

The CHARA Delay Lines Performance Status

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+ CHARA

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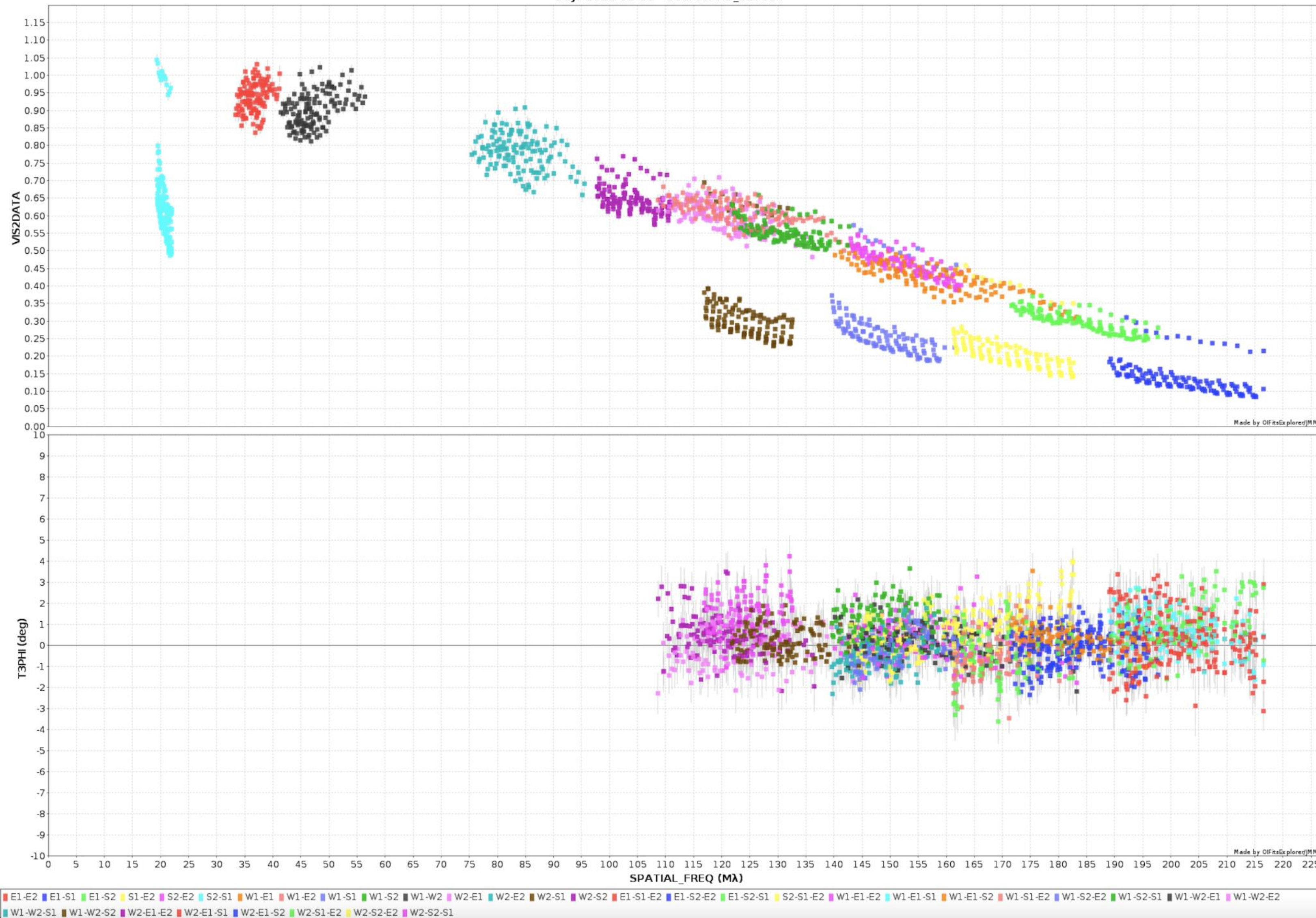
Introduction

- S1 visibility loss problem (solved)
- High RMS errors (pending)

