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T10/00-225r0

Transmitter Precompensation Used with Receiver Equalization

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Introduction

- We evaluated the performance of transmitter precompensation used together with receiver equalization in the same system
- For this evaluation the transmitter precompensation "boost" was 1.5x
- The following is based on data gathered using Quantum's Test Configuration 1 as described in T10/00-214r0 "Details of test set-up used by Quantum for Ultra320 data" and T10/00-215R0 "Quantum Ultra320 SCSI Test Configurations"
  - 10 meter twisted-flat ribbon cable - 32AWG
  - 6-slot backplane fully populated with Quantum Ultra160 disk drives

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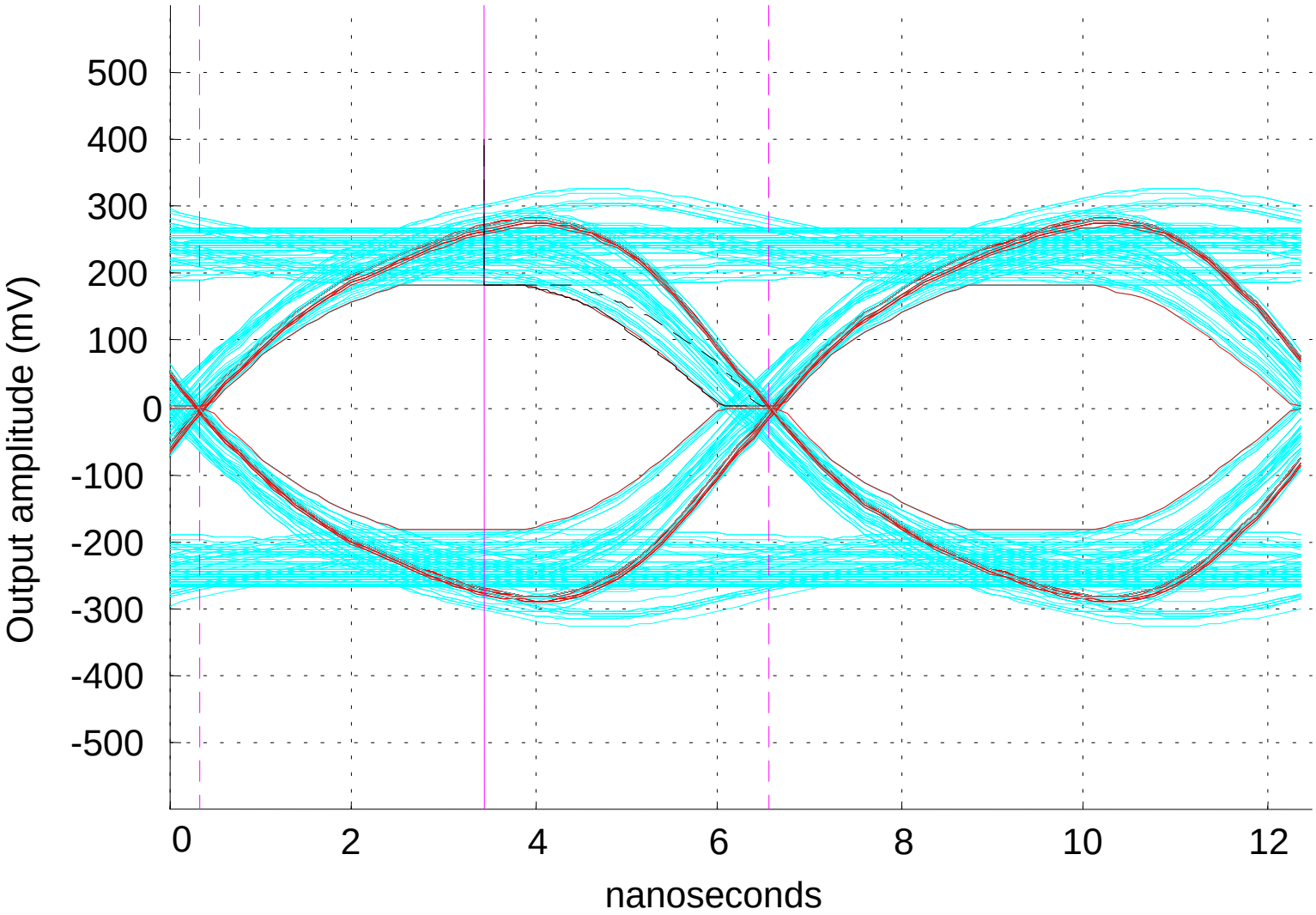
Tx Precomp Only, No Crosstalk



