

Eic Main FPC Prototype

Signal Integrity tests on prototype main FPC.

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Update 3/12/2025



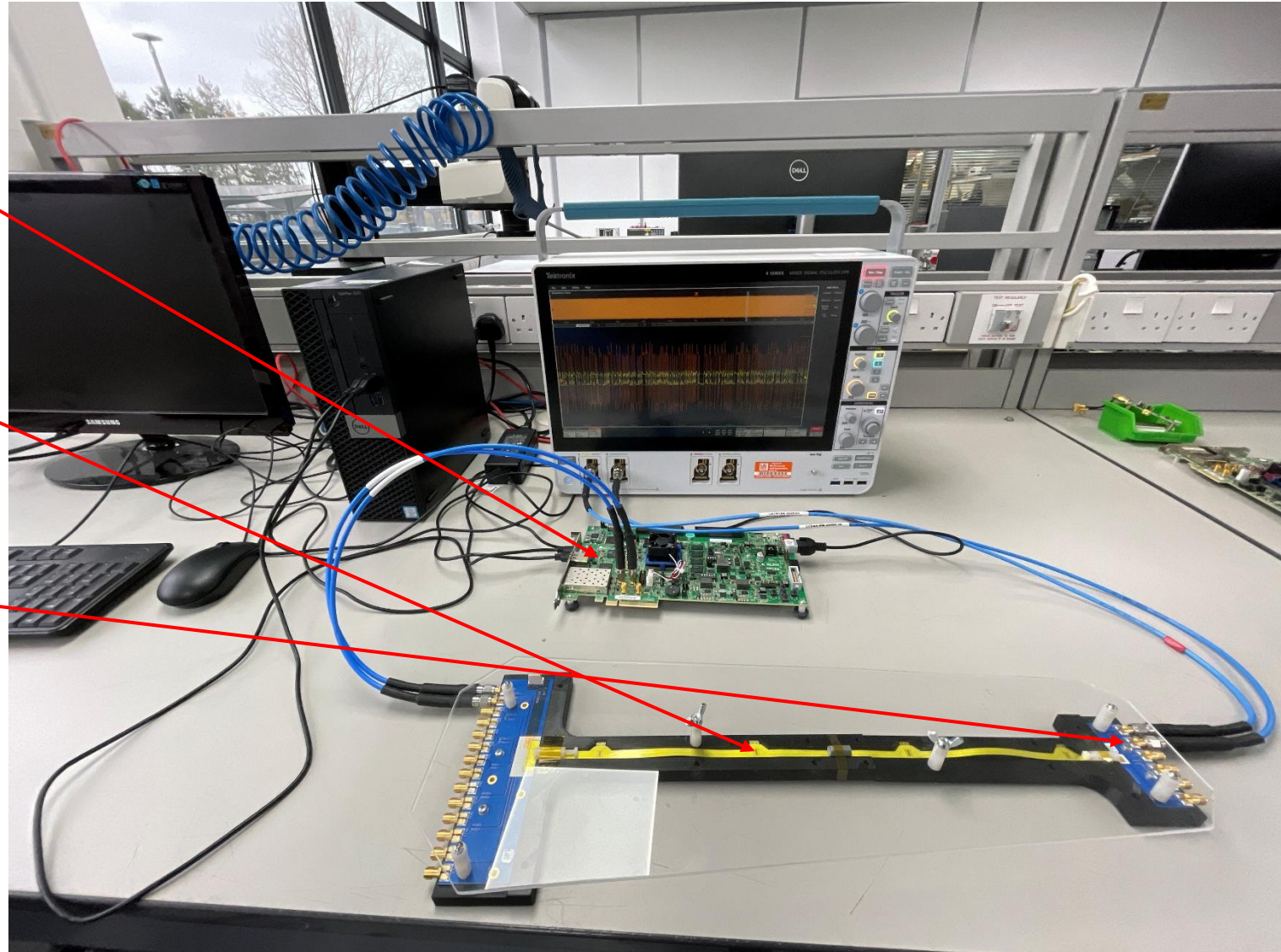
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Main FPC connected to KCU105 and Tektronix MSO6B 'scope

KCU105 AMD
Kintex Ultrascale+
FPGA board

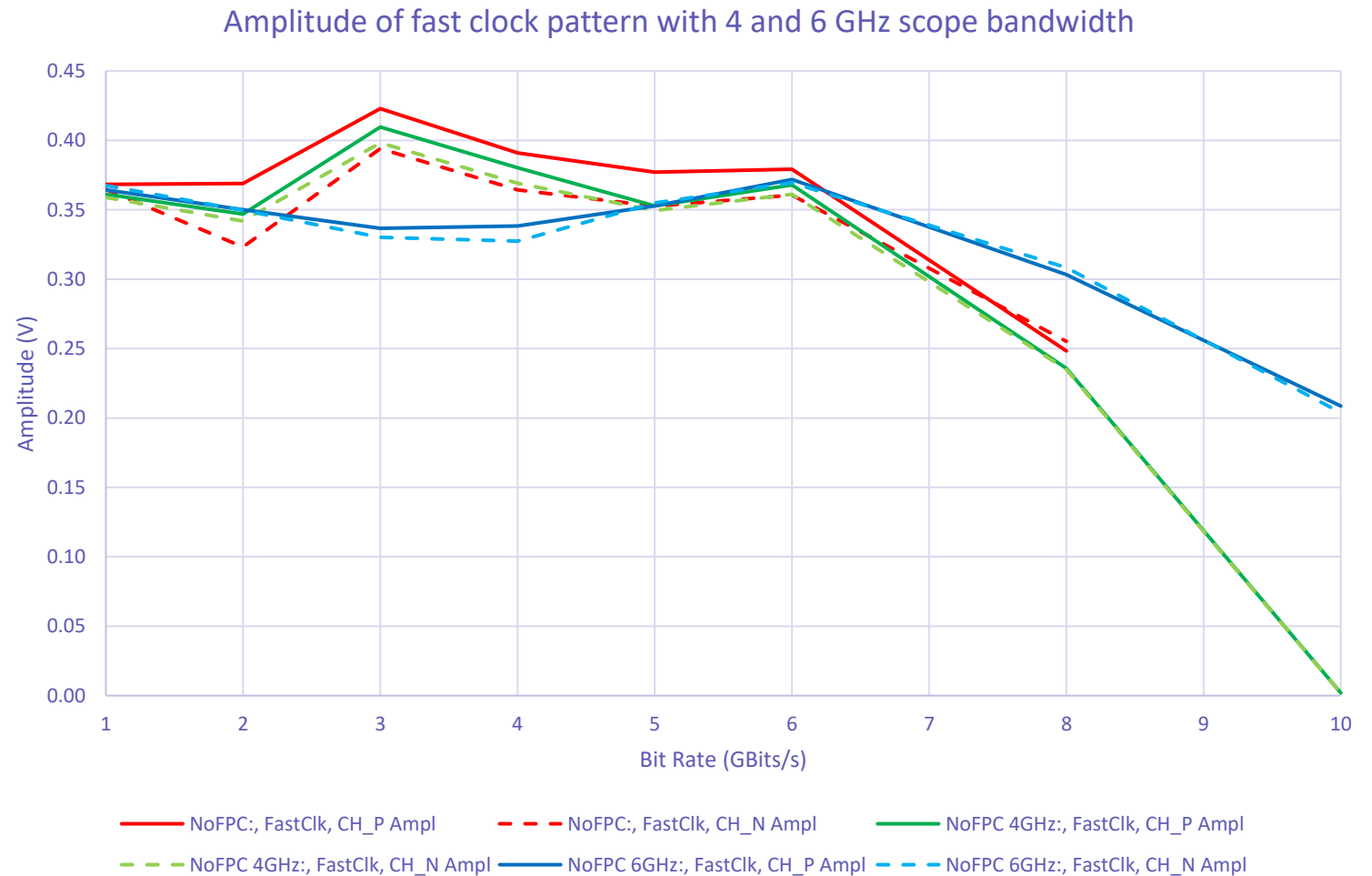
Main FPC with test
boards left and right.
Cables connected to
SCTRL1.