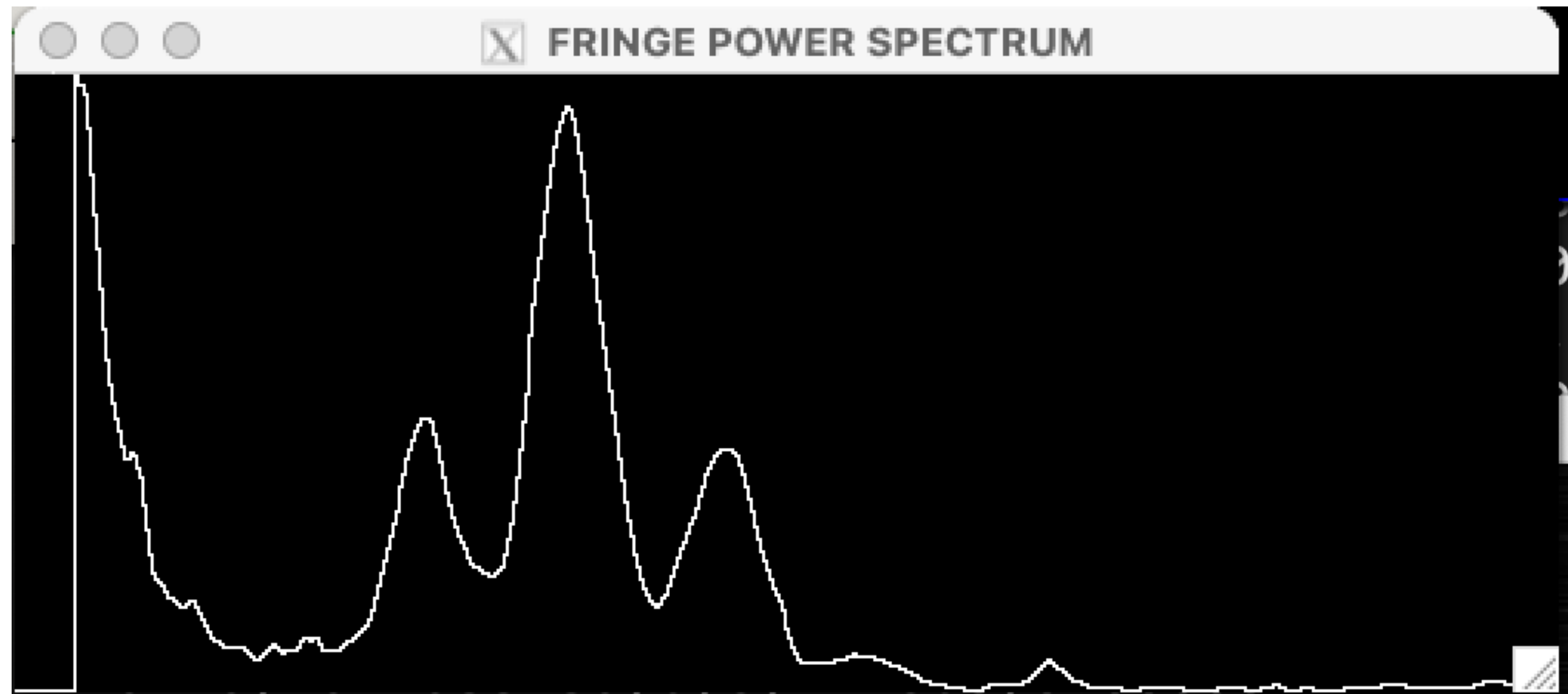
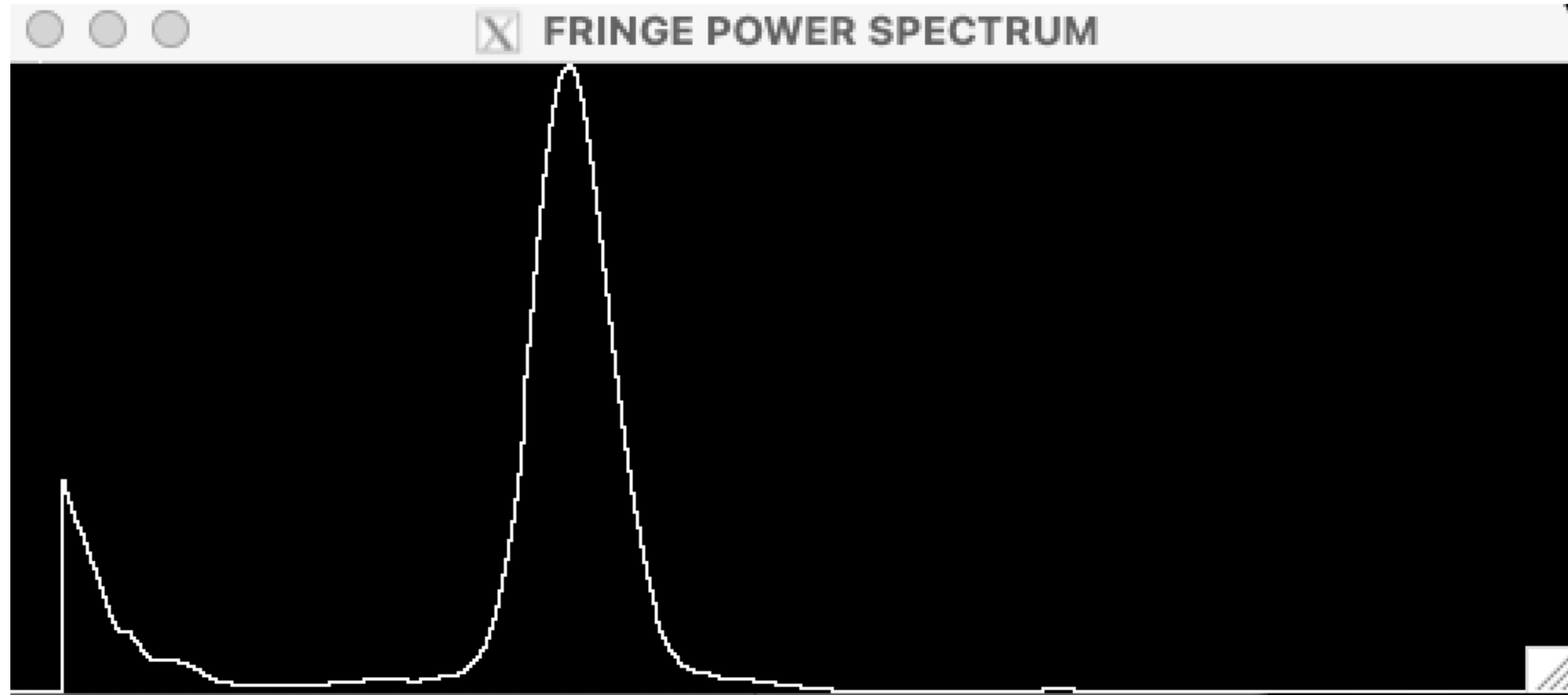
Huge efforts

- Spent months and months of time
- Developed several tools and power spectrum plots to understand the problem
- Played with how we communicate with carts (velocity mode, ramp mode)
- Several nights of on-sky time to understand S1 visibility problem
- Create lab fringes and move the delay lines to understand the S1 problem

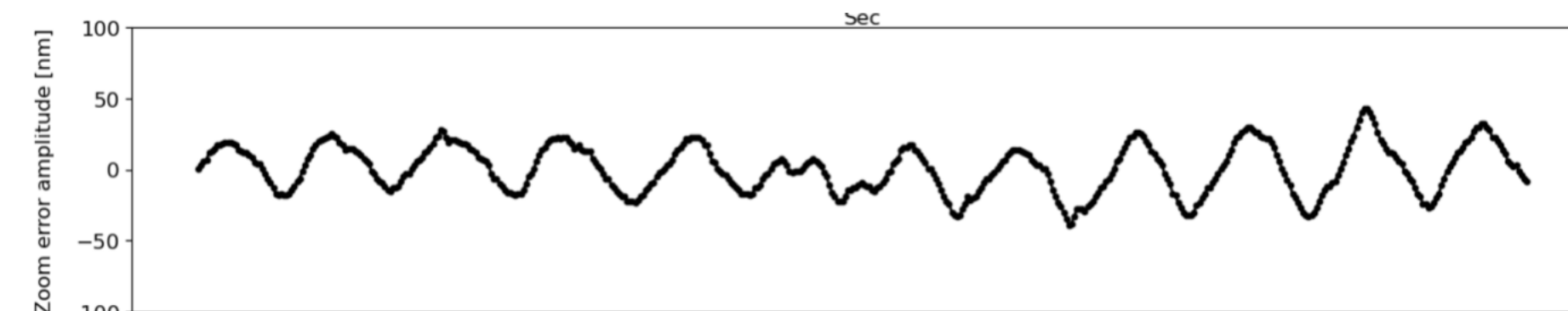
S1 visibility problem



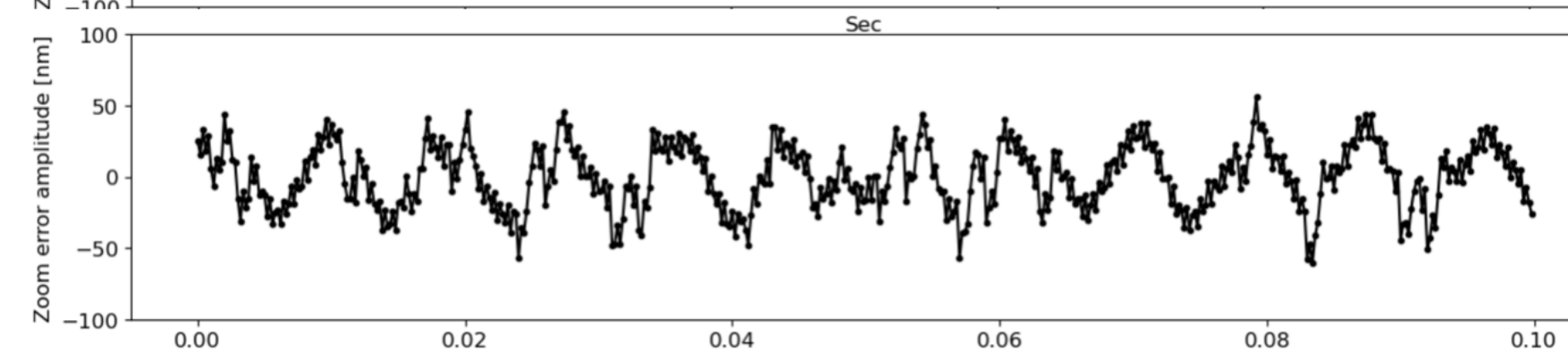
S1 visibility (solved on Oct 19, 2023)



