Backplane Ethernet Call-For-Interest

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1. Outline

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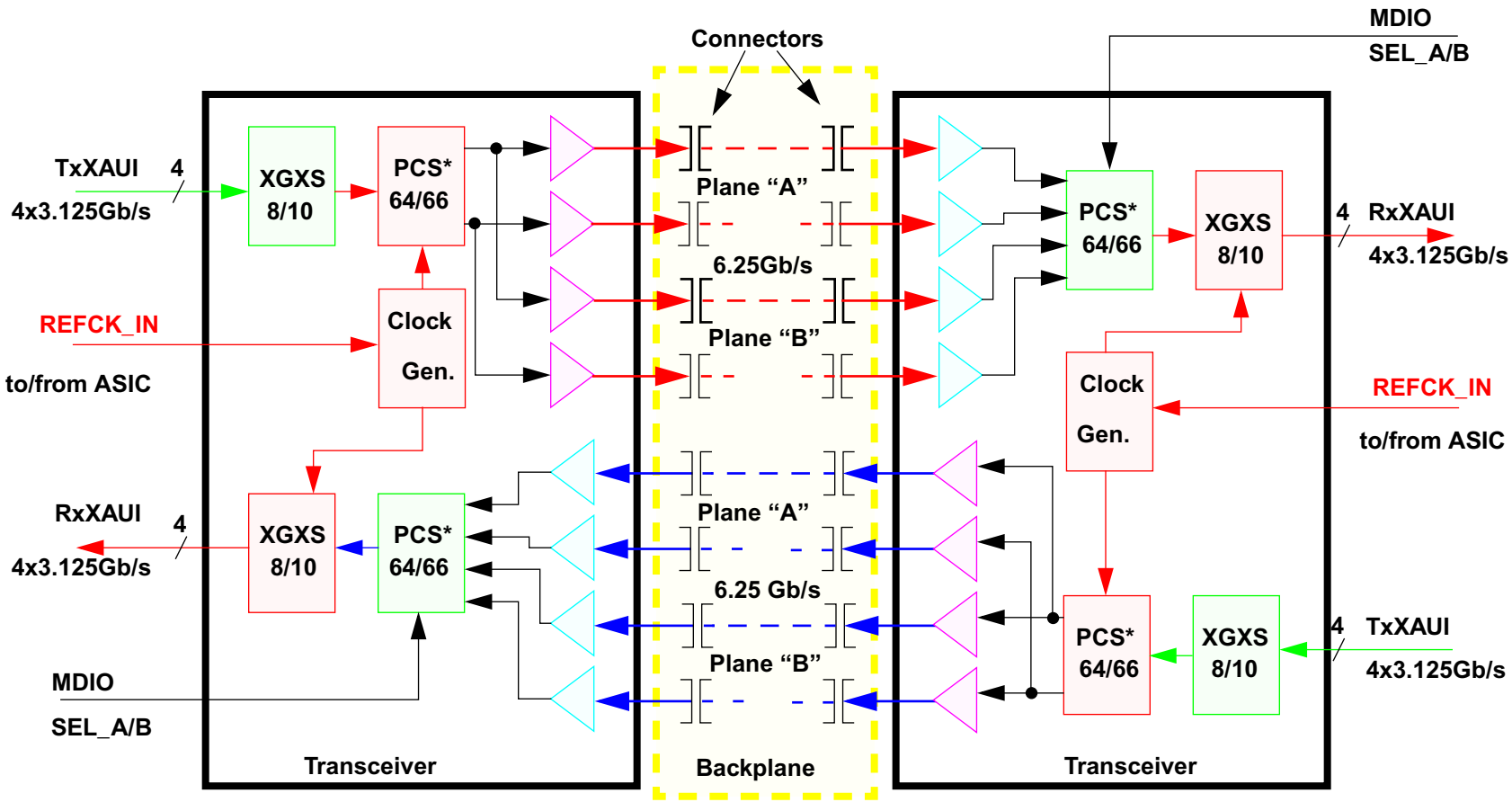
2. Reduced-lane XAUI, 10Gb/s Ethernet Backplane Transceiver with Redundancy (1)



- Transparent XAUI ASIC to ASIC connections over the backplane.
- Remove jitter from the ASIC and from the backplane (green blocks are running on high jitter recovered clock, red blocks are running on low jitter clock) for improved timing budget.
- Programmable redundancy capability, using MDIO control or pin selection.