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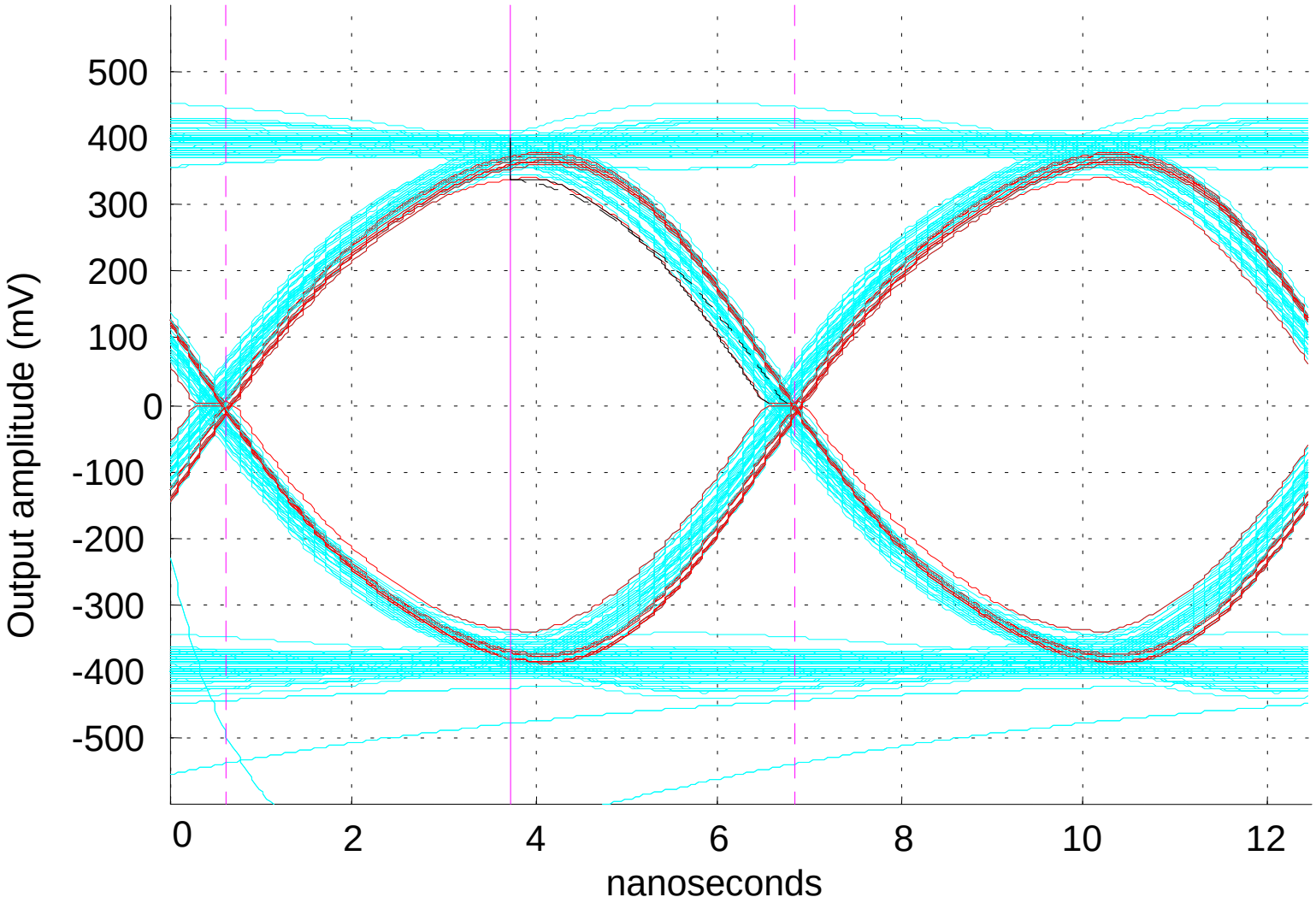
Rx Equalization Only, No Crosstalk