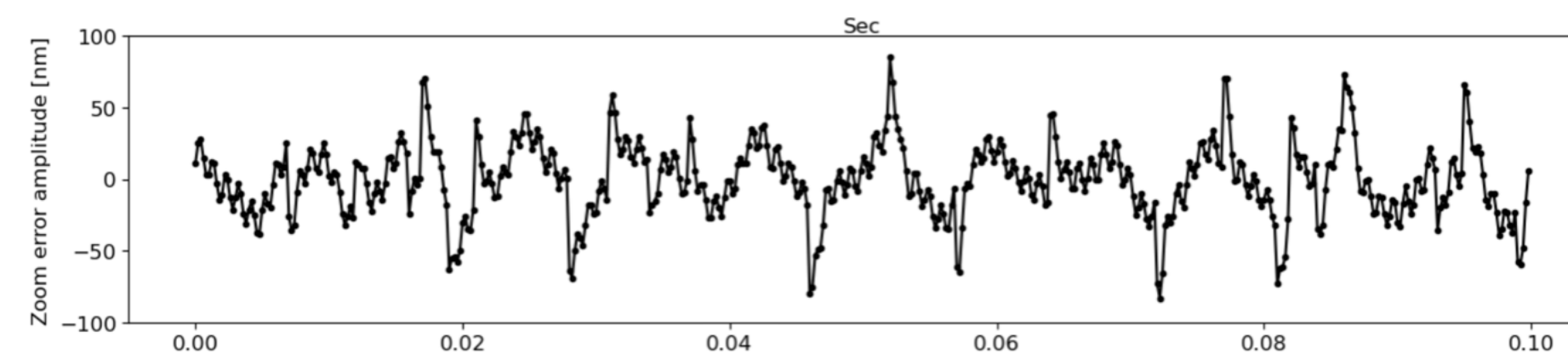
Understanding the source of errors



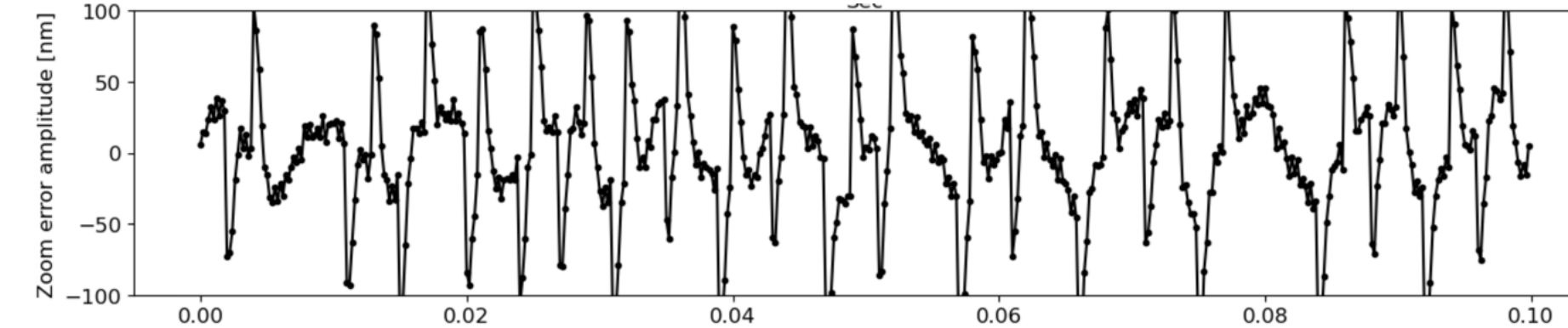
(A) Not moving or tracking target position