Termination
resistors removed
from RHS

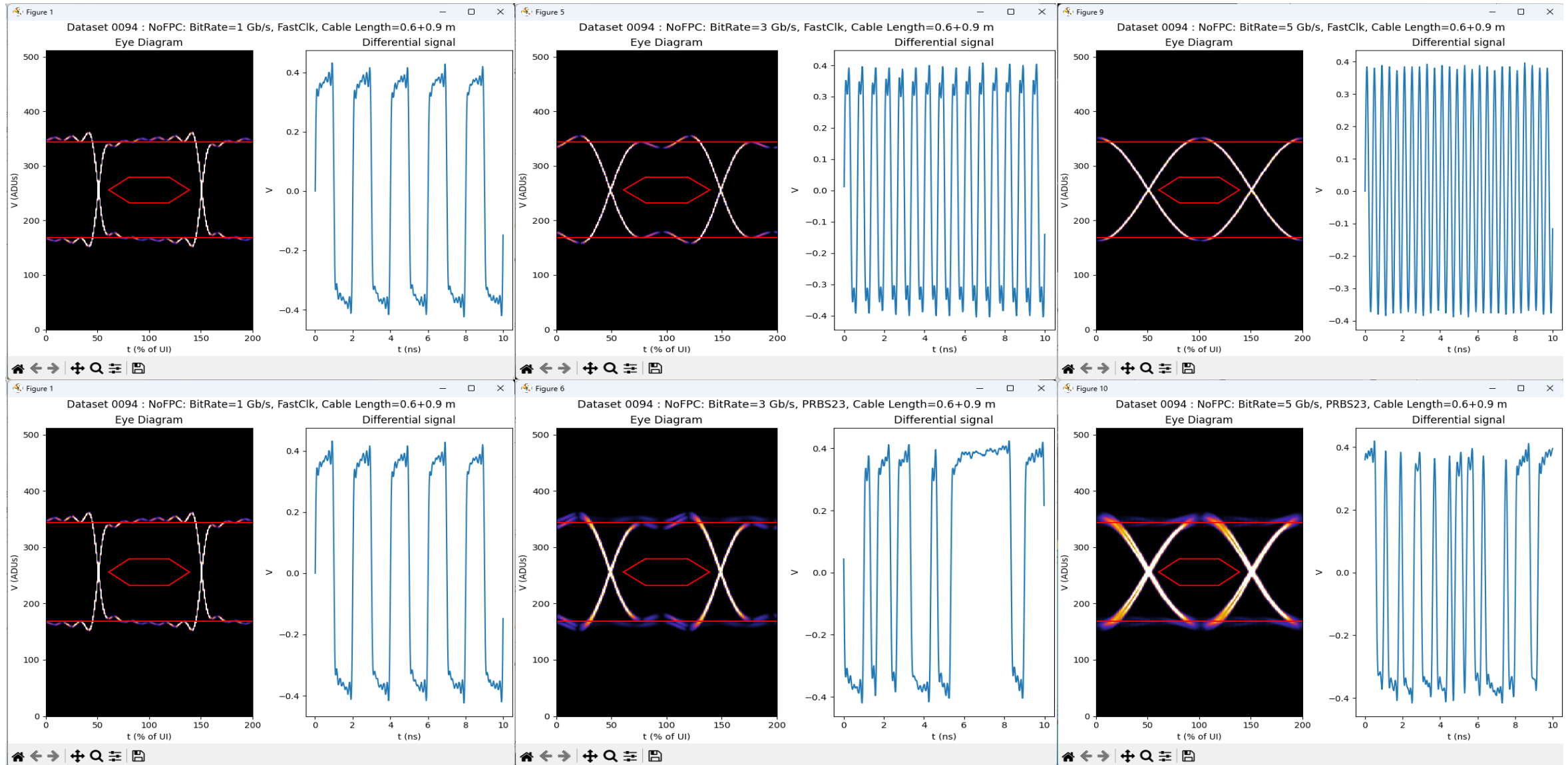


Changes from previous data

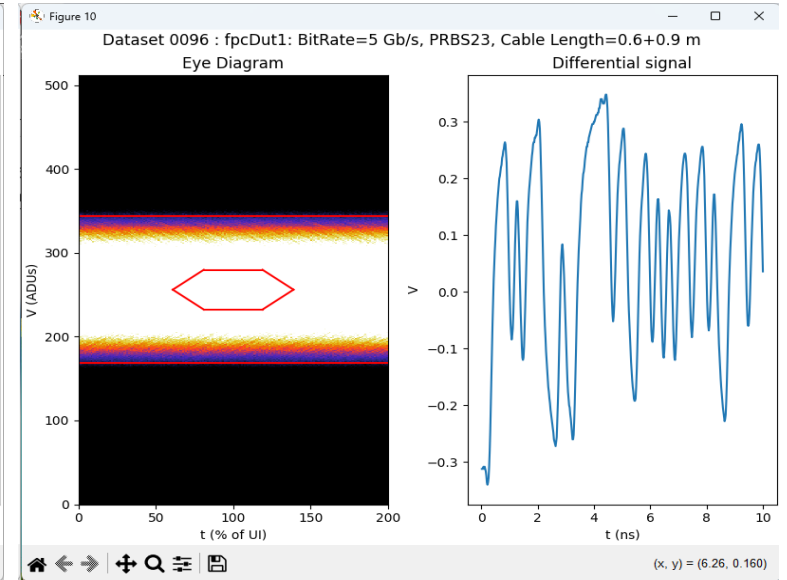
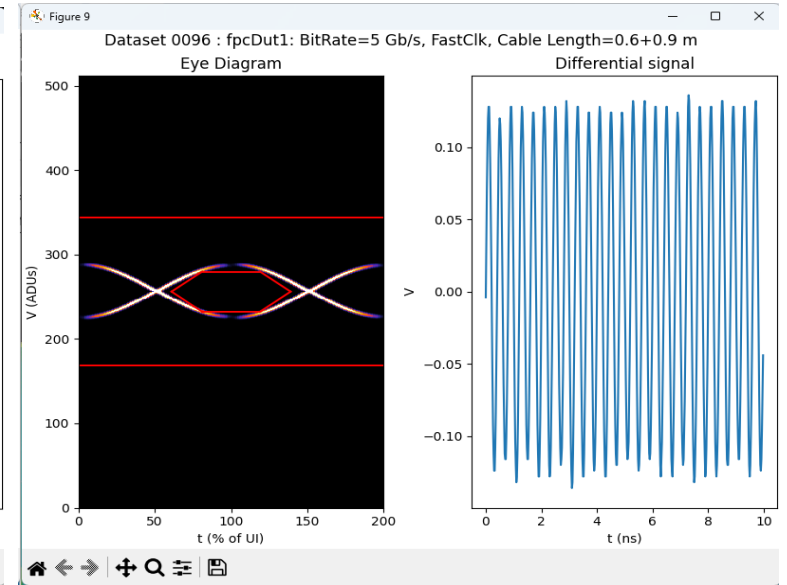
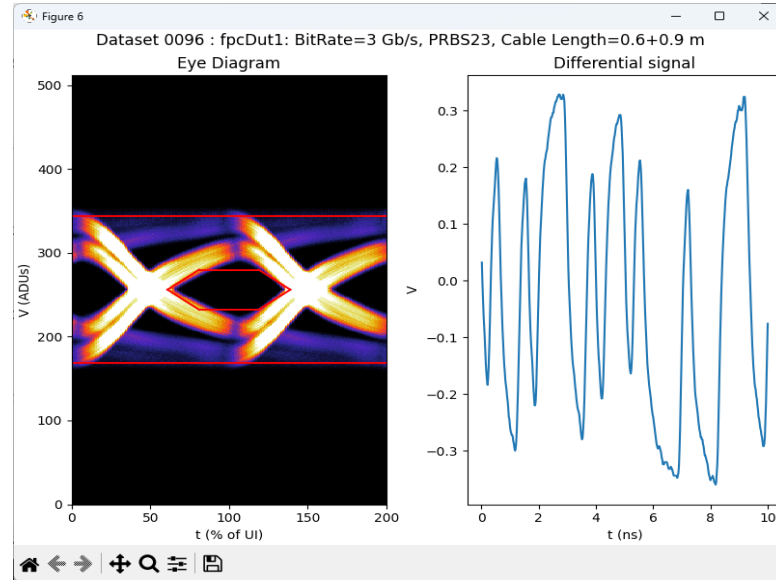
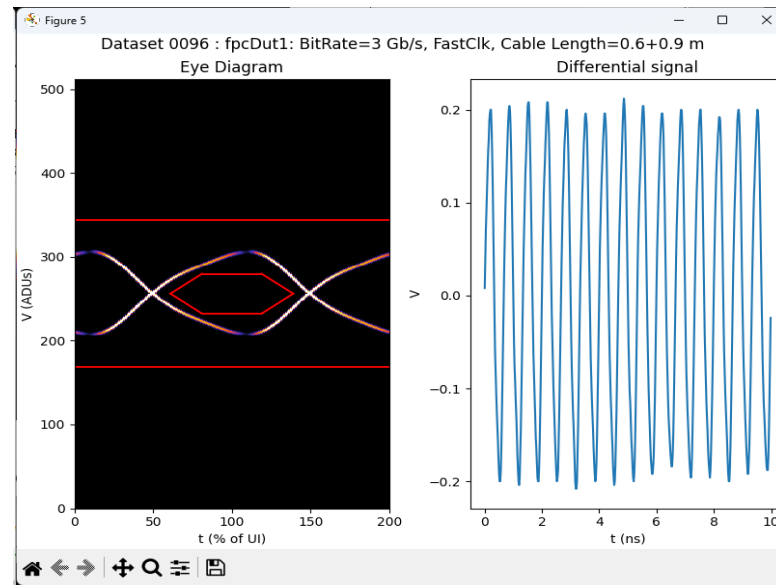
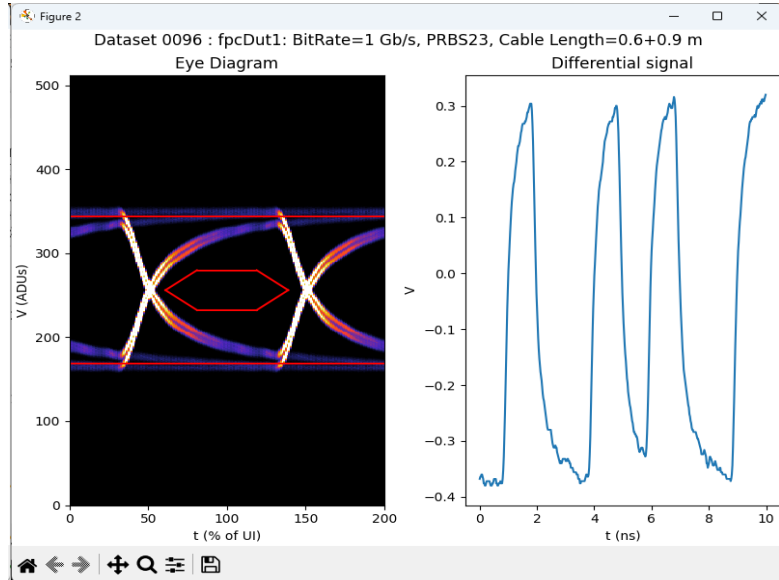
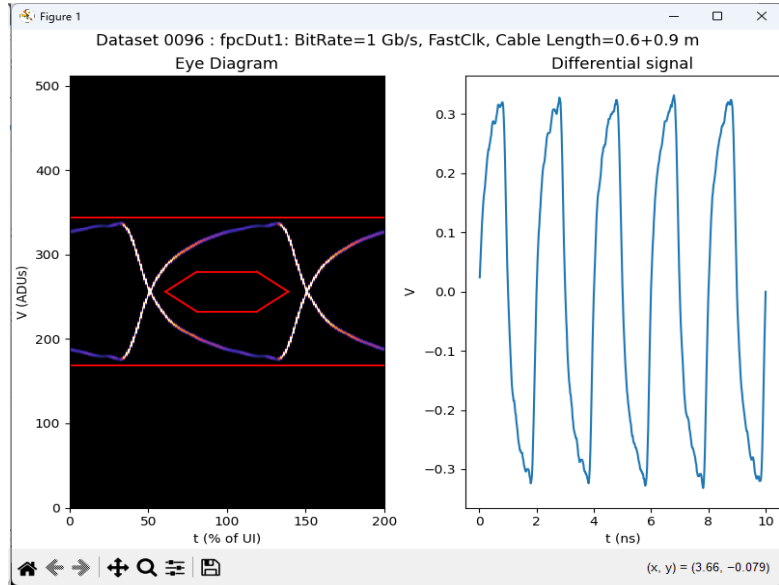
- Scope bandwidth increased to 6 GHz
- Interpolating eye diagram
- VTRX+ input mask



