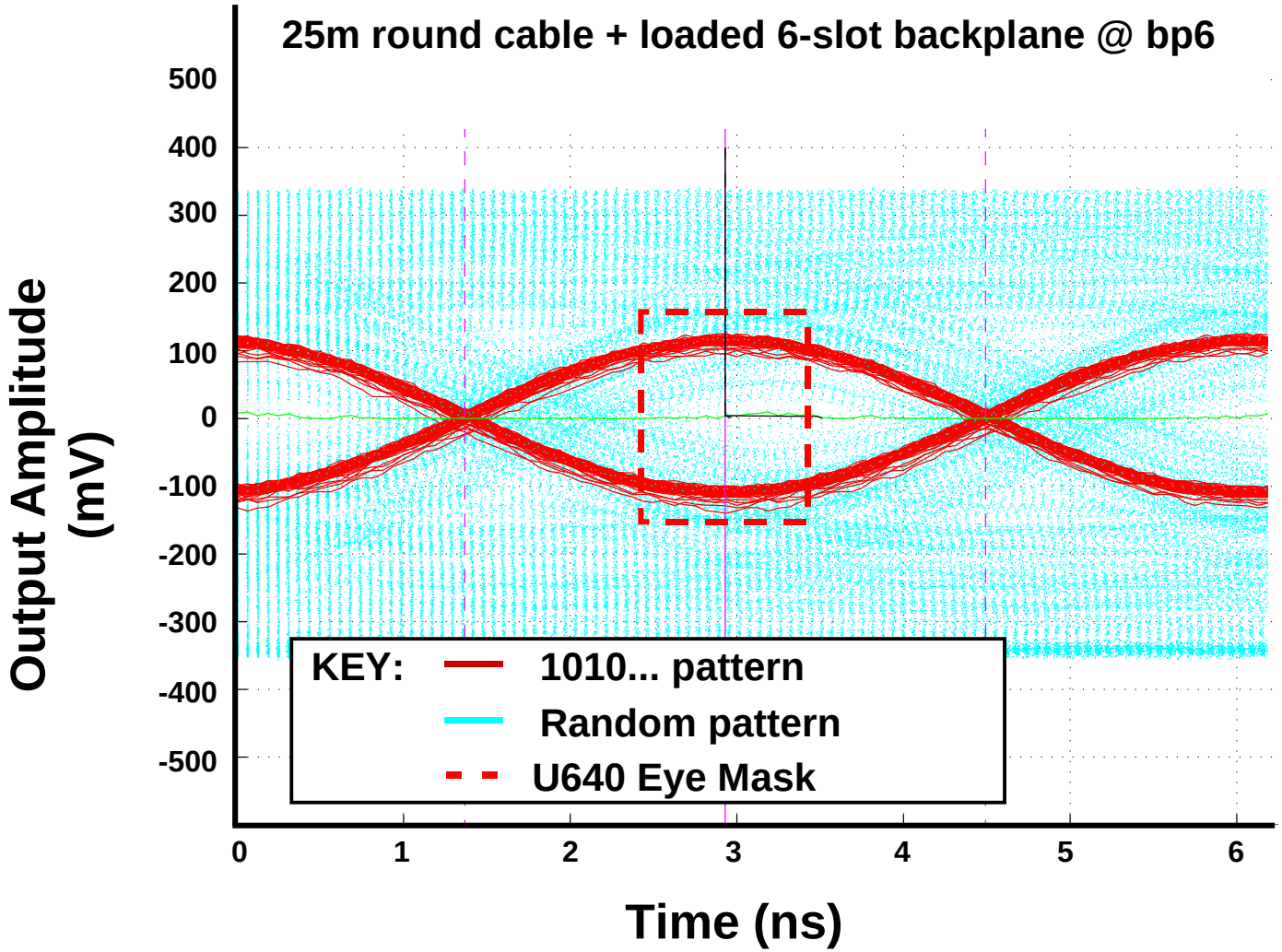
***This has been scaled to be half the value as that used for U320 analysis**

- **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.**

Quantum™ U640, Eq Input, 25m Cable, bp6 (raw)