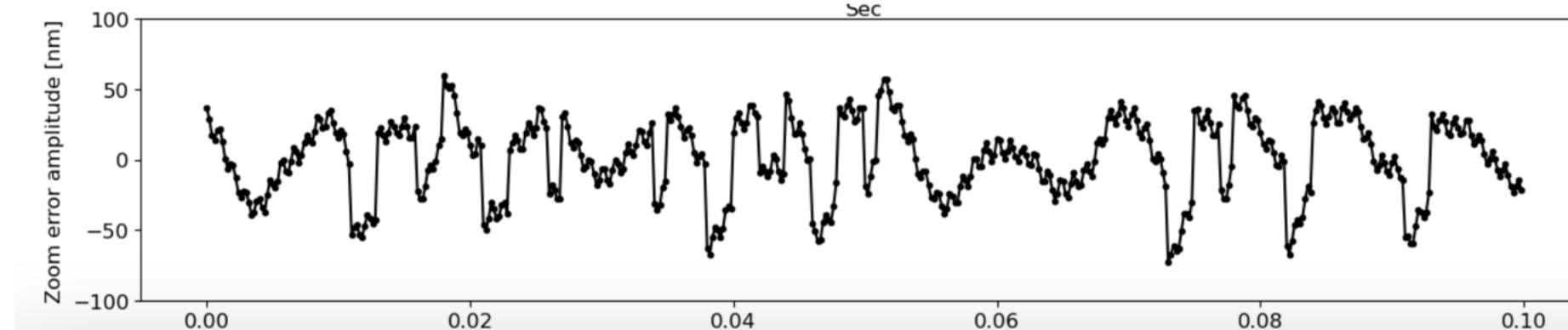
(B) Moving 1.5 mm/s



(C) Moving 2 mm/s, started to see extra vibrations

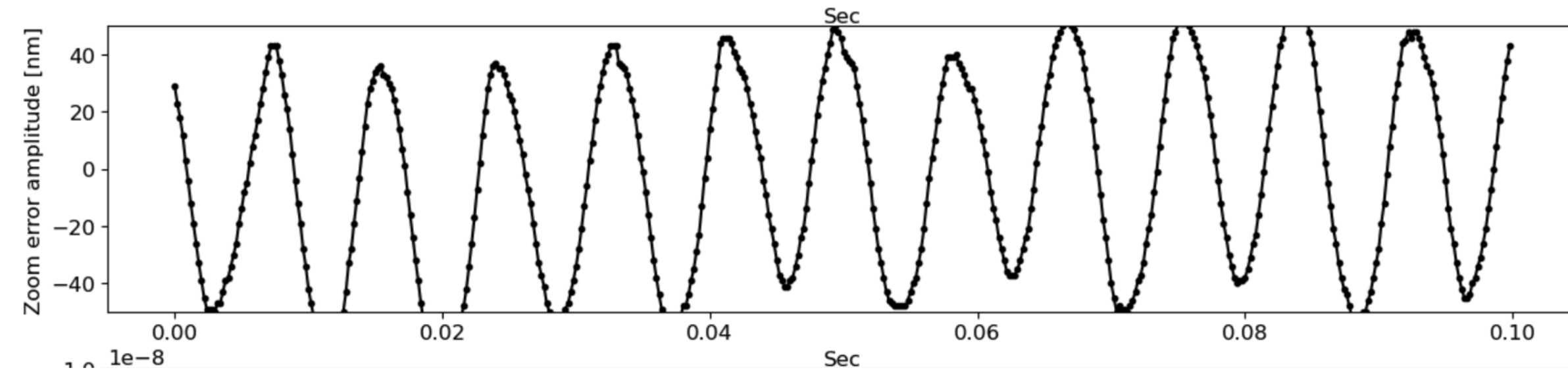


(D) Moving 4 mm/s

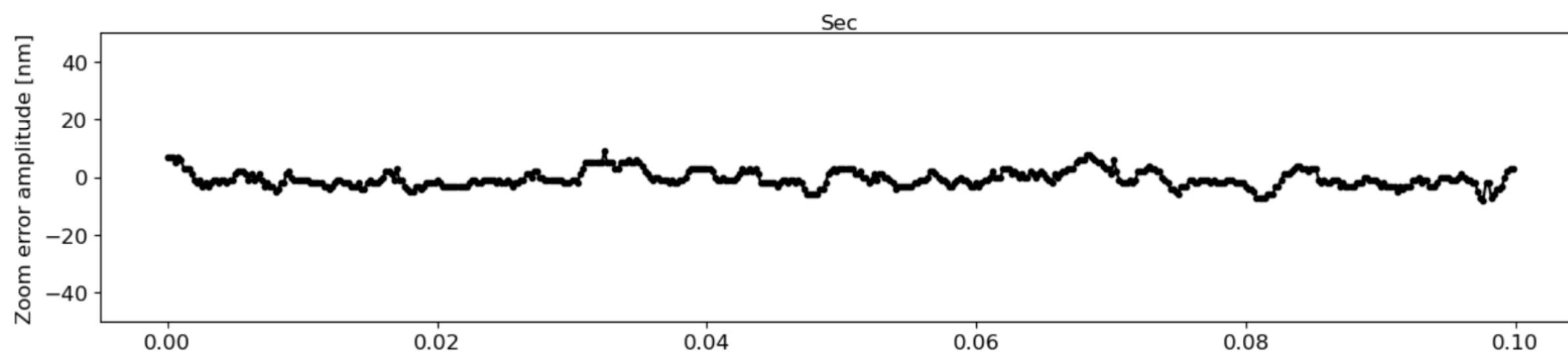


(E) Moving 4 mm/s but with my new gains