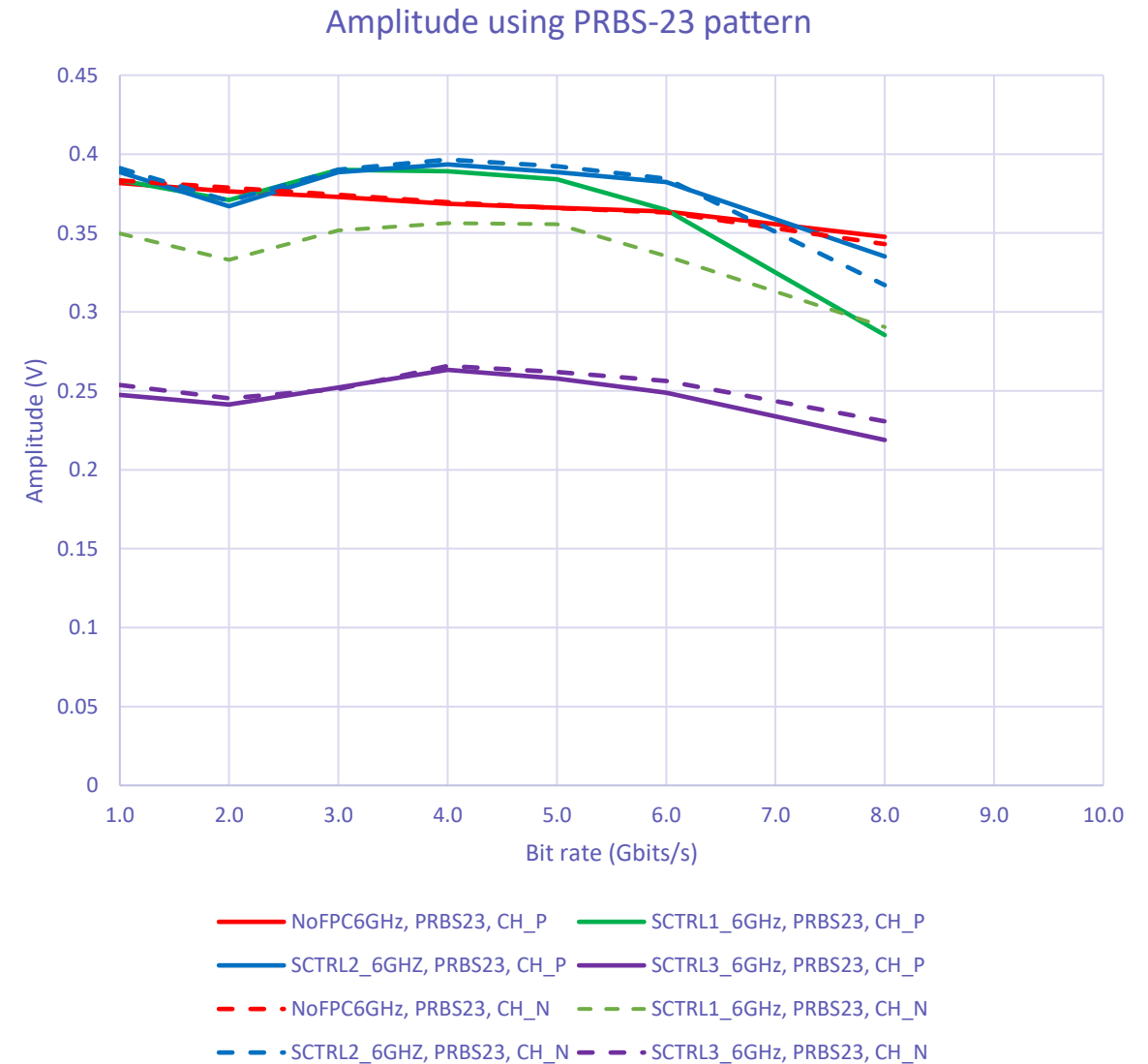
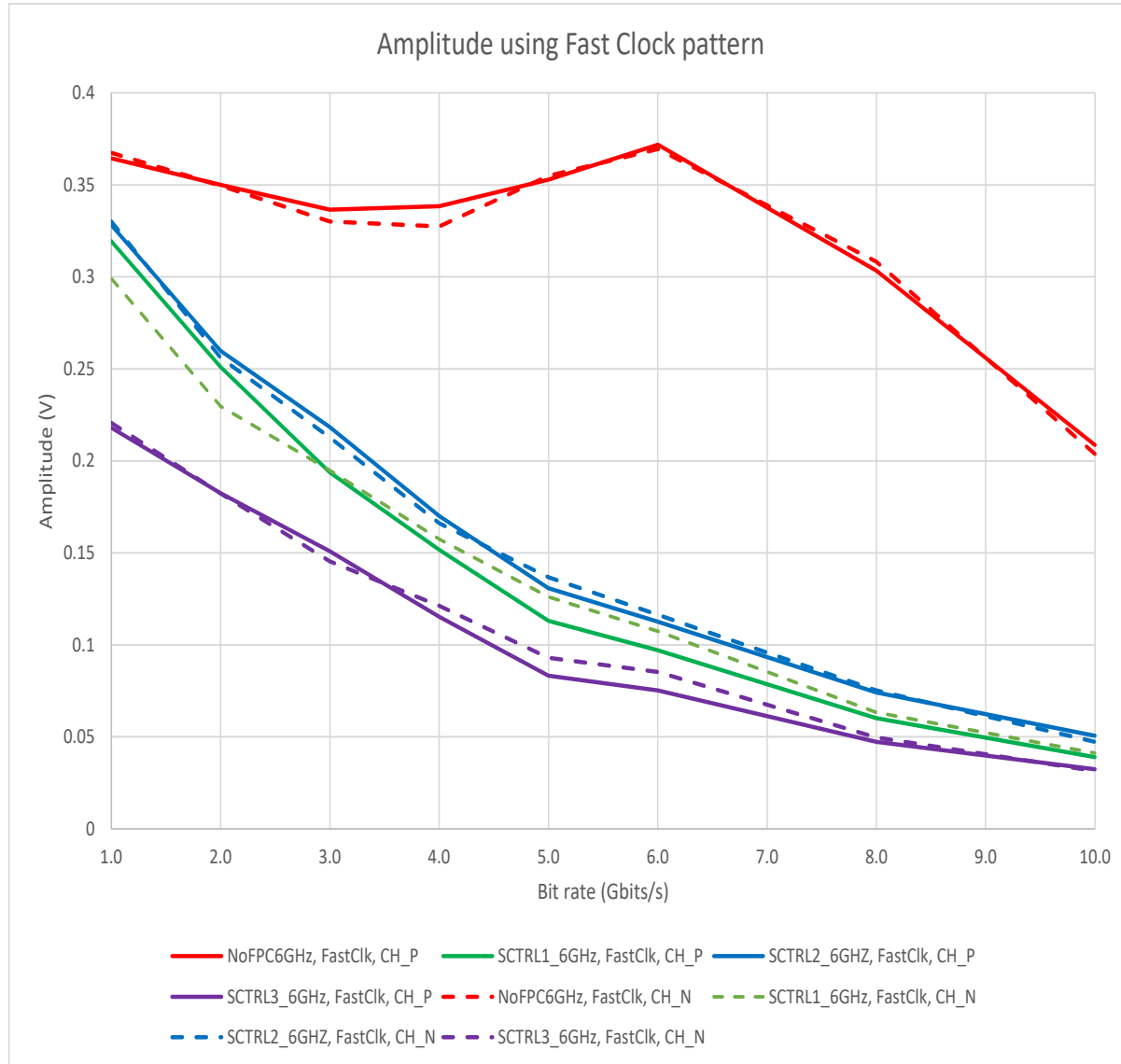
Test rig (KCU105, cables and 'scope) without FPC.



Signal transmitted via FPC SCTRL1.

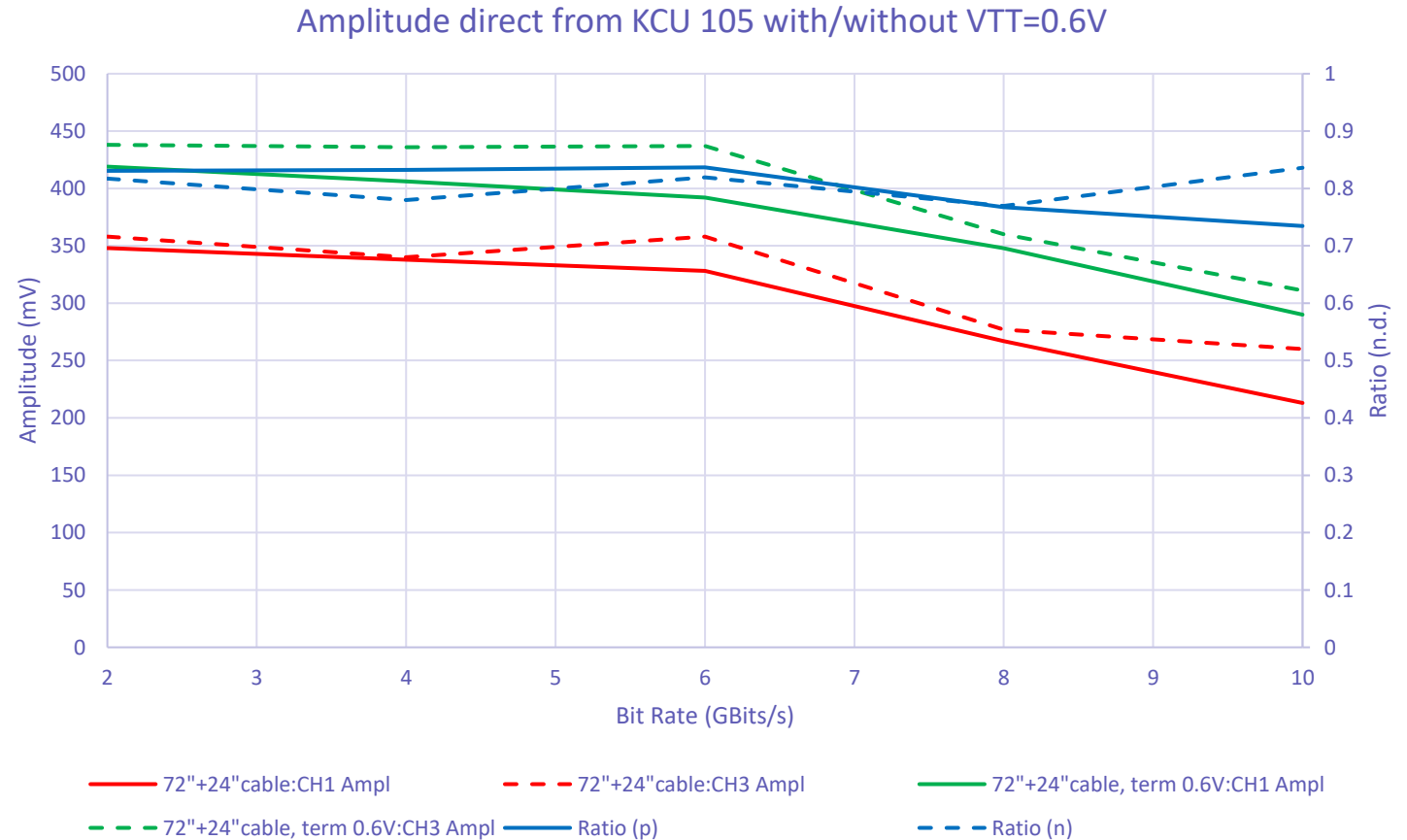


Amplitudes using Fast Clk and PRBS-23 patterns



Effect of DC path to GND compared to $V_{TT}=0.6V$

- Test results from work on er1 High-speed Test chip
- KCU105 amplitude lower when driving $50\ \Omega$ to GND
- $\approx 80\%$ of amplitude.



Transmission of the fast clock signal

Adjusted for DC coupling without FPC.