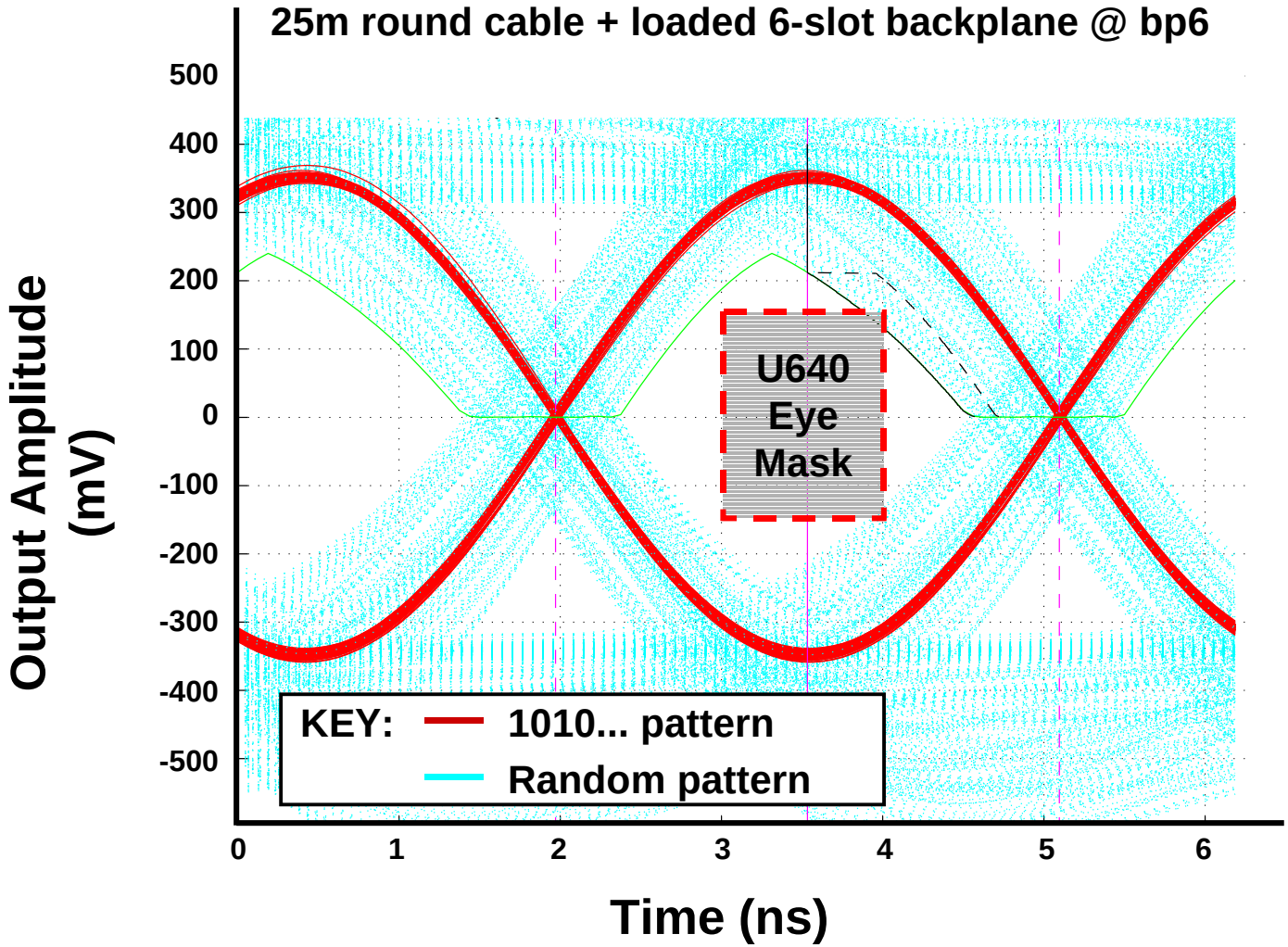
U640, Eq Input, 25m Cable, bp6



Conclusion: No Margin

(Increasing amplitude would still fail)

