RG-E Experiment Update

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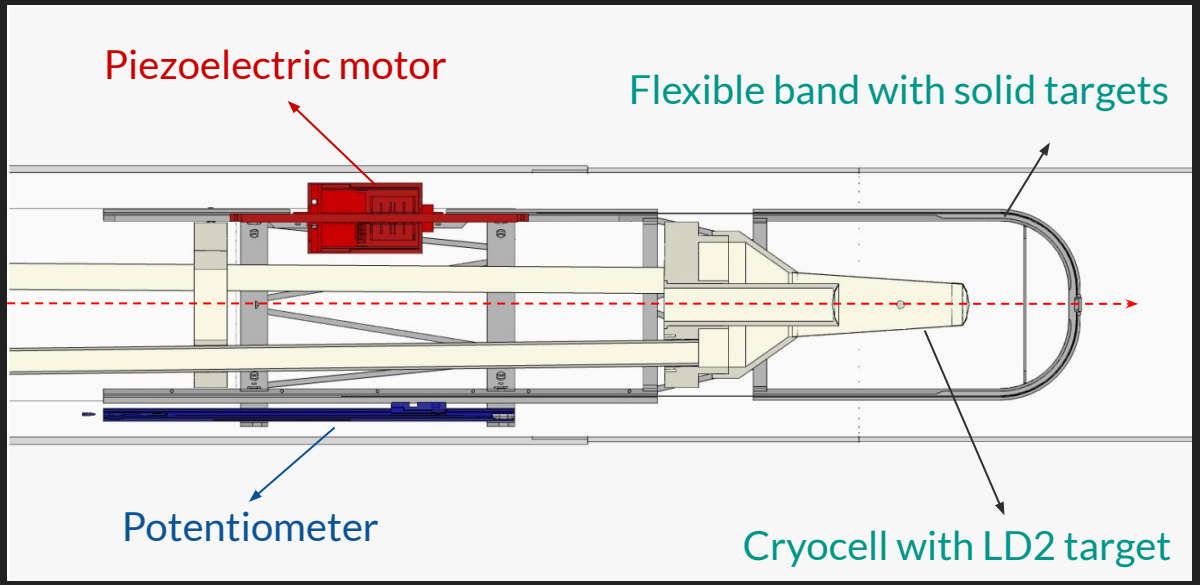
CLAS collaboration meeting
March 4 - 7 2025

RG-E Double-target system

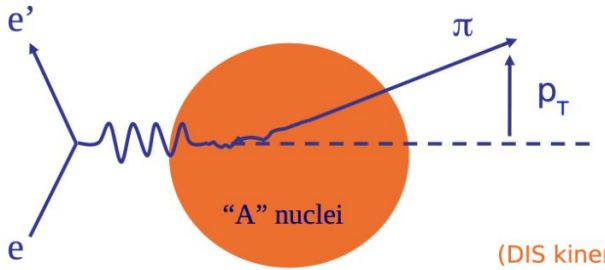


Solid target
- Carbon
- Aluminum
- Copper
- Tin
- Lead

Liquid target
- Deuterium

Physics and observables

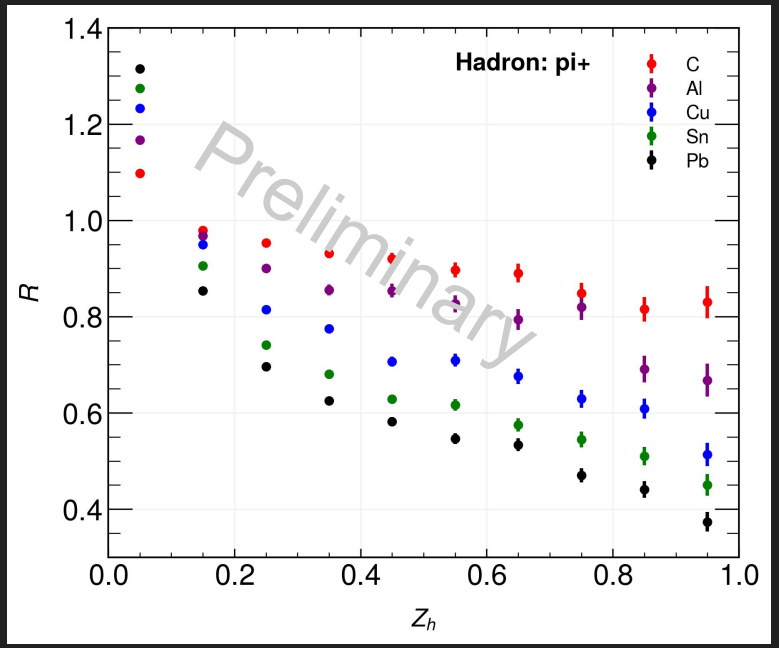
Transverse momentum broadening: $\Delta p_T^2 = p_T^2(A) - p_T^2(^2H)$



(DIS kinematics)

Hadronic multiplicity ratio:

$$R_M^h(z,\nu,p_T^2,Q^2,\phi) = \frac{\left\{\frac{N_h^{DIS}(z,\nu,p_T^2,Q^2,\phi)}{N_e^{DIS}(\nu,Q^2)}\right\}_A}{\left\{\frac{N_h^{DIS}(z,\nu,p_T^2,Q^2,\phi)}{N_e^{DIS}(\nu,Q^2)}\right\}_D}$$