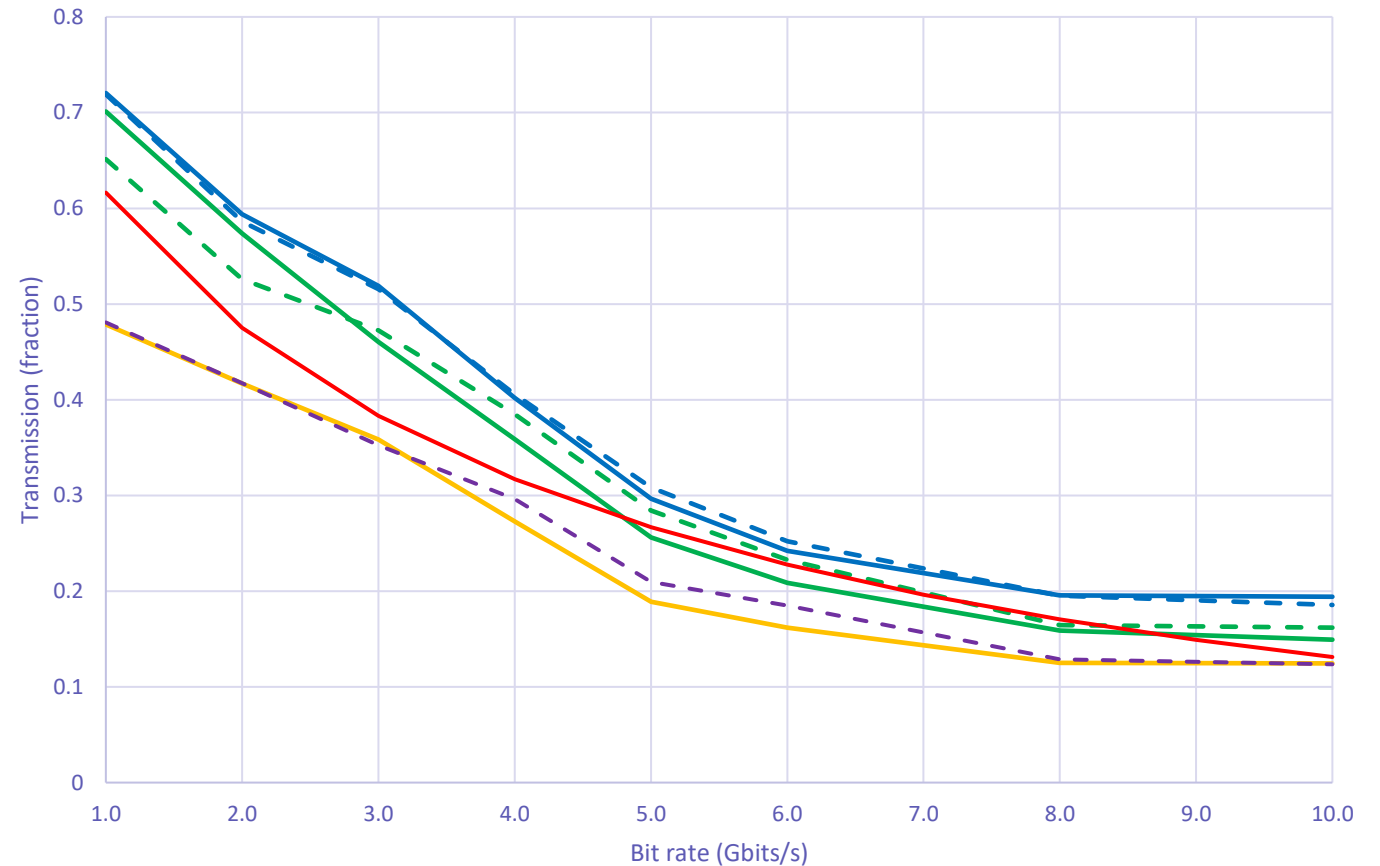
SCTRL1&2 give similar results.

SCTRL3 has lower transmission due to extra 50Ω termination.

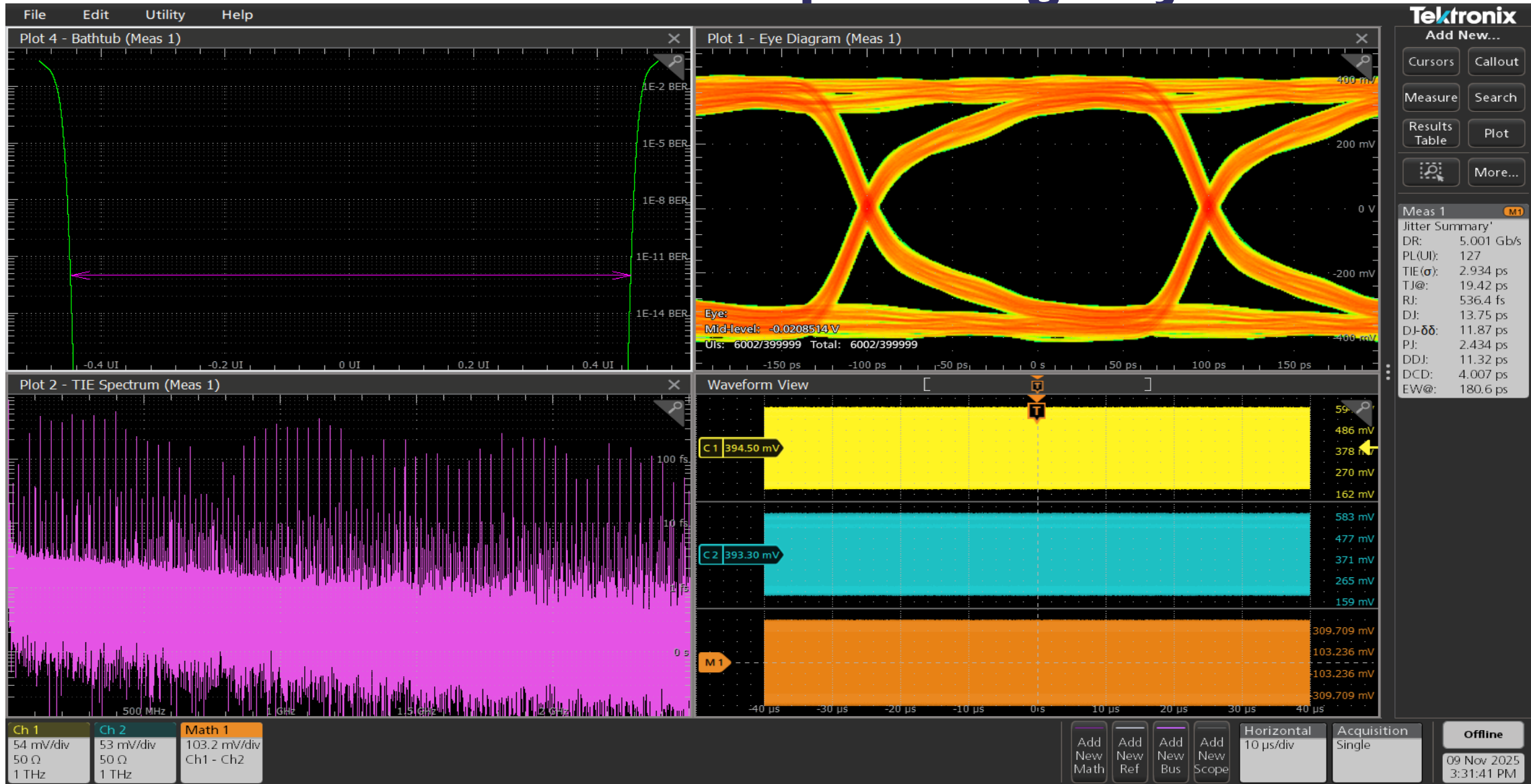
Attempt at calculating loss shown in red.