3. Reduced-lane XAUI, 10Gb/s Ethernet Backplane Transceiver with Redundancy (2)

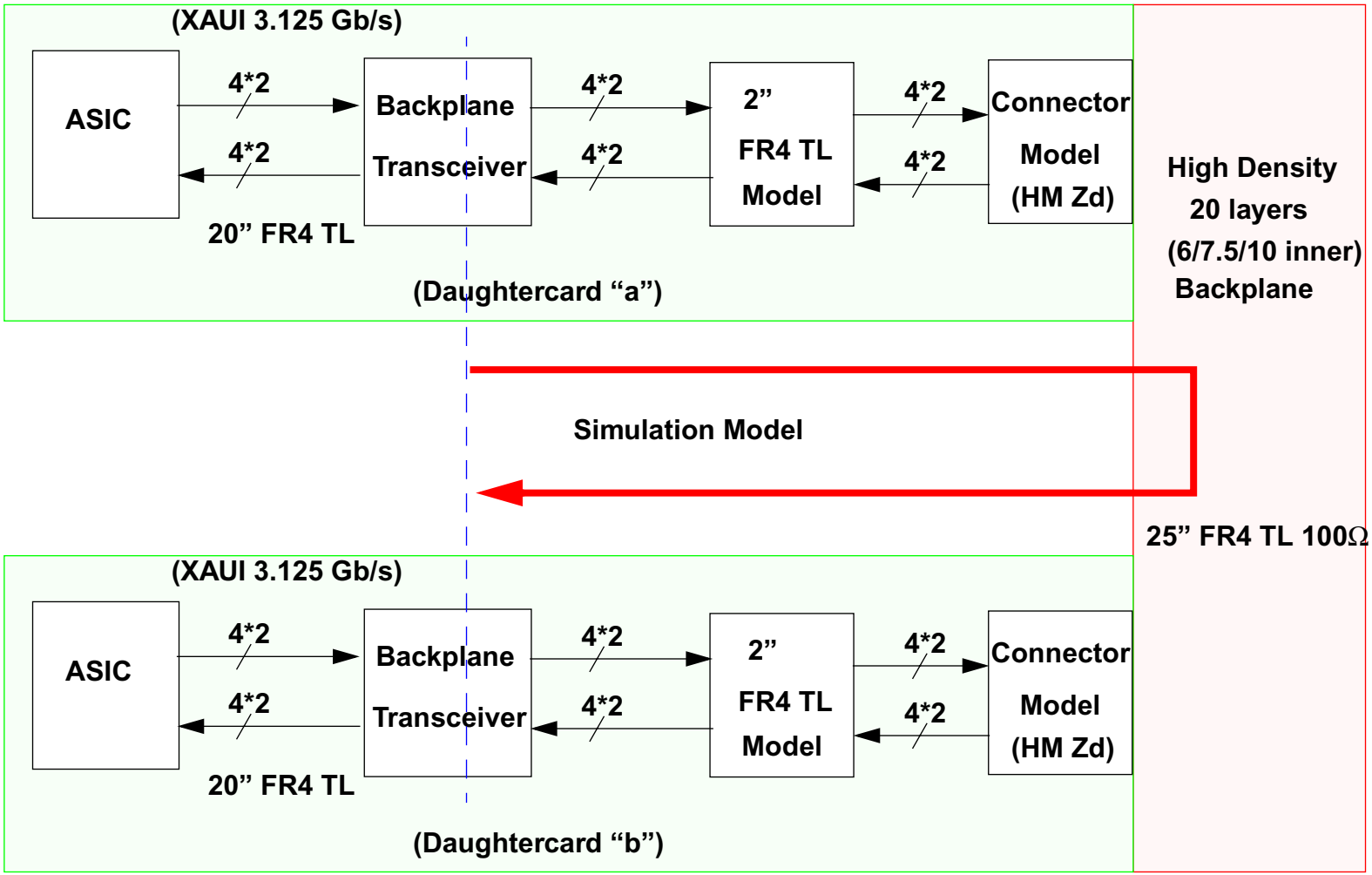
Features

- **Supports XAUI 10GE (3.125 Gb/s) and 10GFC (3.1875 Gb/s) data rates.**
- **Fully XAUI standard compliant design, supports AC coupling.**
- **High performance programmable (20” and 40”) pre-emphasis, using MDIO control or pin selection for low power operation, and adaptive receive equalization for backplane interface.**