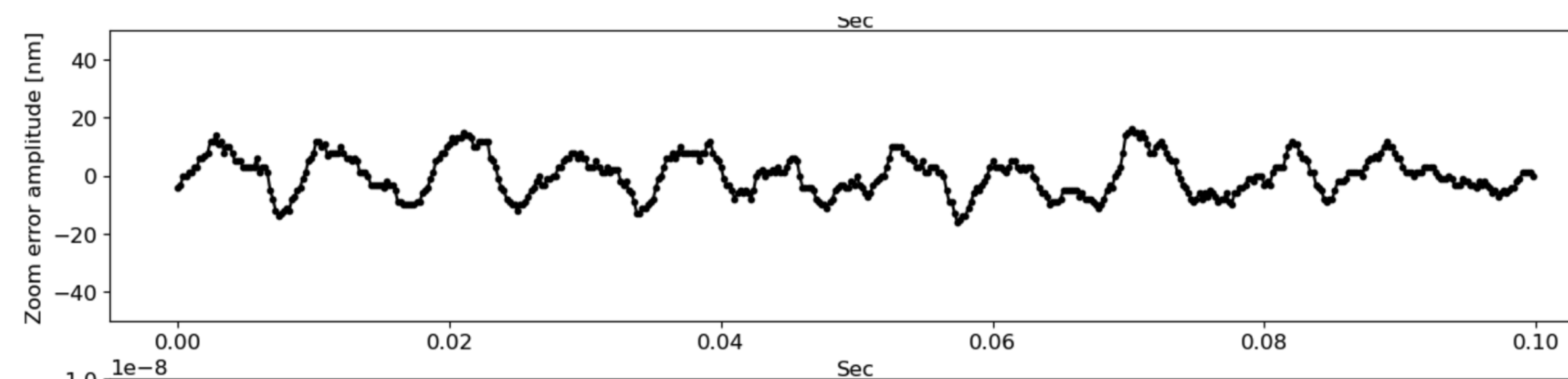
E1 voice coils



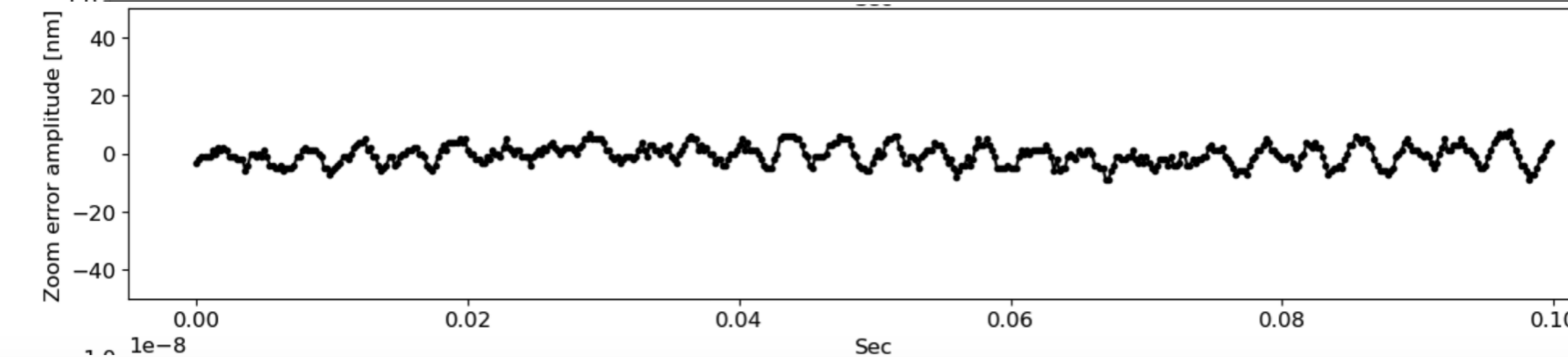
E1



E1 - fixed
with voice coil gains

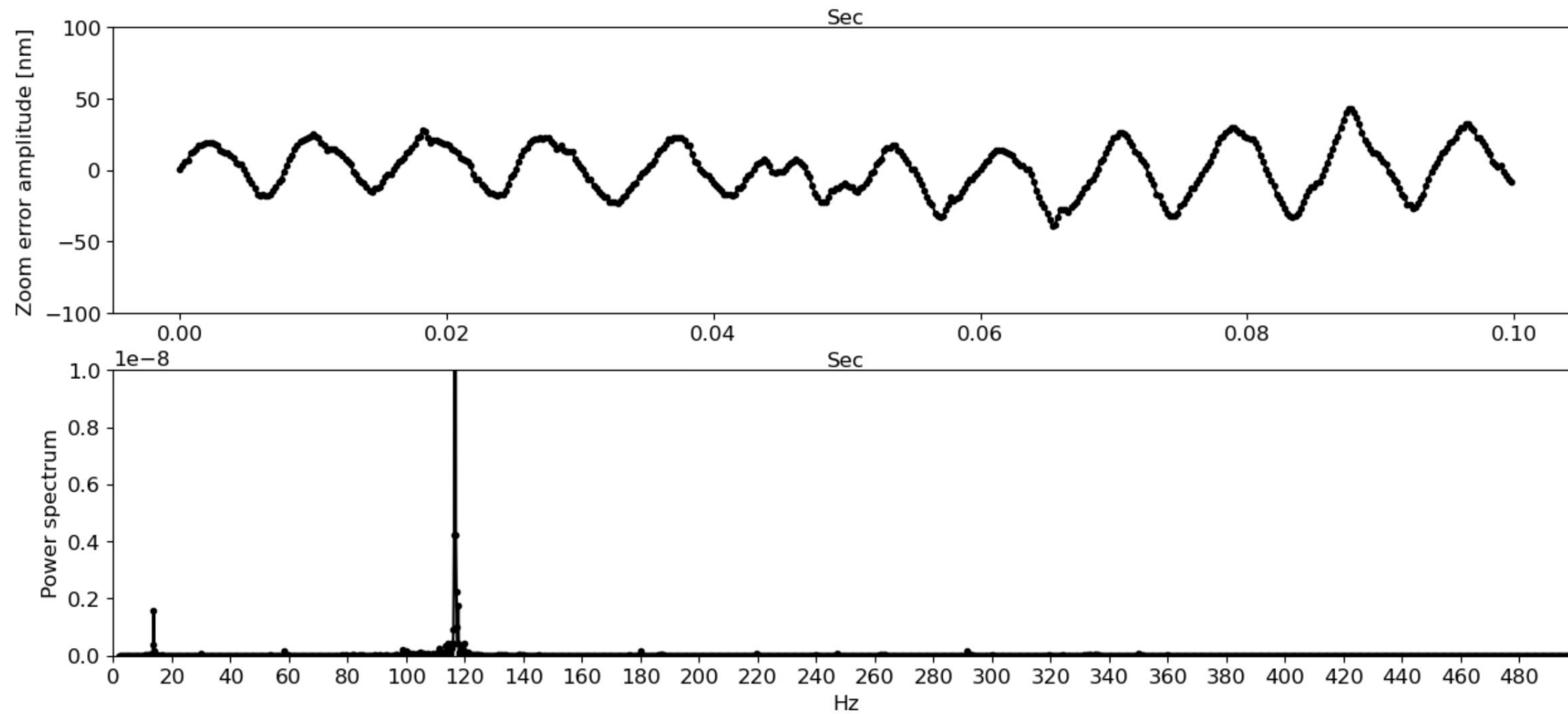


E2



W1

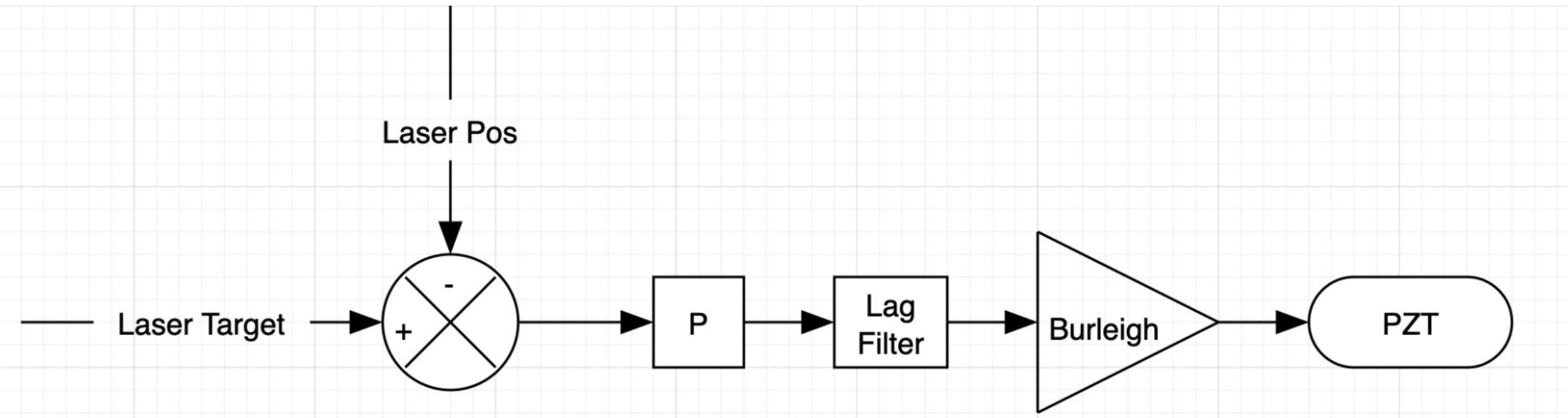
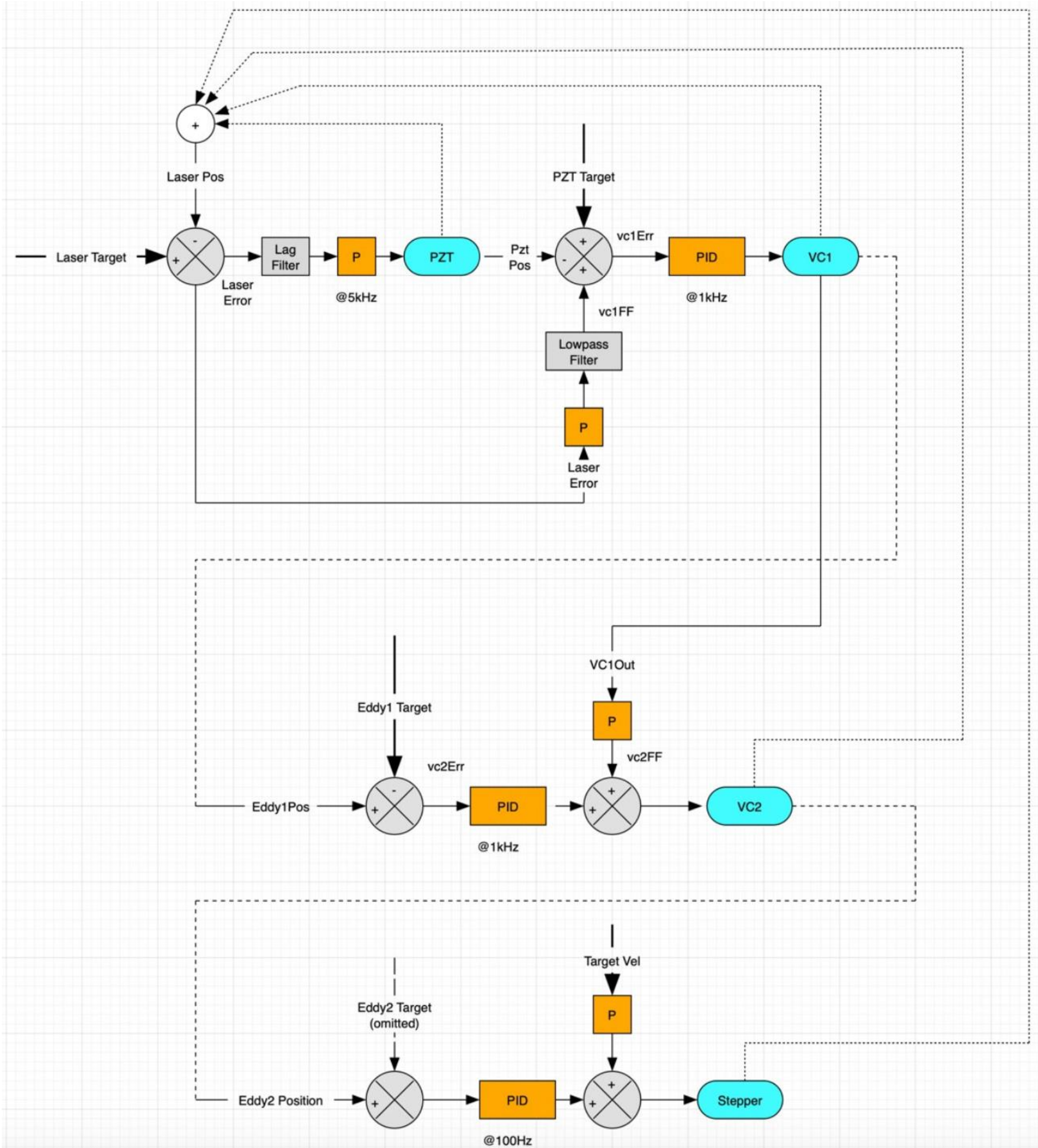
E1 voice coils