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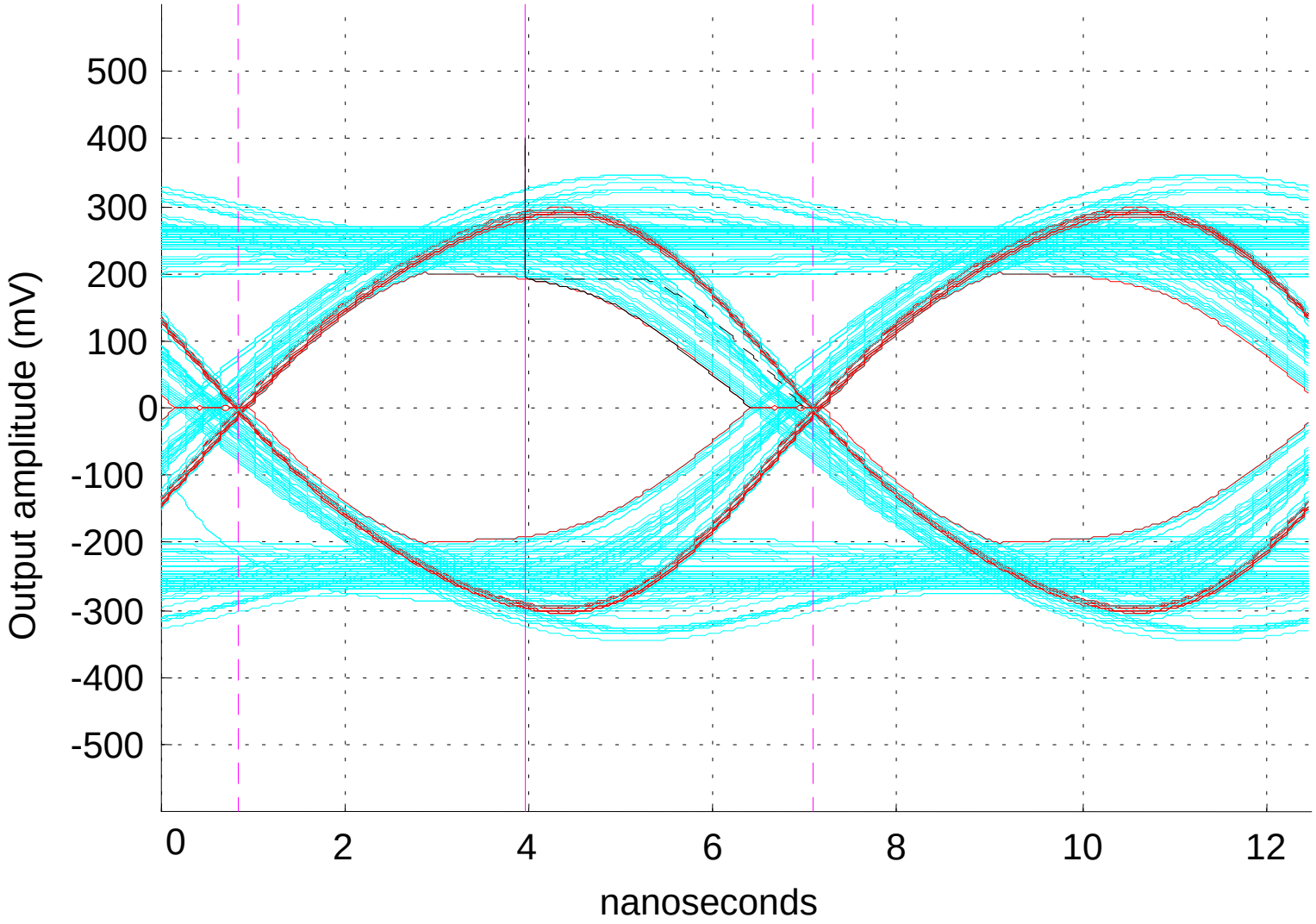
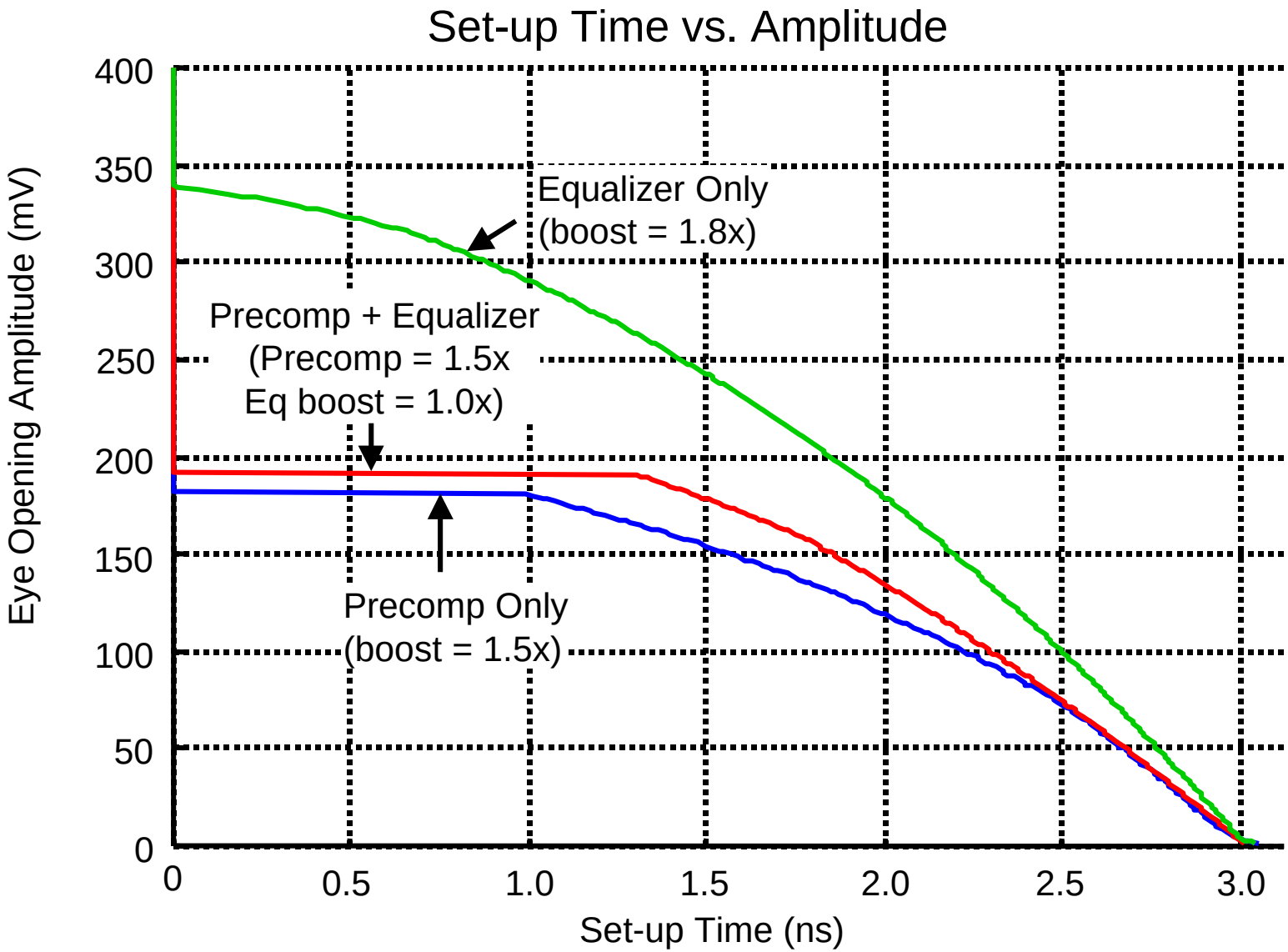
Tx Precomp + Rx Equalization



Set-up Time Comparison



Analysis

- Both transmitter precompensation and receiver equalization boost the signal.
- Precomp can be approximated by (As + B)
- Equalization is defined as (Ms+N) / D(s)
- The product of the two = (AMs^2 + (AN + BM)s + BN) / D(s)
- The second order boost (s^2) doesn't properly match the first order rolloff of the cable (1/s) at 80 MHz.

Conclusions and Recommendations

- The addition of transmitter precompensation significantly reduces the effectiveness of receiver equalization at 80 MHz.
- It's possible to design a different filter to compensate, but the main modification would be to cancel the effect of precompensation.
- If precompensation is to be included in the SPI-4 standard, the following are recommendations:
  - Precomp ratios need to be standard for all vendors
  - The width of the precomp pulse needs to be standard for all vendors
  - It must be possible to disable precomp so that maximum margin can be achieved in all system configurations (this could probably be done as a result of Domain Validation)