Benefits

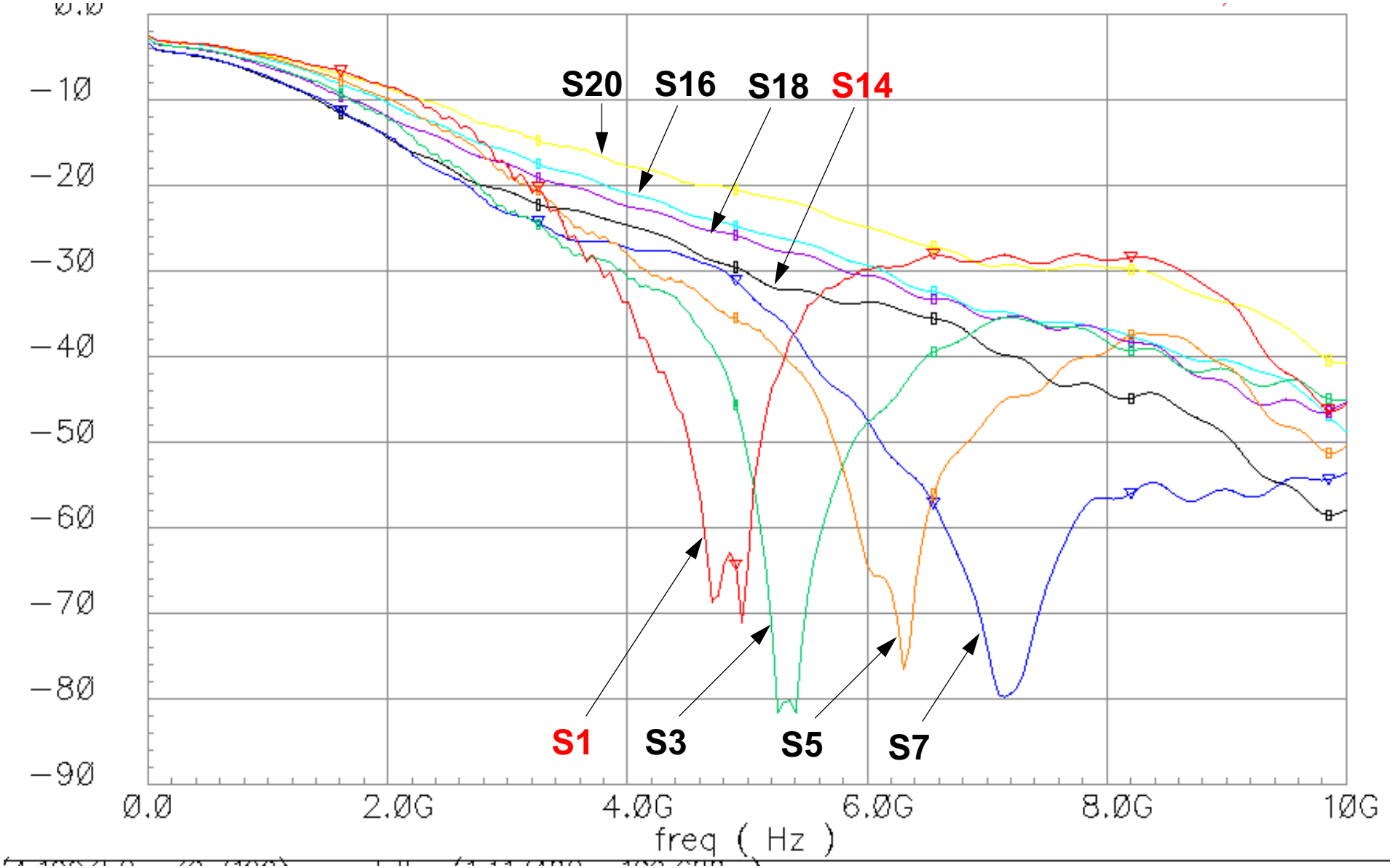
- **Double the backplane bandwidth (relative to XAUI) without increased complexity or power dissipation.**
- **Flexible architecture supports single plane and dual plane (redundancy) applications.**
- **Backplane extended range operation, >40” and two connectors.**
- **Board extended range operation, 20” between ASIC and backplane transceiver.**

4. Backplane - Simulation Environment for S Parameters



The simulation model includes the backplane driver, board transmission line (2", w=6, s=7.5, h=10 mils, 100Ω differential transmission lines, inner layer), connector including vias (10 layer board and 20 layer backplane), 25" backplane 100Ω differential transmission lines, connector model including vias, and the backplane receiver.