Swapped E1 Techron
in place of E2 not solved

Seems to be happening on the cart.
Needs more work identify

Four stage control



Four stage control:

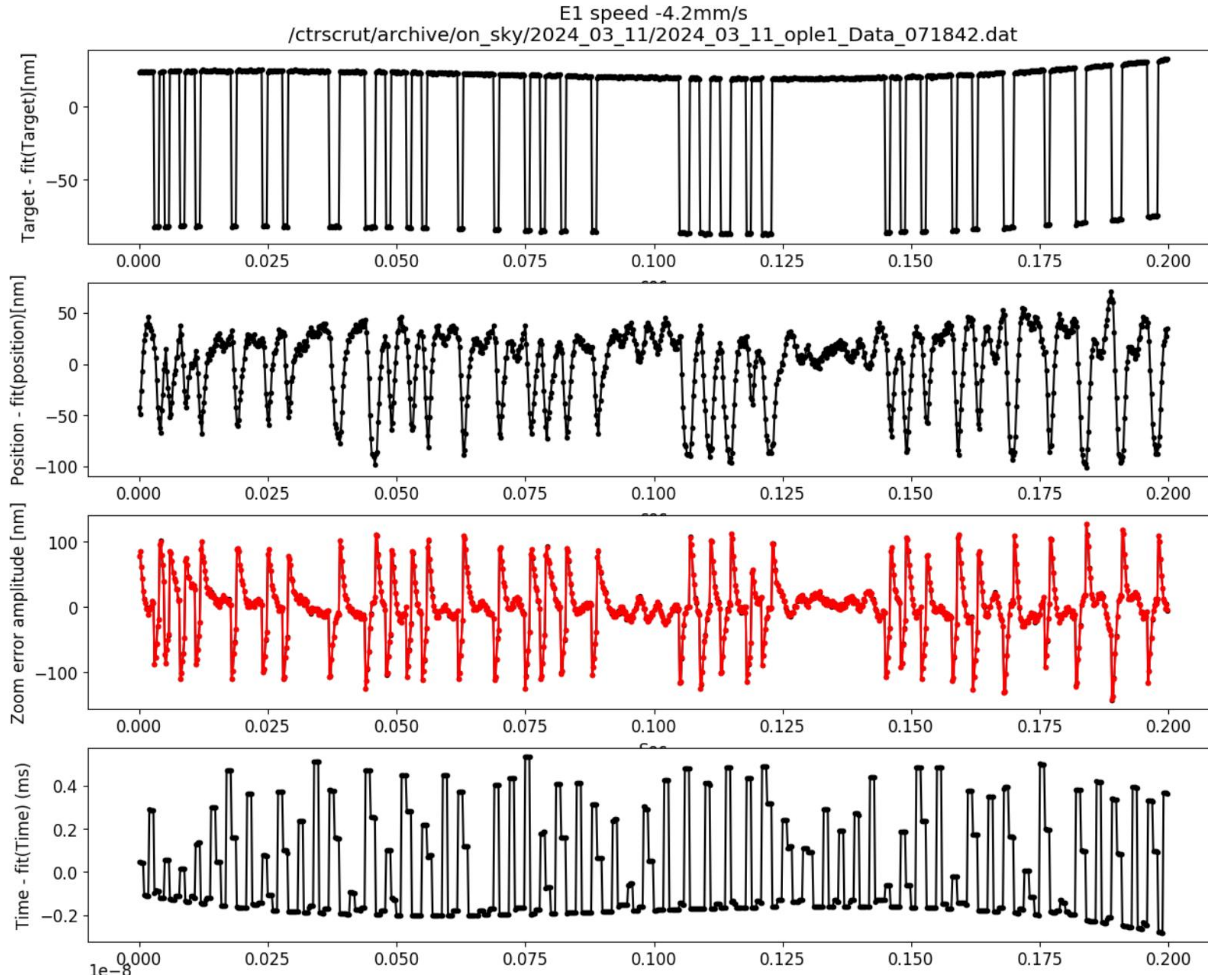
(1) PZT

(2) Voice coil 1

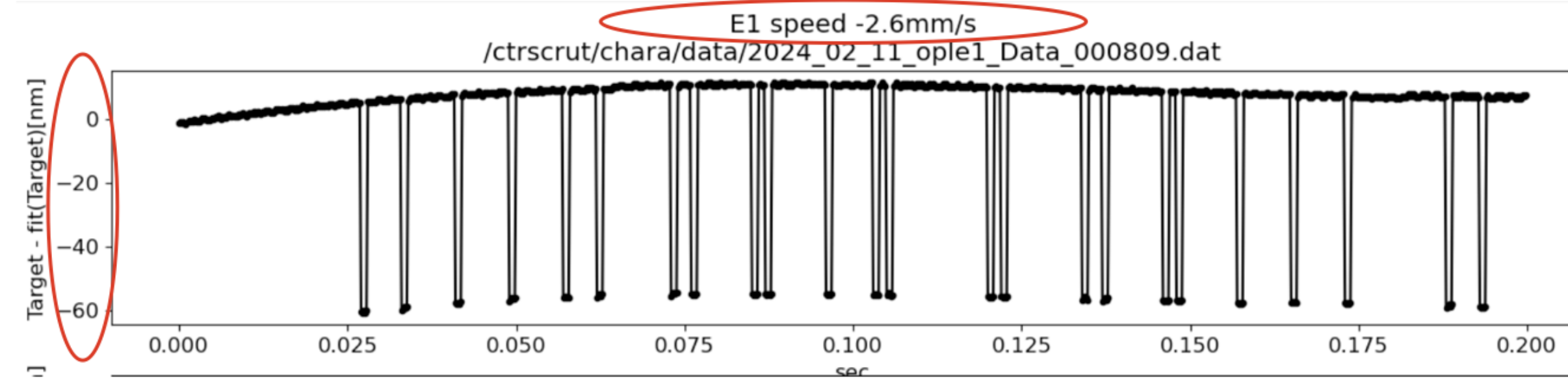
(3) Voice coil 2

(4) Stepper motor

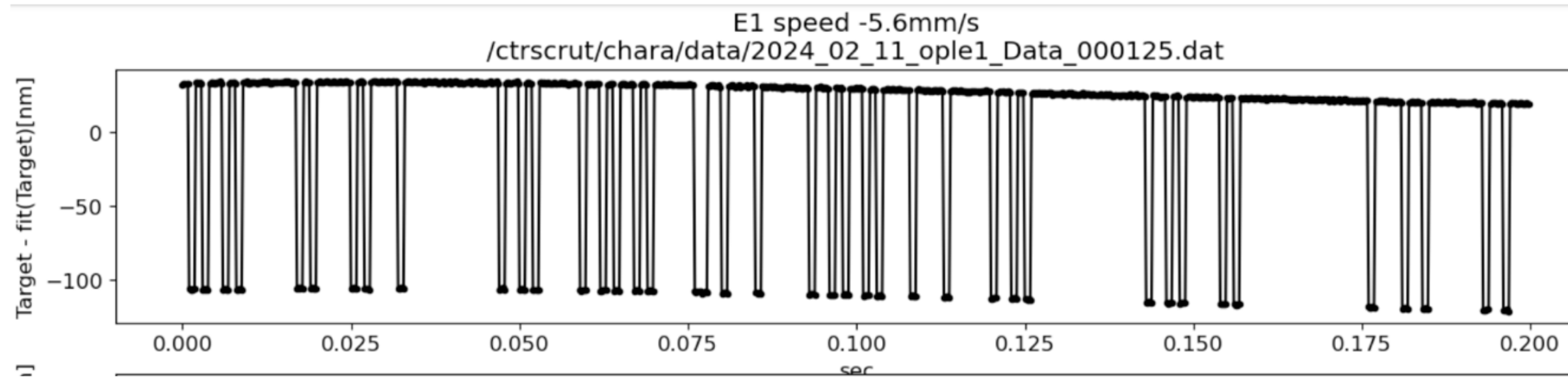