DC transmission $100/(100+2*13)=0.8$

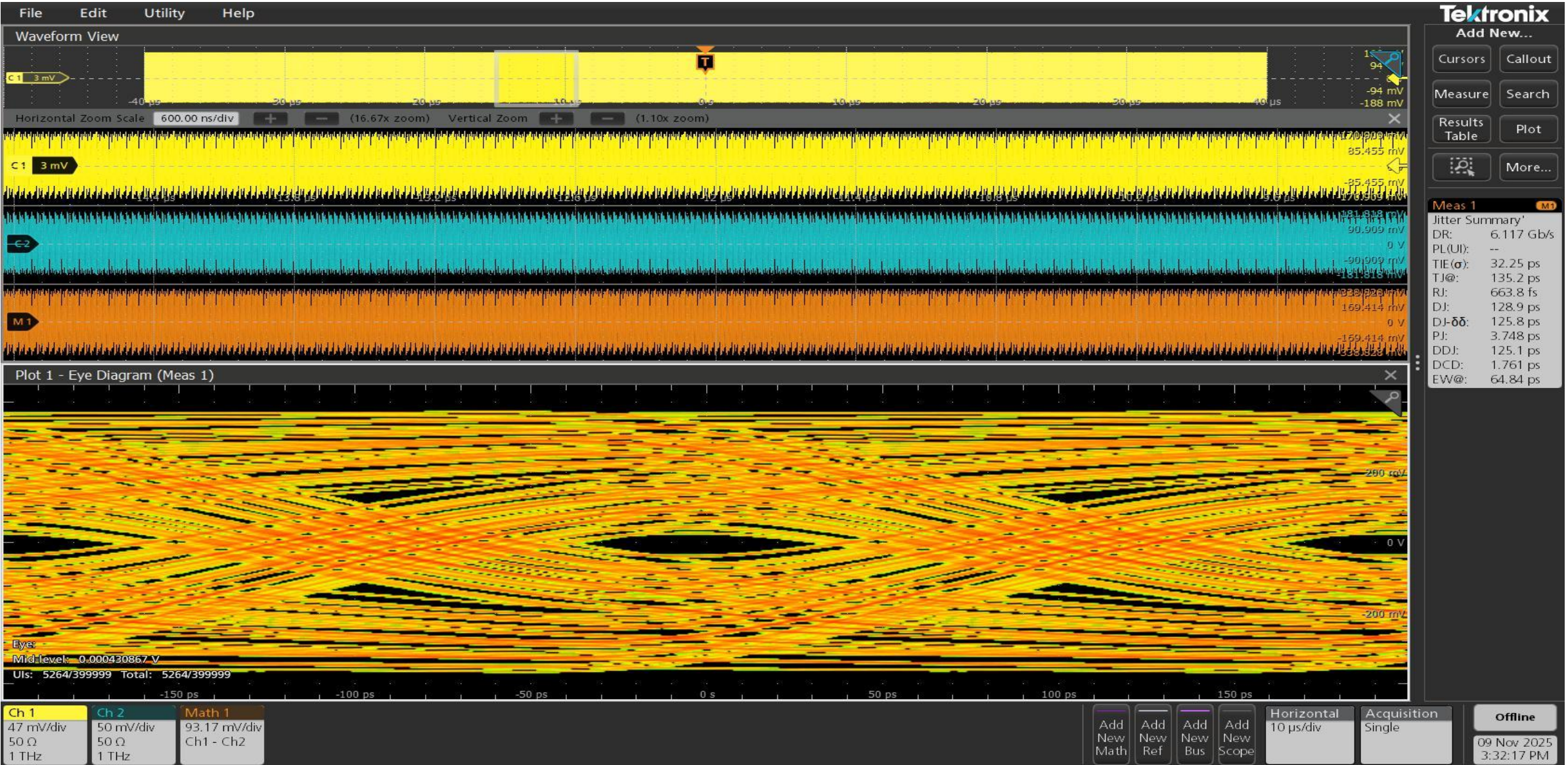
Transmission using Fast Clk pattern



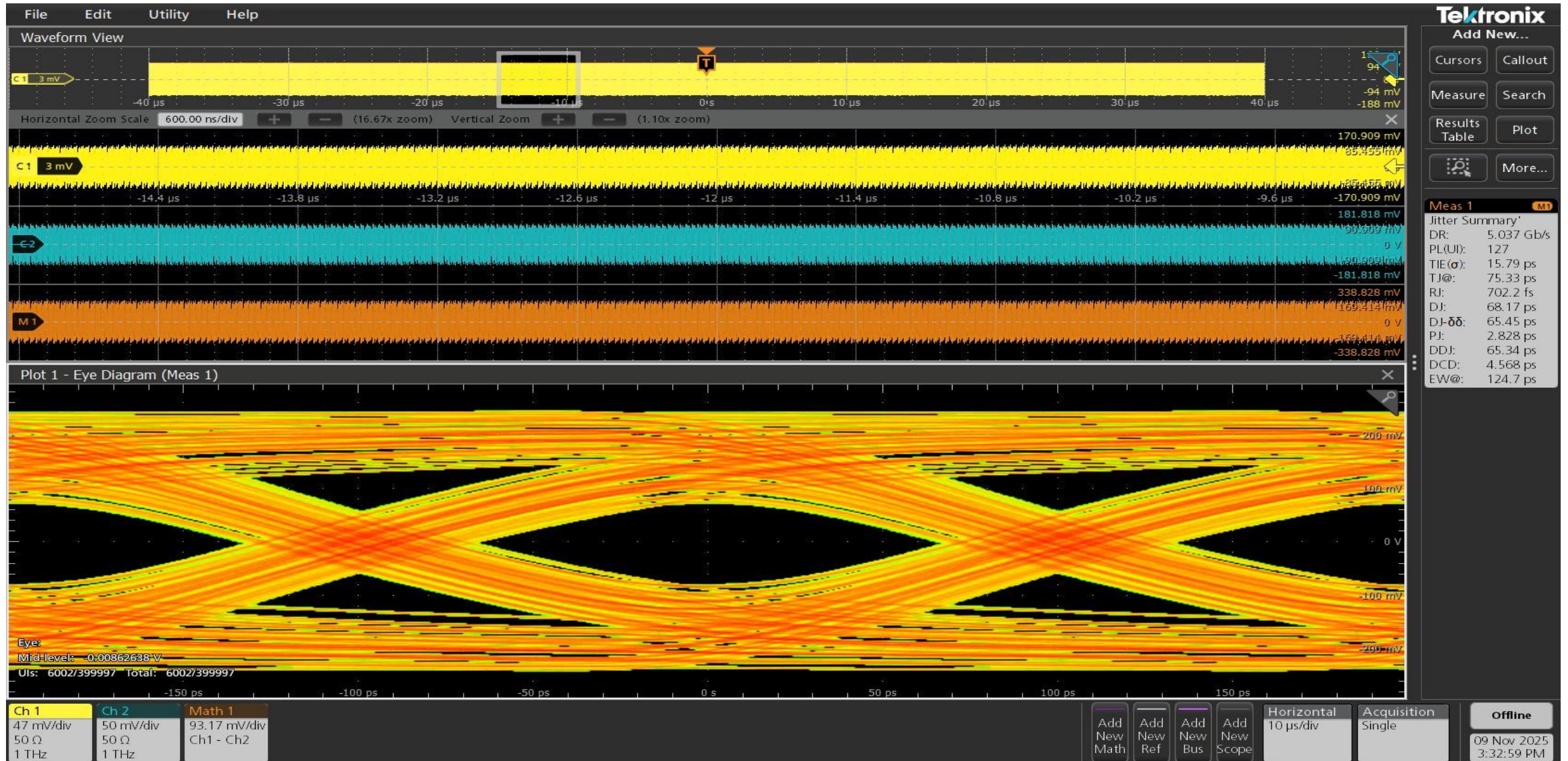
KCU105 to Tek 25 GHz scope using Crystek cables



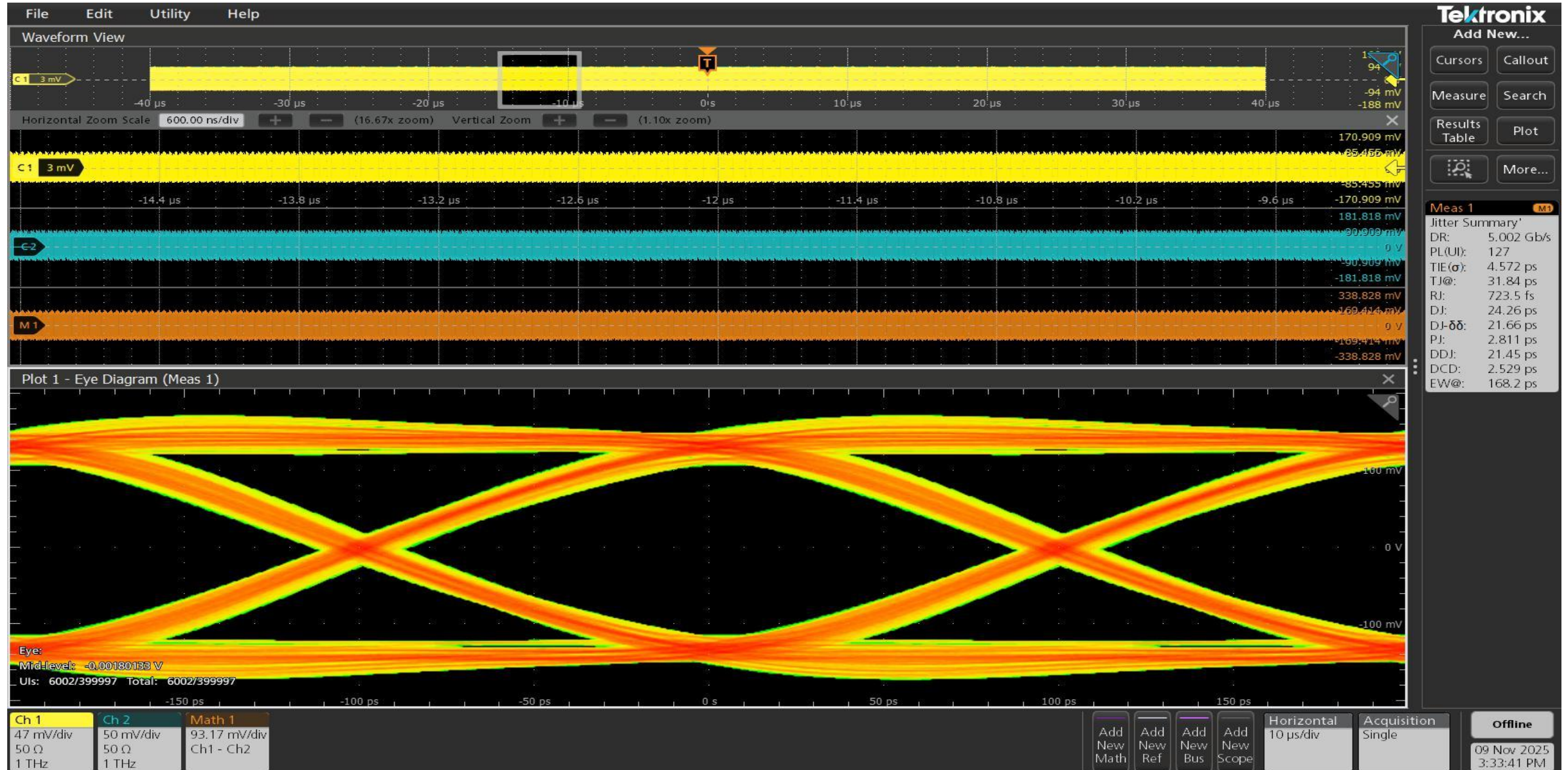
Using Main FPC SCTRL1 at 5 Gbits/s



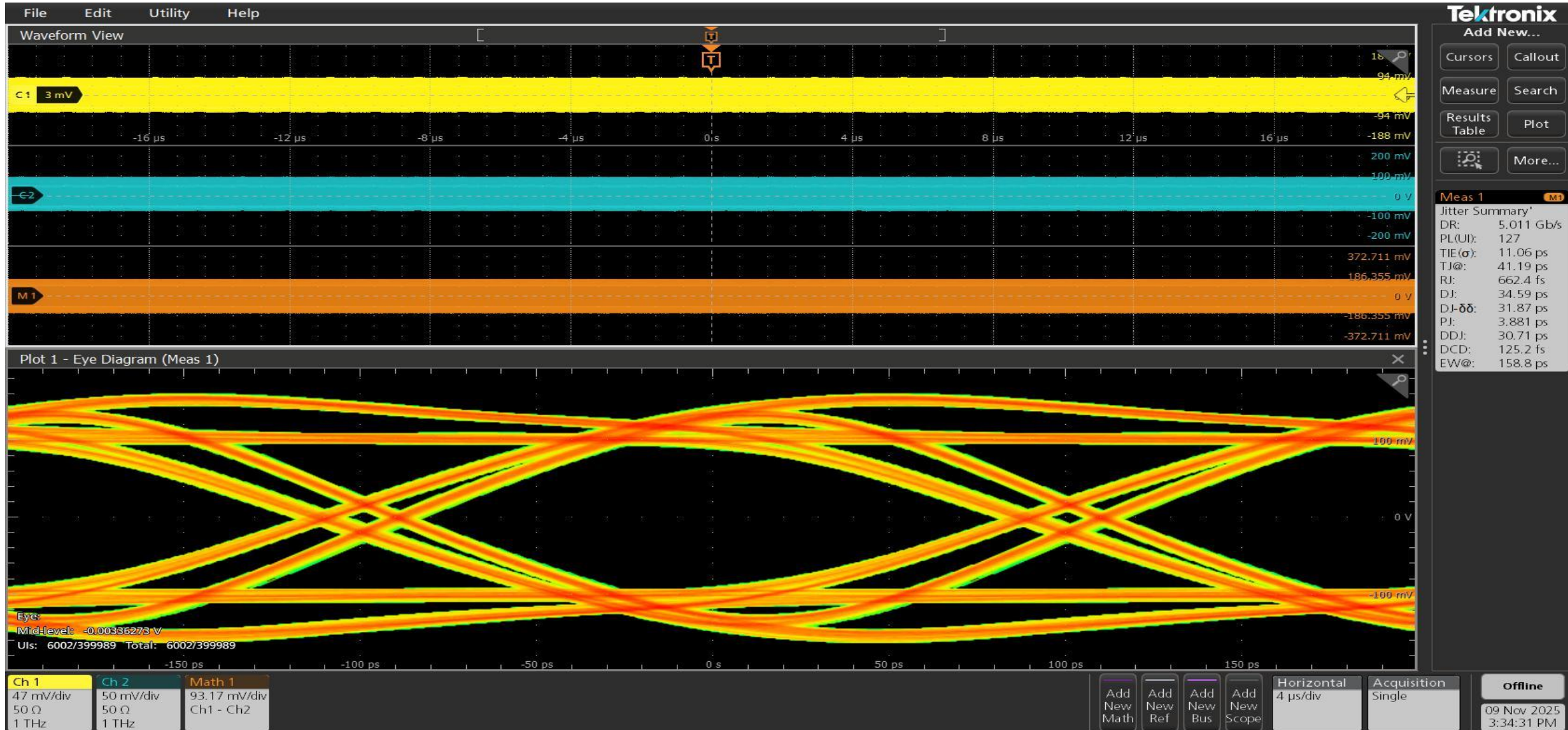
FPC SCTRL1 at 5 Gbits/s with 4 dB Post-Cursor