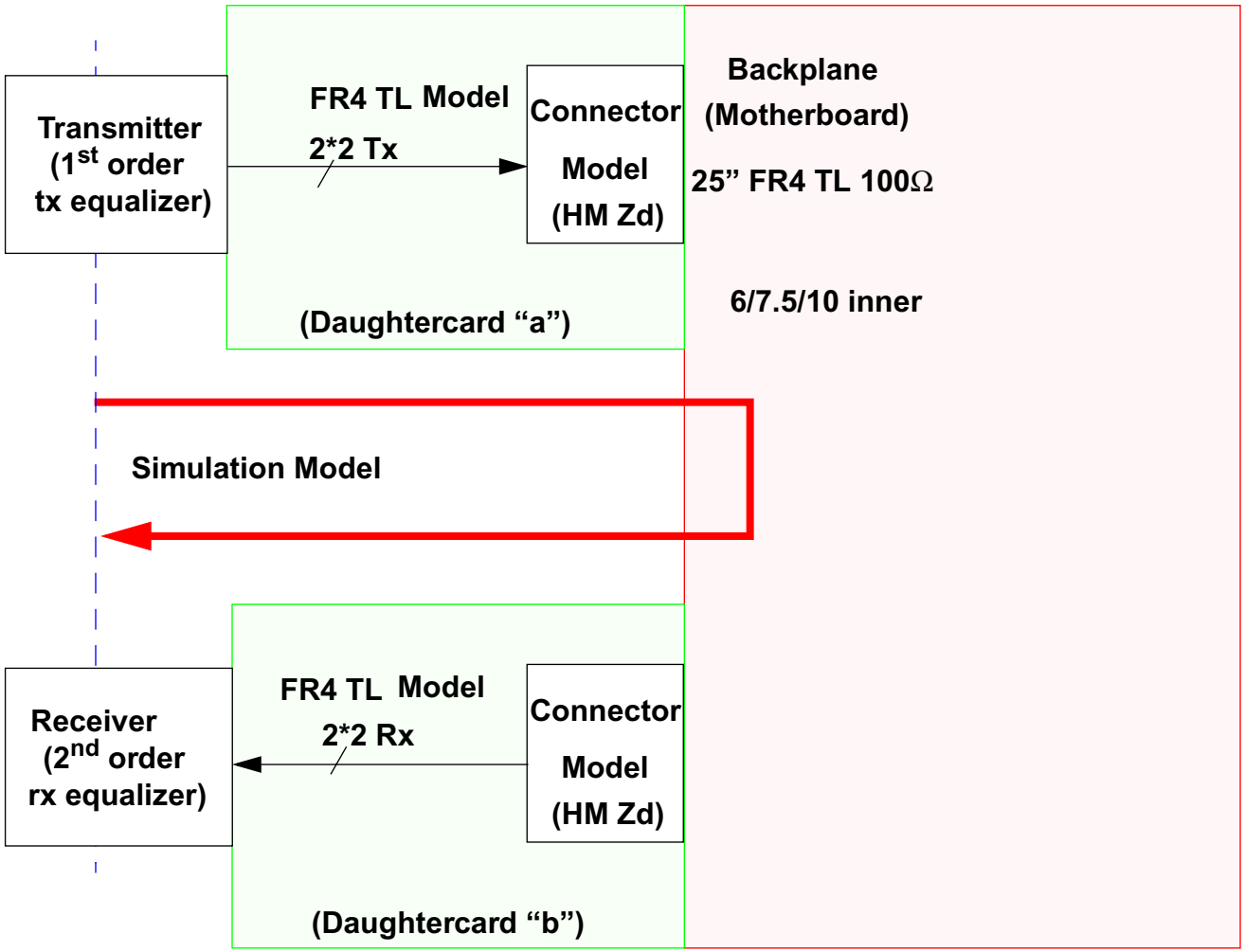
5. Transmission Lines, S21 Simulation Results