Digital spikes in target



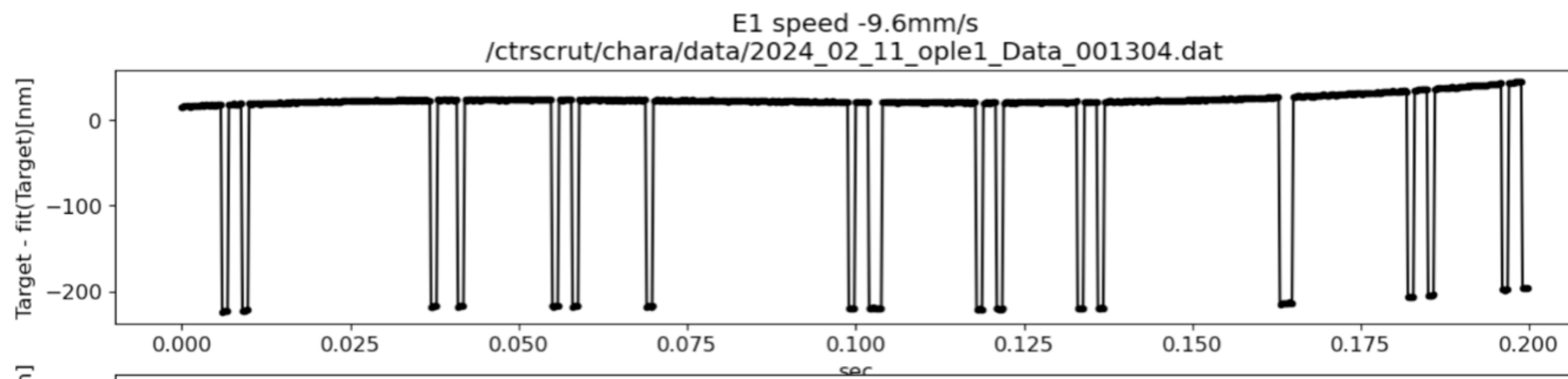
Missing 25 us tick



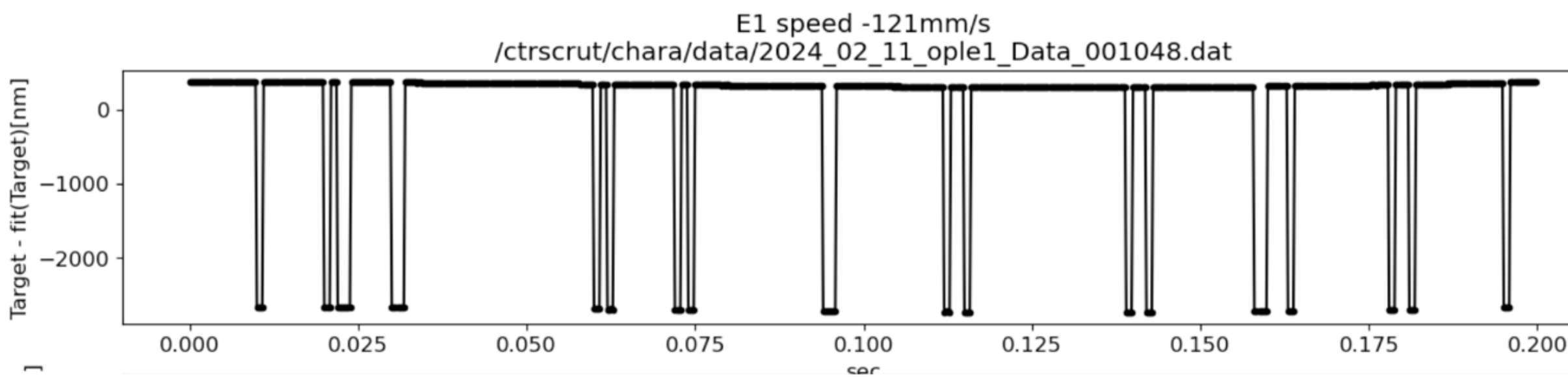
$$65e-9 / 2.6e-3 * 1e6 = 25\mu s$$



$$140e-9 / 5.6e-3 * 1e6 = 25\mu s$$



$$240e-9 / 9.66e-3 * 1e6 = 25\mu s$$



$$3000e-9 / 120e-3 * 1e6 = 25\mu s$$

How it is computed?