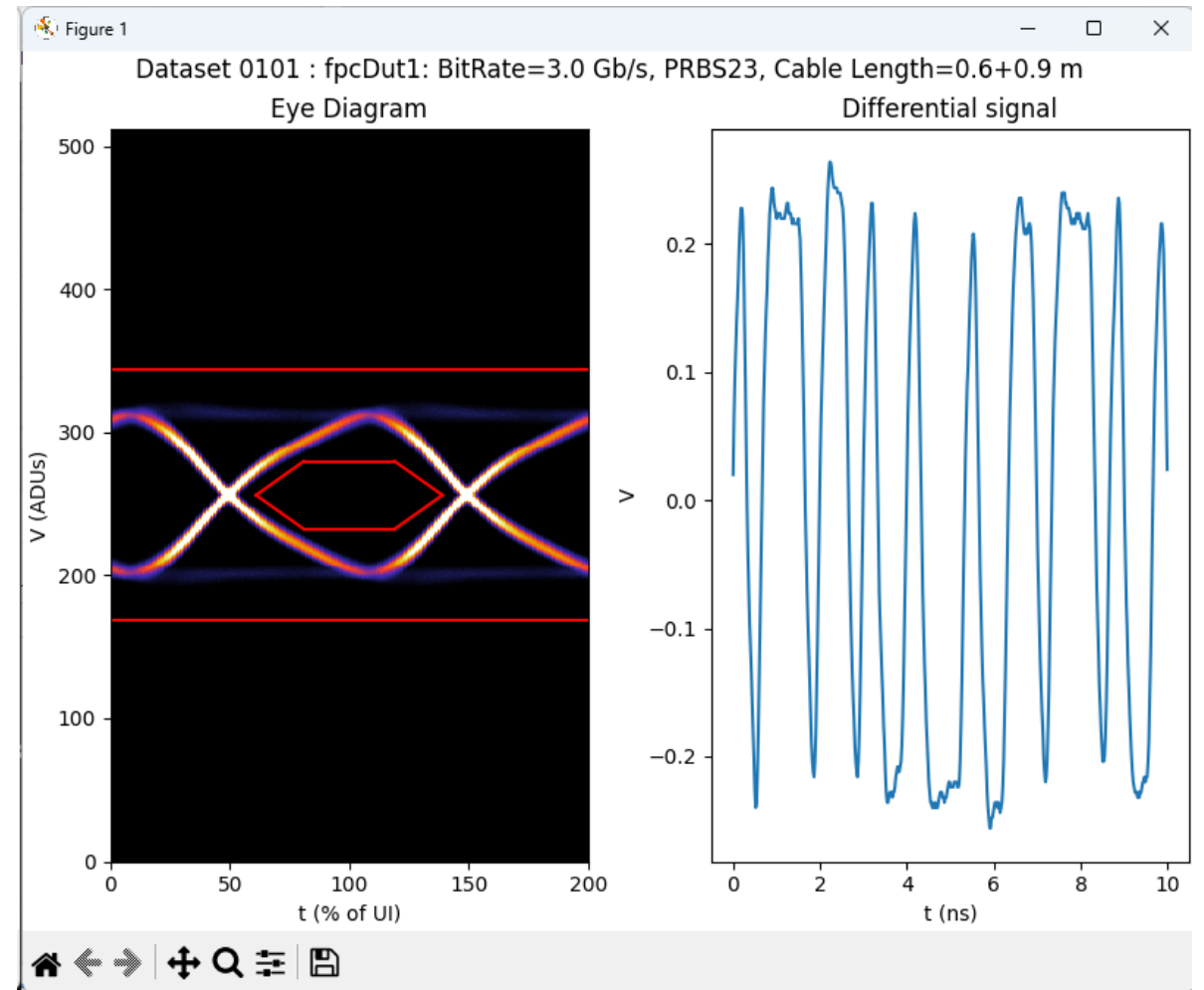
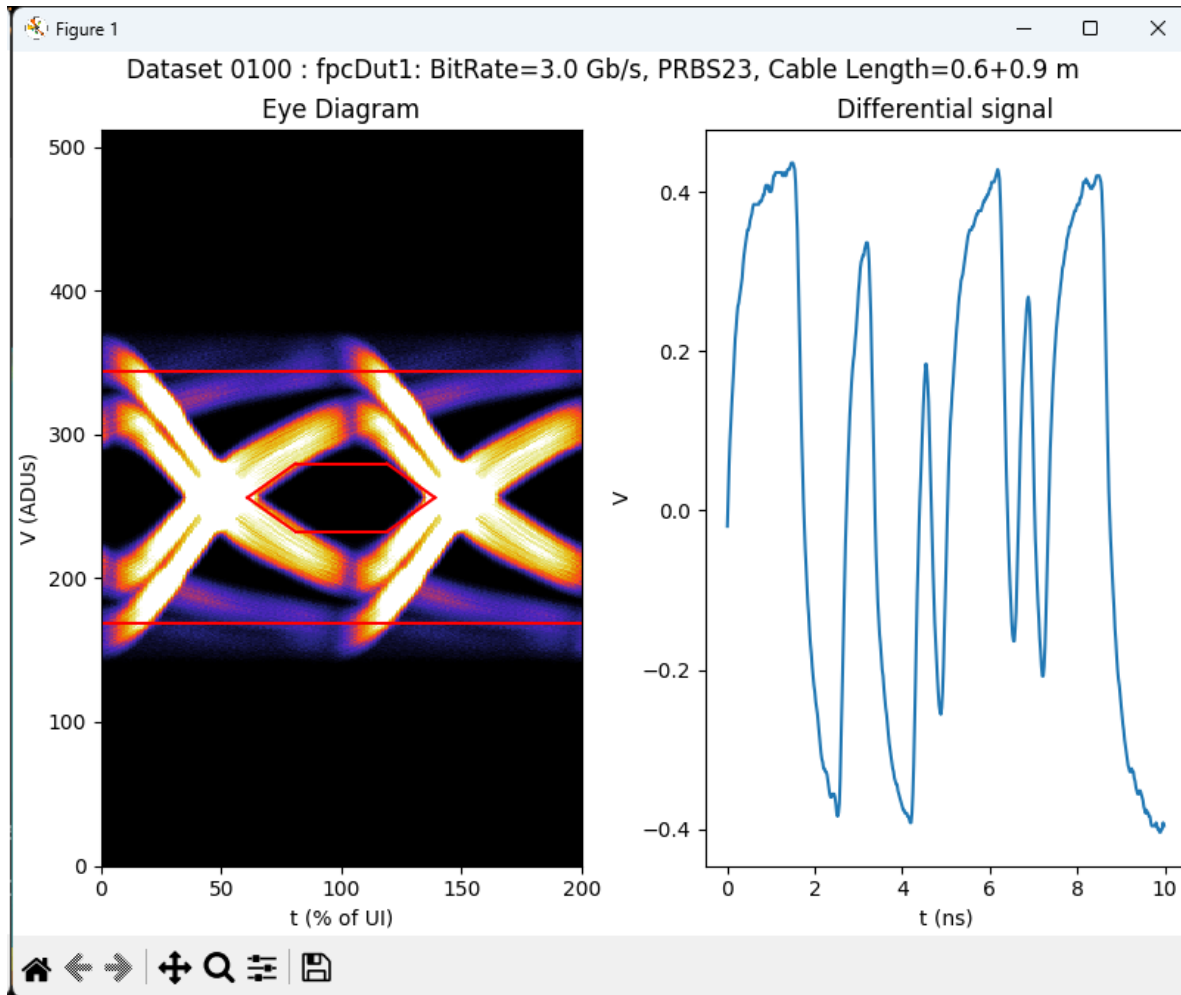
FPC SCTRL1 at 5 Gbits/s with 8.5 dB Post-Cursor



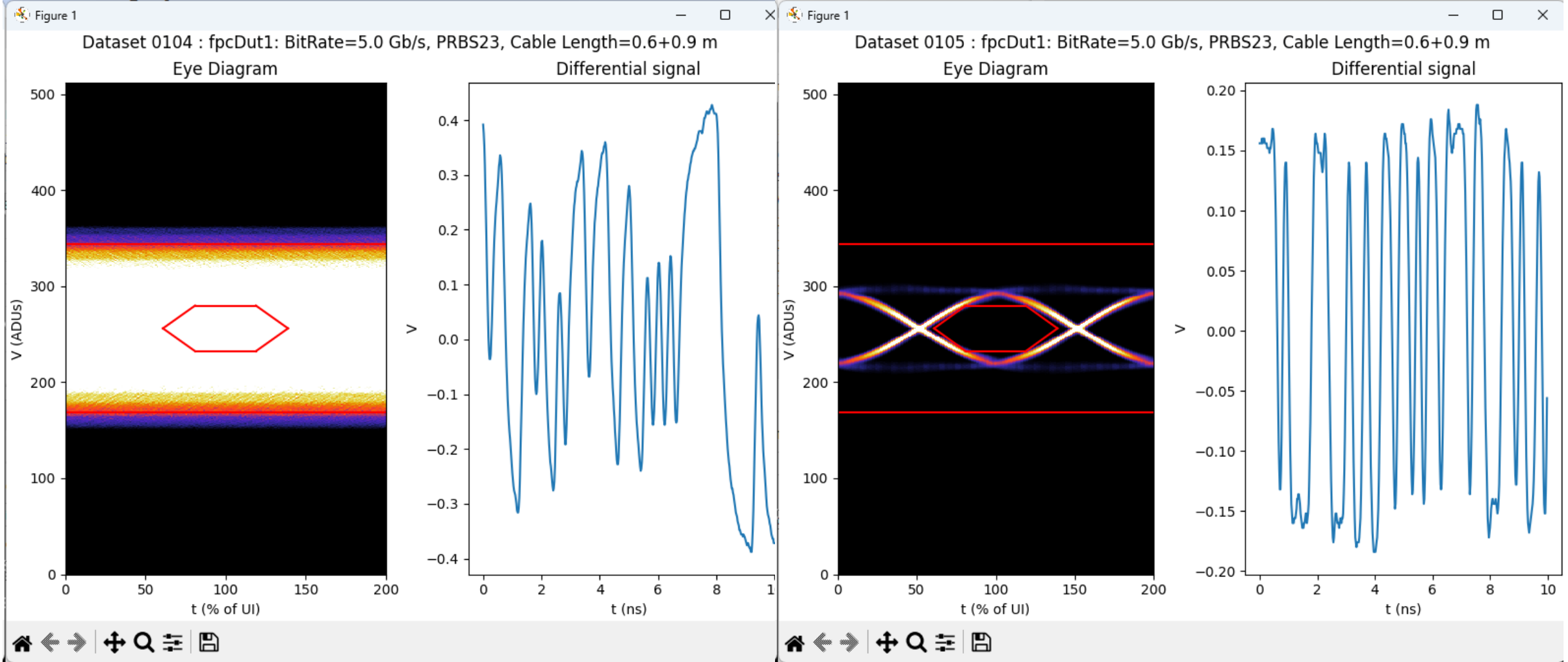
FPC SCTRL1 at 5 Gbits/s with 12 dB Post-Cursor



3 Gbits/s PRBS with and without a 6 dB post-cursor



5 Gbits/s PRBS with and without an 8.52 dB post-cursor



Eye mask specification

From: **Versatile Link+ Technical Specification, part 2.1**

EDMS Document Number: **1719329**

Table 6: VTRx+ Eye Mask Parameters.