6. Connector Via Impact

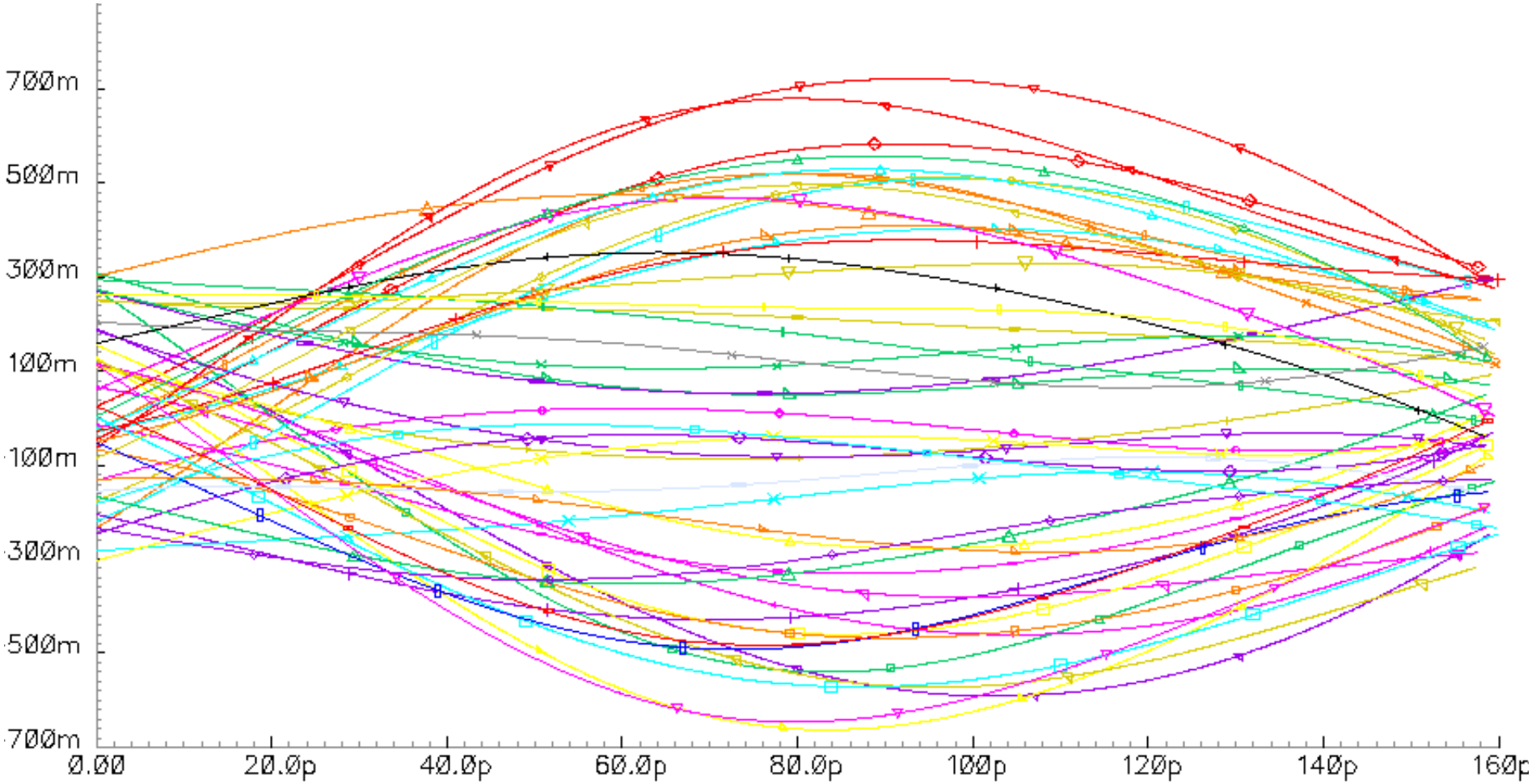
- The connector via introduces a discontinuity in the transmission path.
- The stub attached at the two ends of the transmission line introduces a notch in the transmission characteristic.
- The length of the stub will determine the notch centre frequency (the notch centre frequency is lower for longer stubs).
- The width of the notch depends on the dielectric losses, we have to refine the model for better agreement with the measured data.
- Transmission lines on signal layer 1, 3, 5, and 7 will be the most affected for transmission rates higher than 6.25 Gb/s.
- The attenuation at the notch centre frequency is higher than 60 dB.
- The impact of via can be reduced using various techniques.