16 MHz signal

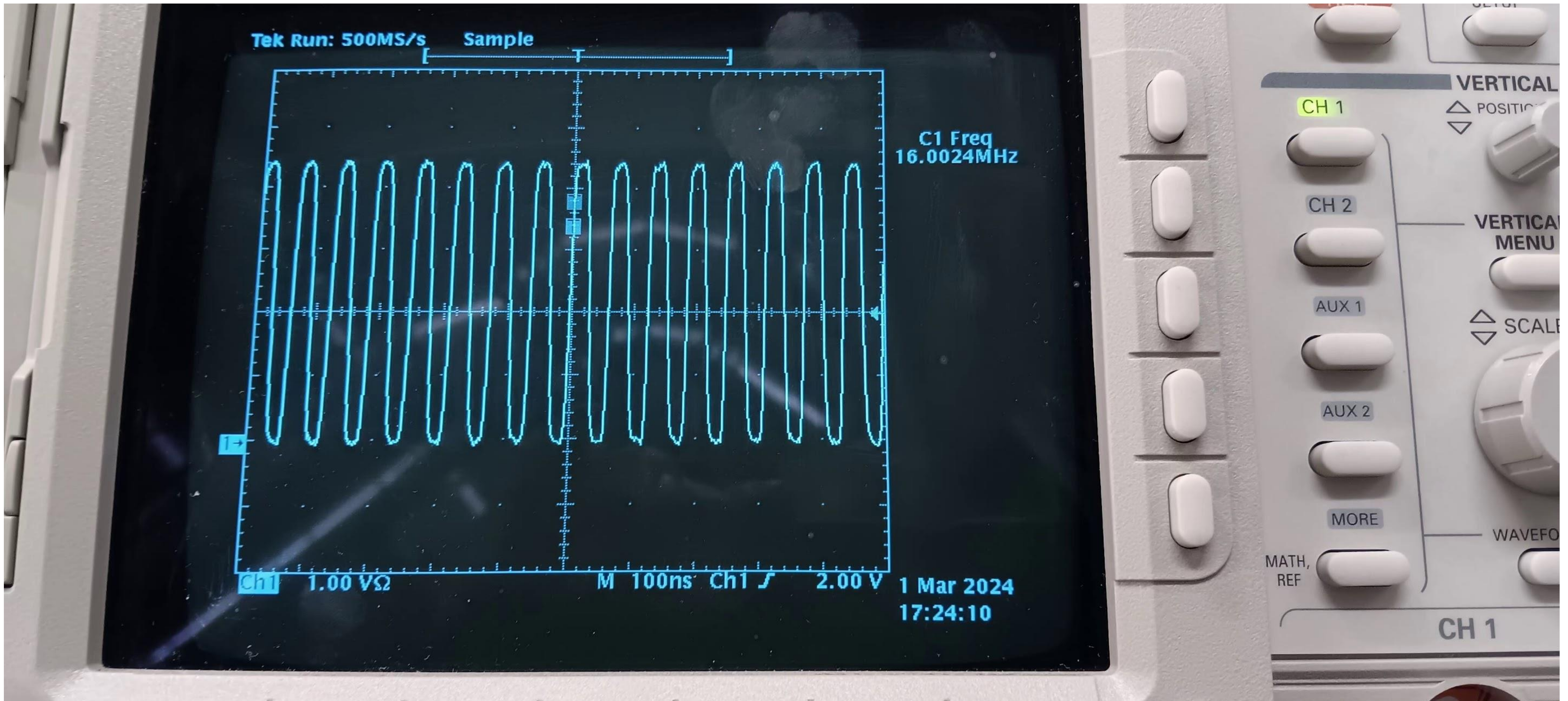
1 Hz signal

25 us ticks scheduler

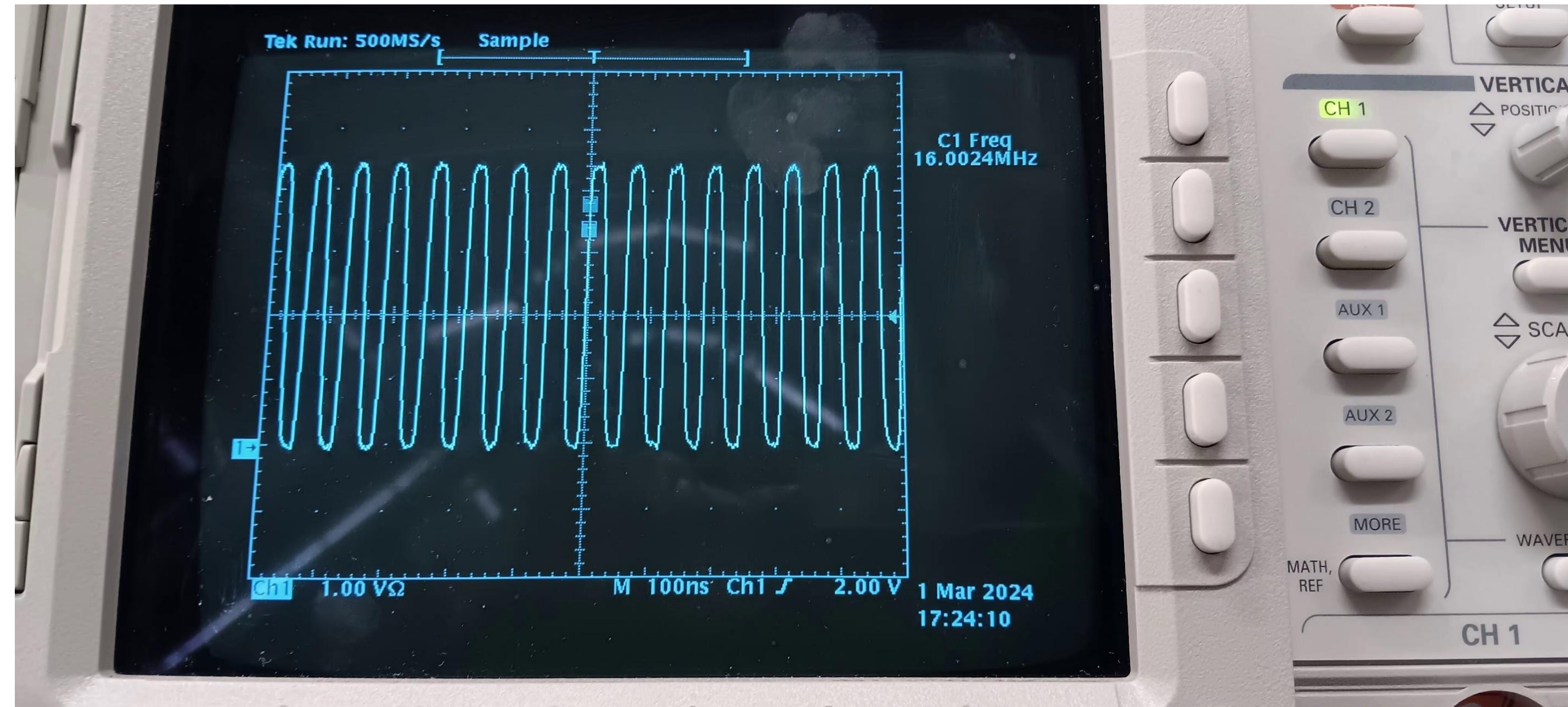
40K Kz loop



16 MHz clock calibration checks



Checked with signal generator



Generated signal



Signal generator

Temporary/intermediate fix?