#	Specification	X1	X2	X3	Y1	Y2	Y3
4.1.7	Tx Output Eye Mask Unit (UI = 97.66 ps)	22.5 ps	33.2 ps	42 ps	0.27 Norm. Amp.	0.35 Norm. Amp.	0.40 Norm. Amp.
4.2.5	Tx Input Eye Mask Unit (UI = 97.66 ps)	10.7 ps	30.3 ps		95 mV	350 mV	
4.4.5	Rx Output Eye Mask Unit (UI = 390.6 ps)	28.3 ps	48.8 ps		95 mV	350 mV	

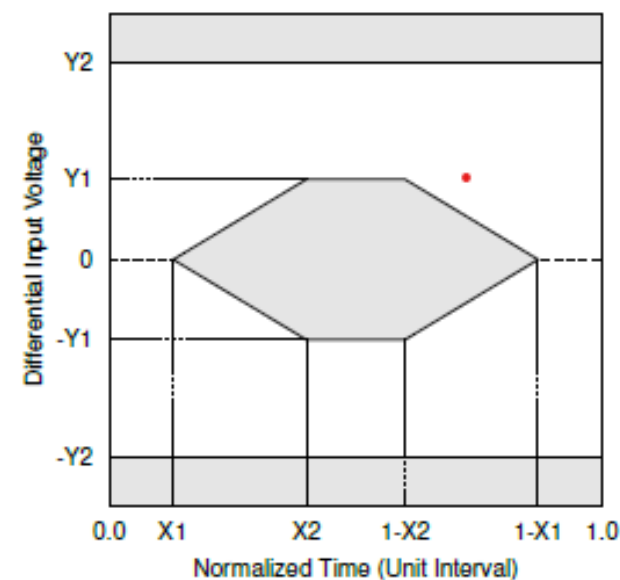
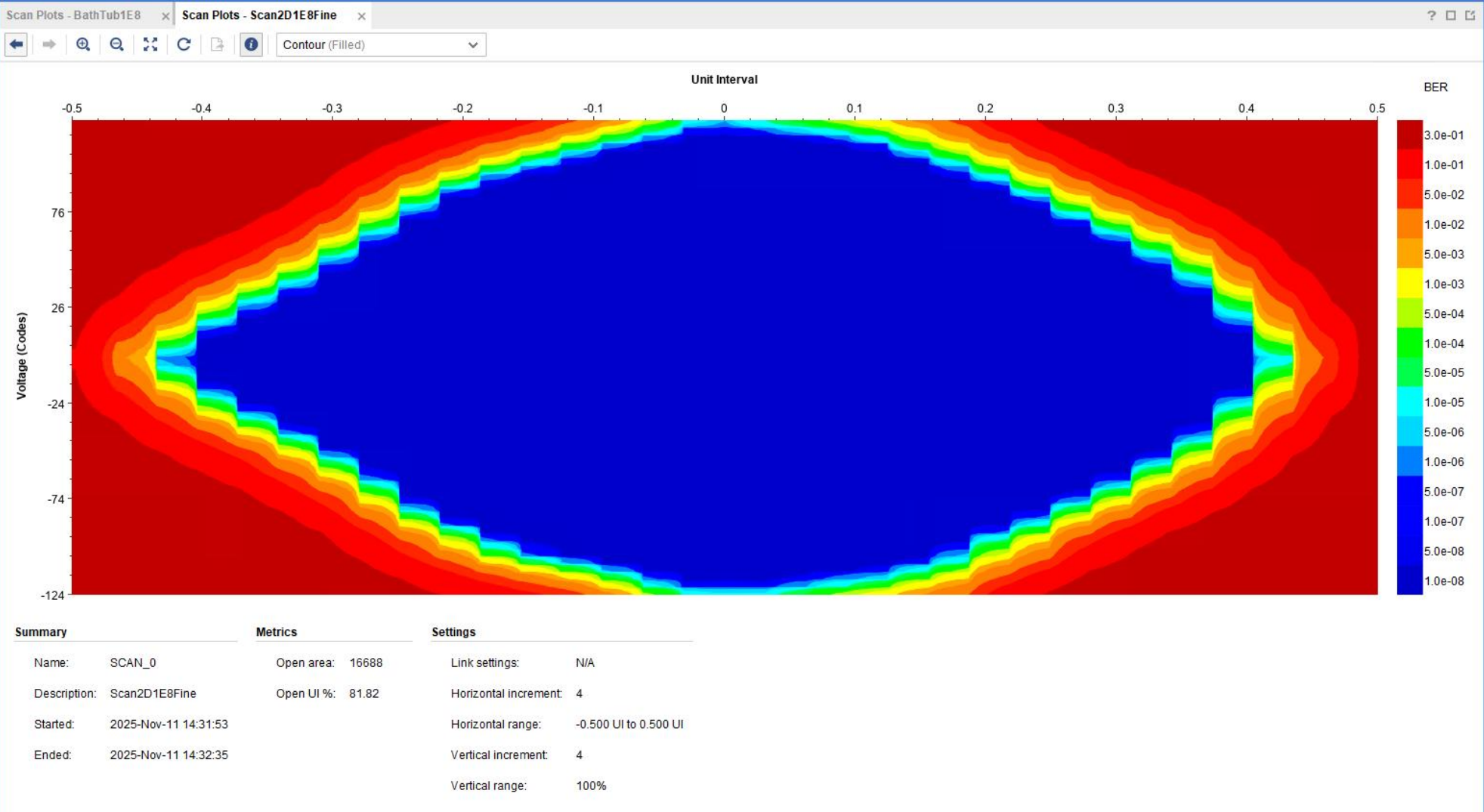
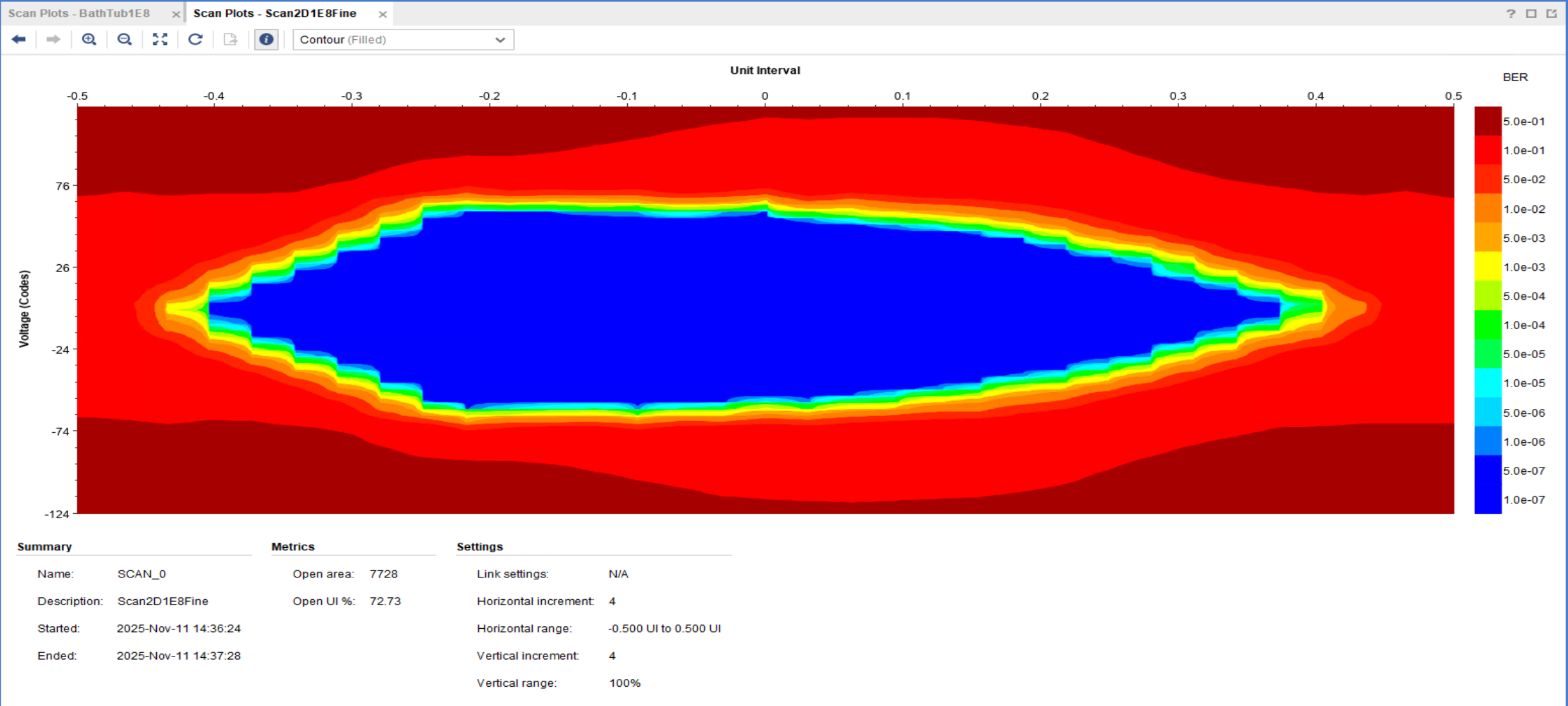