7. Backplane - Simulation Environment for Time Domain Analysis at 6.25 Gb/s



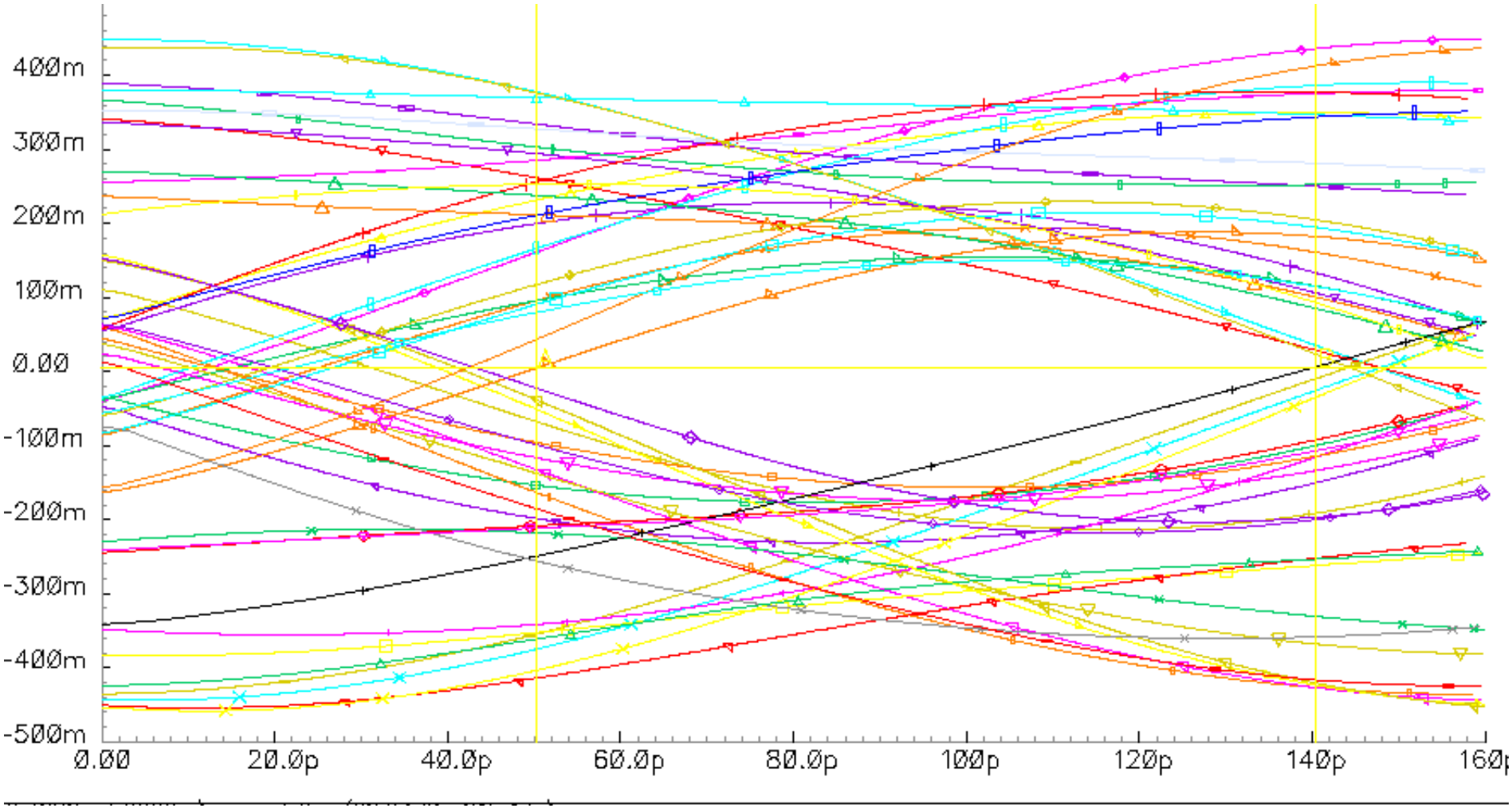
The simulation model includes daughter card differential transmission lines (TX-S1, TX-S14 and RX-S1, RX-S14), connectors including vias, 25" backplane 100Ω differential transmission lines, the transmitters (driver only) with first order transmit equalizer, and the receivers (input comparator only) with second order receive equalizer.