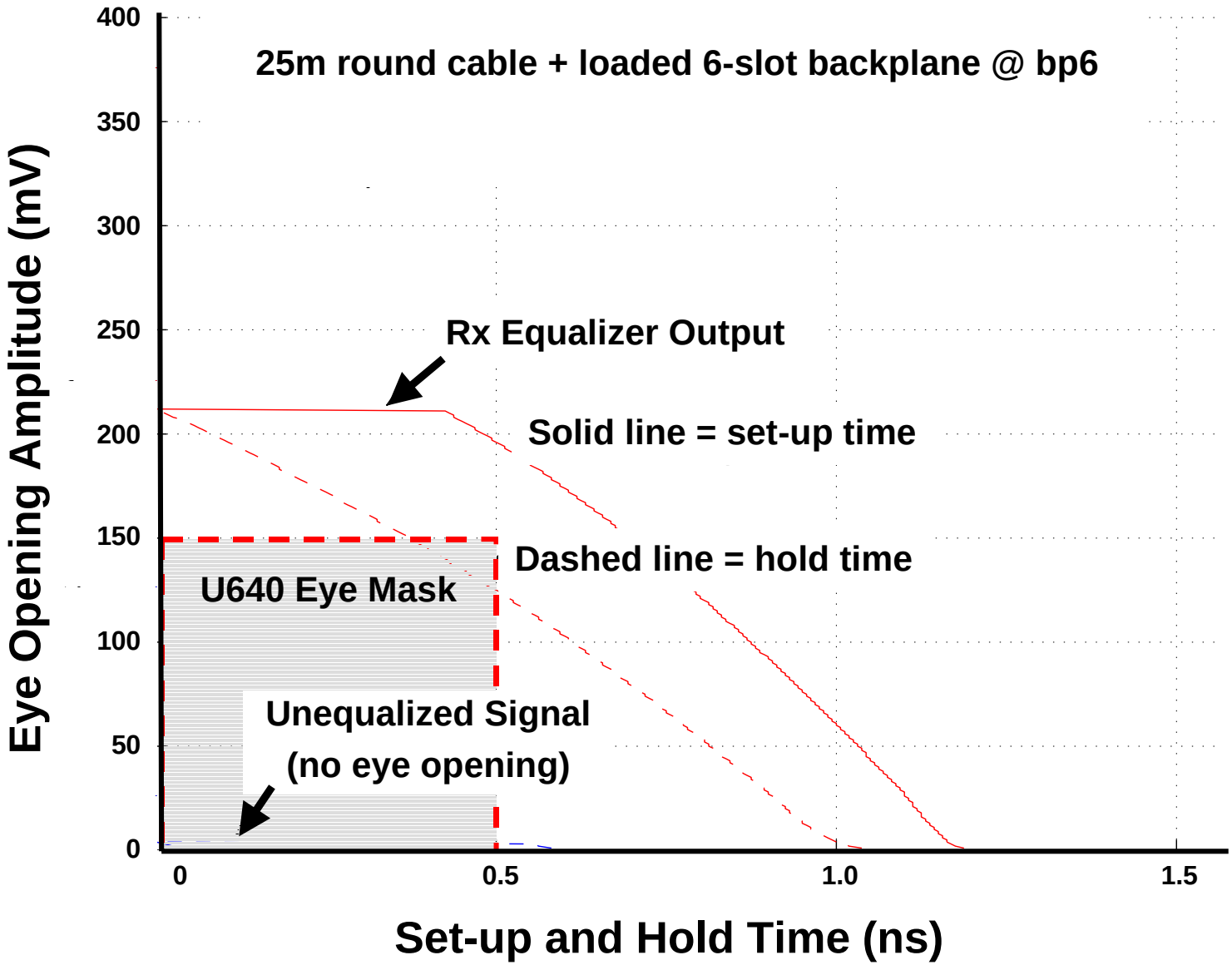
U640, Rx Equalized, 25m Cable, bp6



Conclusion: Good Set-up Margin*

(*Increased amplitude would improve margin)

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



U640 25m Cable Test Conclusions

- **Though this test was a "rough cut", it demonstrates that a receiver equalization scheme is so robust, it can adapt a signal to having sufficient margin from a signal having no margin at the receiver input.**
- **In addition, the data indicate that a receiver equalization scheme could be developed to operate at U640 transfer rates without changing the SPI specification for the maximum bus path length between terminators (25 meters point-to-point and 12 meters multidrop interconnect).**