Figure 6: Electrical Eye Mask for 4.2.5 Tx Input & 4.4.5 Rx Output

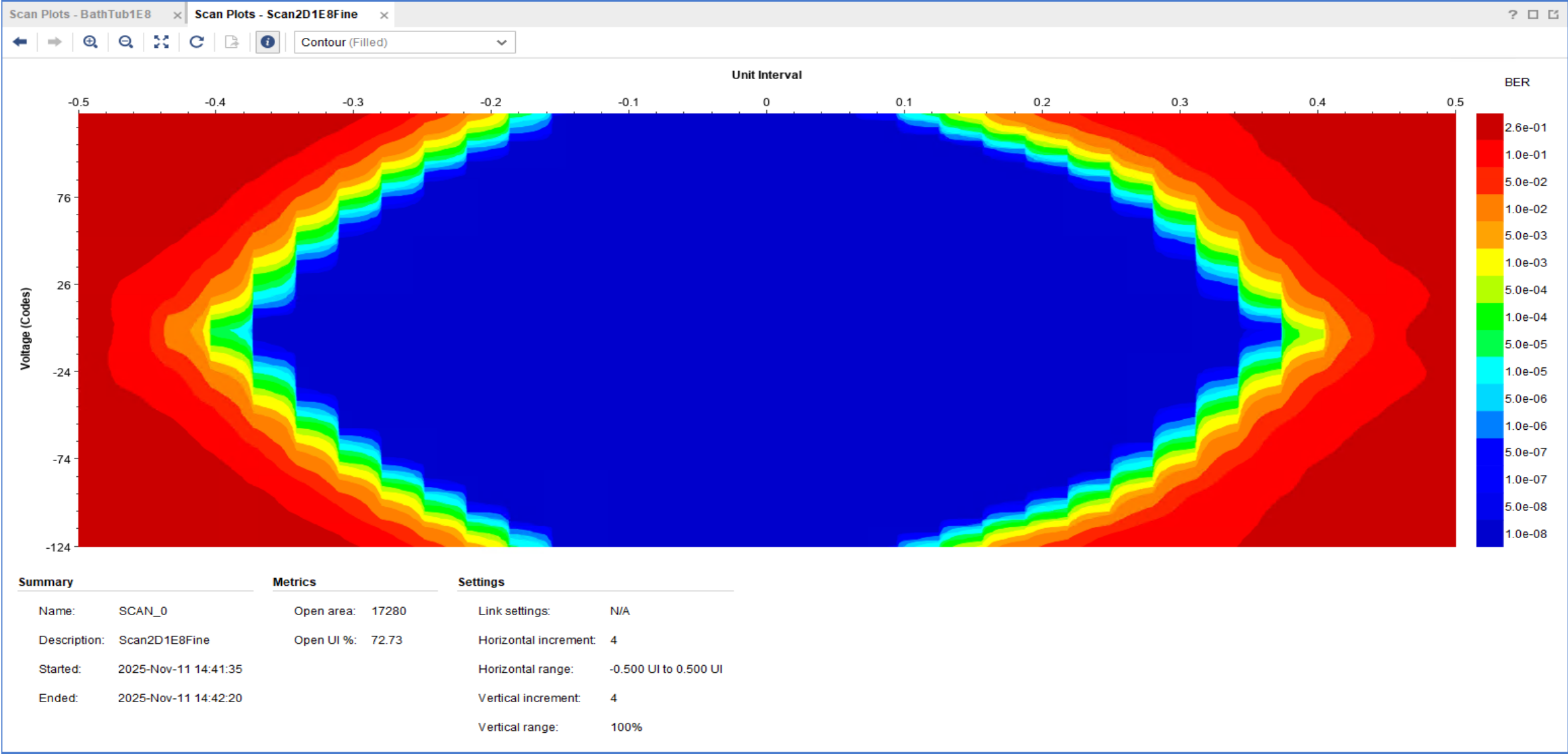
Ibert scans using Vivado, 5GBits/s, No DFE, No Post-Cursor. LPM linear equaliser in use.



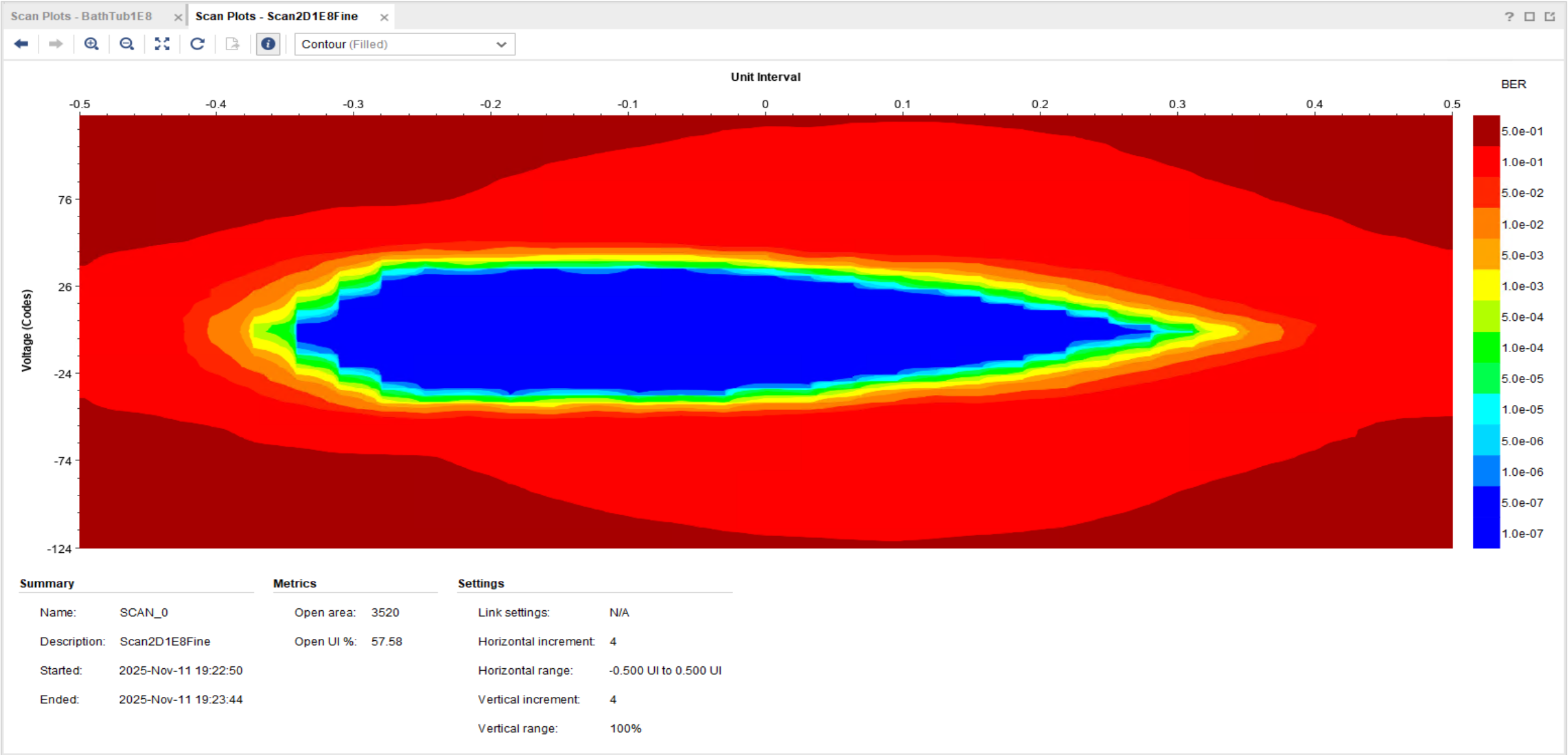
5GBits/s, With DFE, No Post-Cursor.



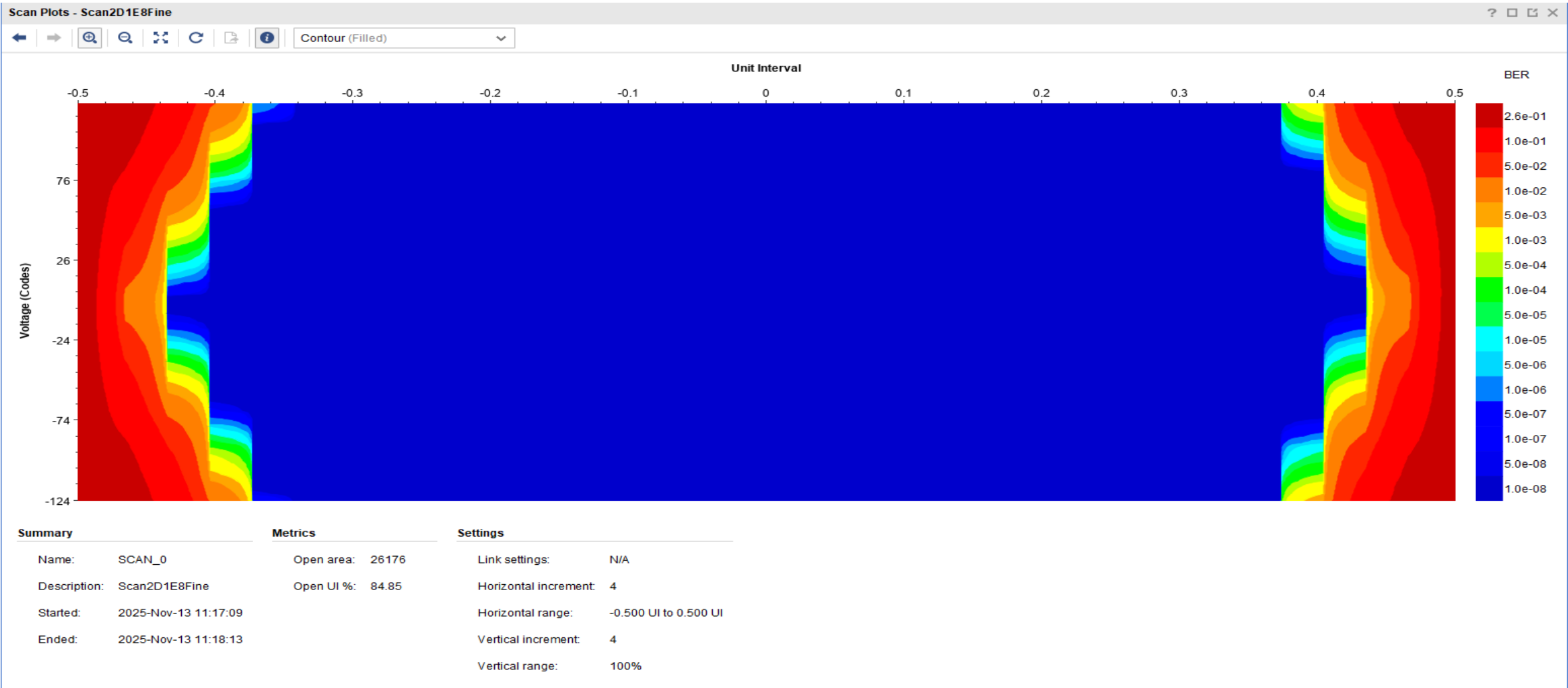
5GBits/s, No DFE and 8.5 dB Post-Cursor.



5GBits/s, With DFE and 8.5 dB Post-Cursor.



5GBits/s, No FPC No DFE No Post-Cursor.



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Testing just the cables, note larger amplitude and faster rise time.