8. TX Driver 6.25 Gb/s Differential Output with PRBS 2^7-1 (S1)



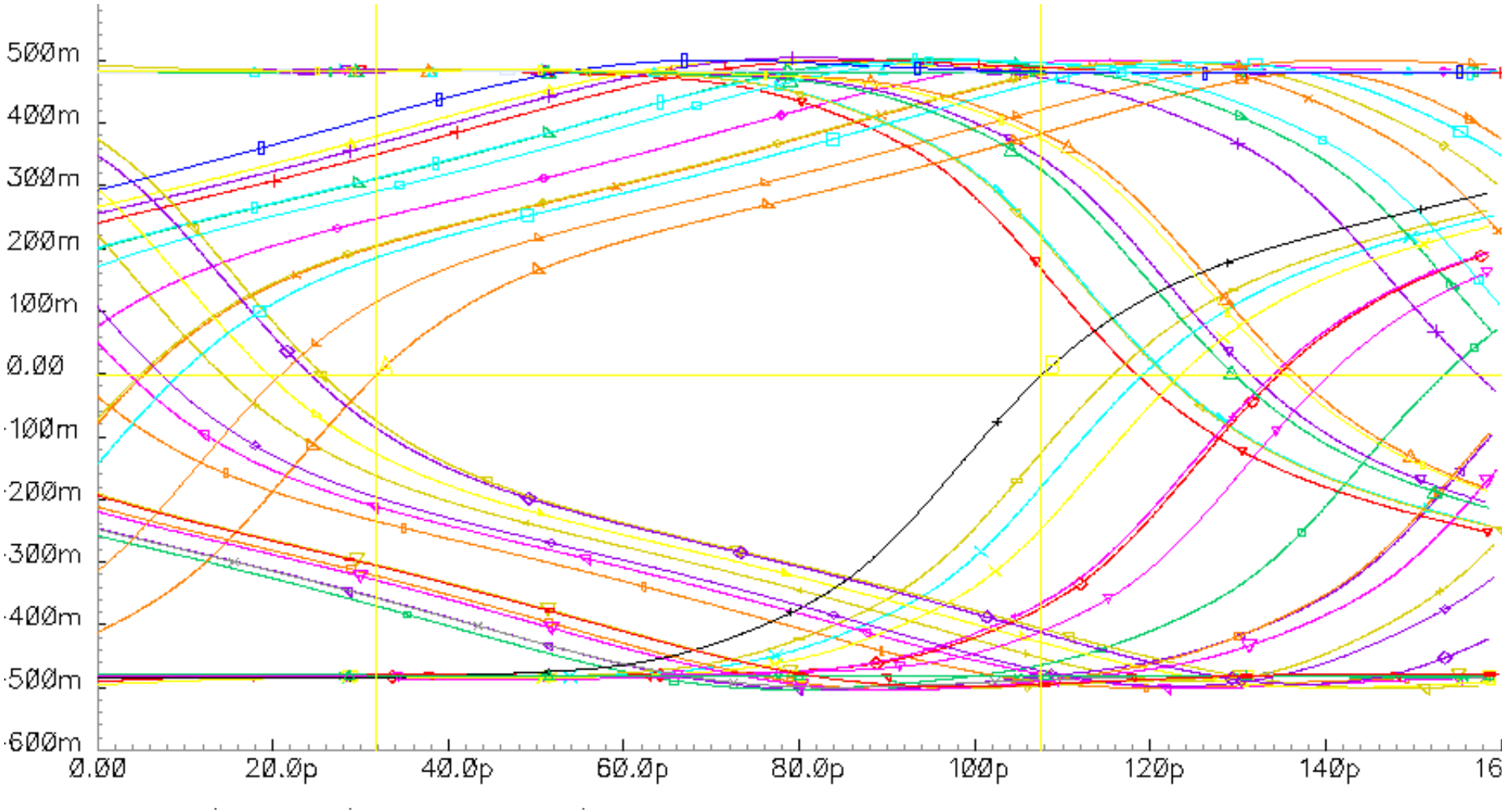
- TX1 transmits on signal layer S1 with worst transmission characteristics (see S21 simulation results),
- The signal is distorted due to the strong reflections, the eye is closed.

9. RX Differential Input Signal at 6.25 Gb/s (S1)



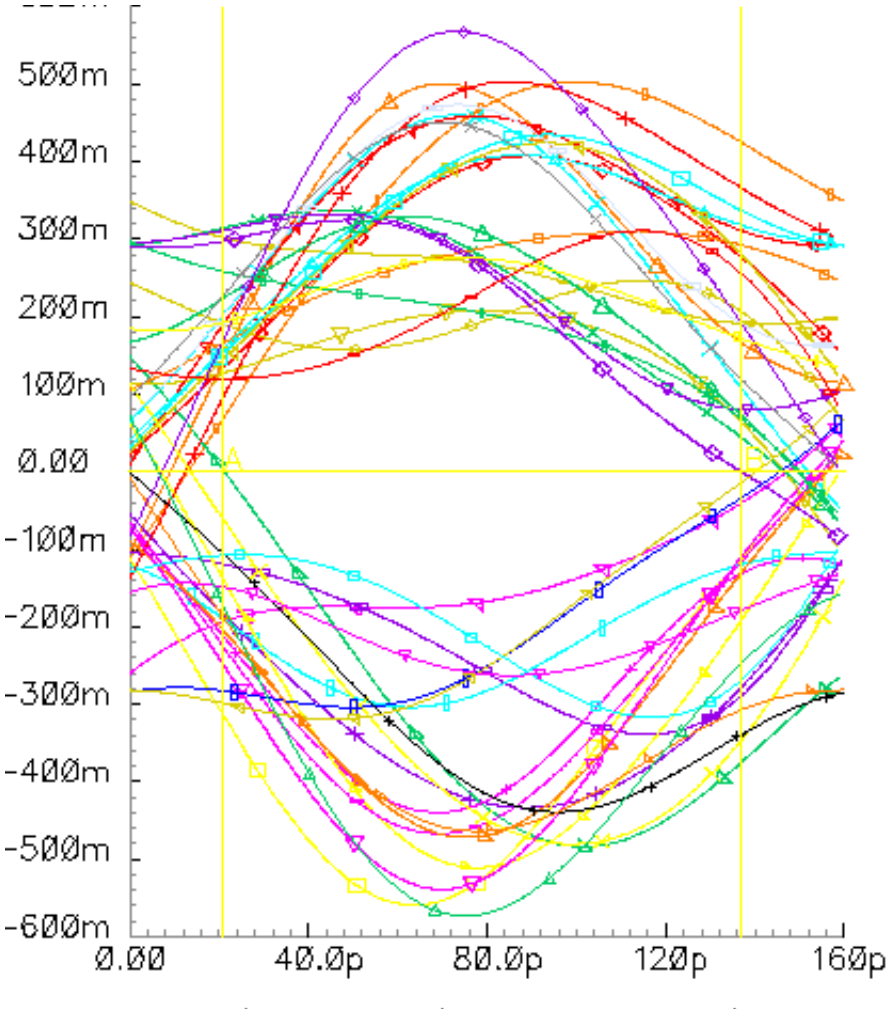
- The eye is not completely closed, the amplitude of the received signal is small, and the noise band is high.
- The signal is applied to the input comparator.

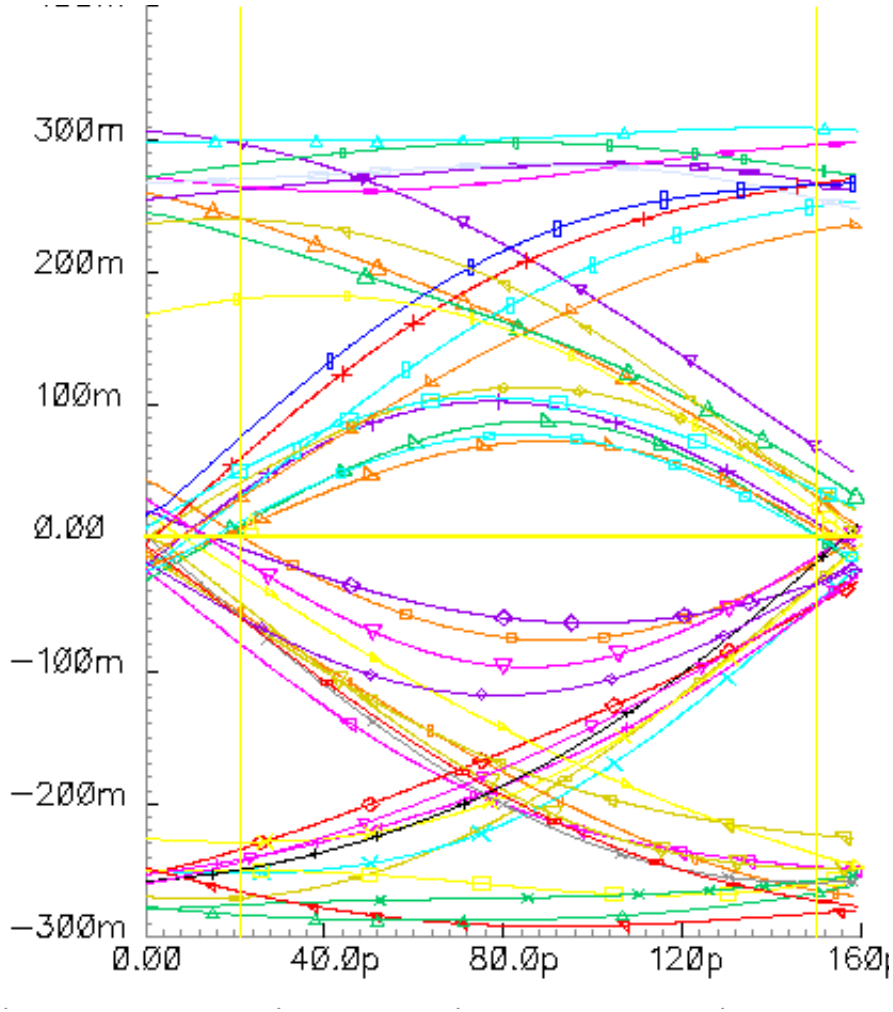
10. RX Input Comparator Differential Output at 6.25 Gb/s (S1)



- The second order equalizer eliminates most of the high frequency noise,
- The eye opening is better than 0.5 UI,
- The receiver operates error free.

11. TX and RX (S14) Simulation Results at 6.25 Gb/s





- The transmitter output is less distorted and the receiver input eye has a good opening.

12. Summary

- The backplane model simulation results for transmission characteristics (S21) show good matching with the measured results.

- Time domain analysis has shown that the backplane can be used, as is, for 6.25 Gb/s connections using first order transmit equalization and second order receive equalization.

- Future simulations could include the impact of power supply noise, input and output impedance mismatch, and transmitter output jitter impact.