Run summary and data collected

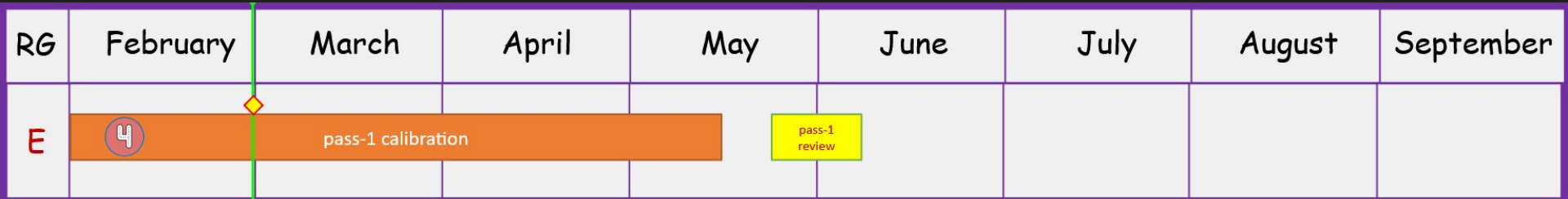
- Data taken in Spring 2024 from March 15th to May 19th
- 10.547 GeV electron beam
- >95% of data has inbending torus polarity

Data taken

Target	Current (nA)	Days	PAC Days	Accumulated charge (mC)	Integrated luminosity (1/fb)
LD2 + C	85	6.3	3.2	23.17	24.38
LD2 + Al	70	6.8	3.4	20.53	24.23
LD2 + Cu	75	6.6	3.3	21.46	22.42
LD2 + Sn	65	9.8	4.9	27.60	21.58
LD2 + Pb	70	14.4	7.2	43.63	26.76
Pb (only)	160	0.7	0.4	4.98	2.84
C (only)	85	0.6	0.3	2.29	3.79
Total		44.7	22.3	143.66	126.00

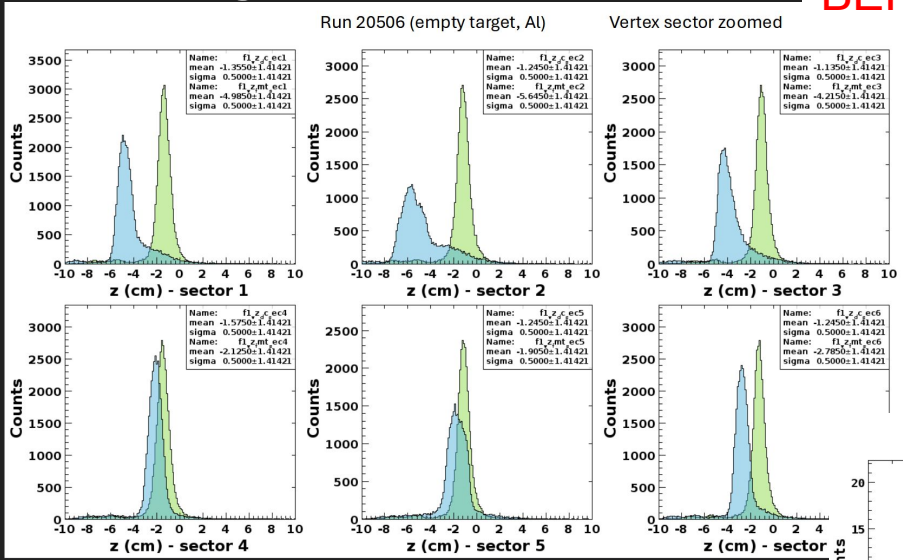
Calibration status

- Last cooked version: pass0.6
- Done:
  - DC and CVT alignment
  - Beam offset calibration
  - CALCOM Ready for calibration review
  - FTOF calibration
  - RF calibration
- Next step: Run selection for subsystems calibration
- Simulation to evaluate how RGE target configuration behaves in reconstruction software
  - Reconstruction software is written with only 1 target in consideration
  - Simulations will show the effect if having to targets with the current version of the software

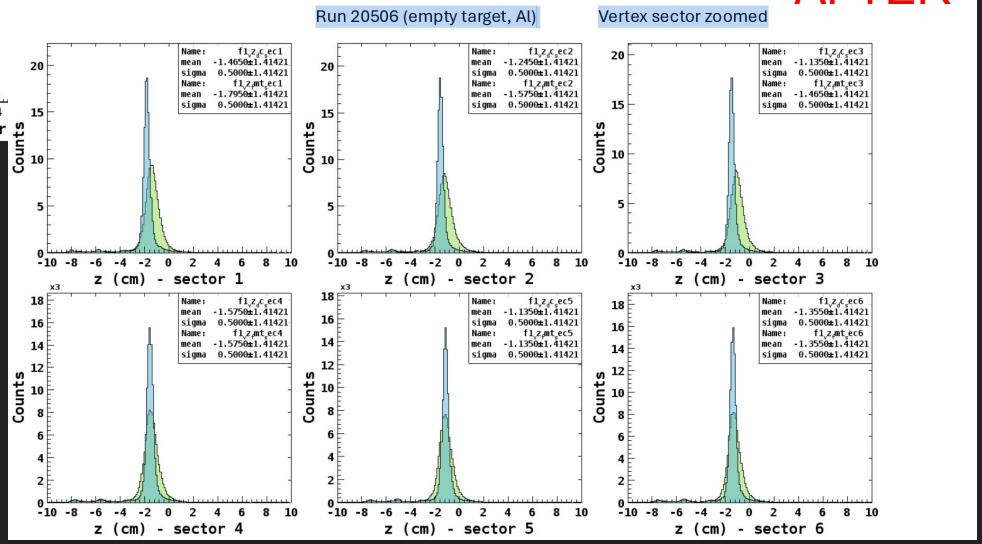


FMT alignment

BEFORE



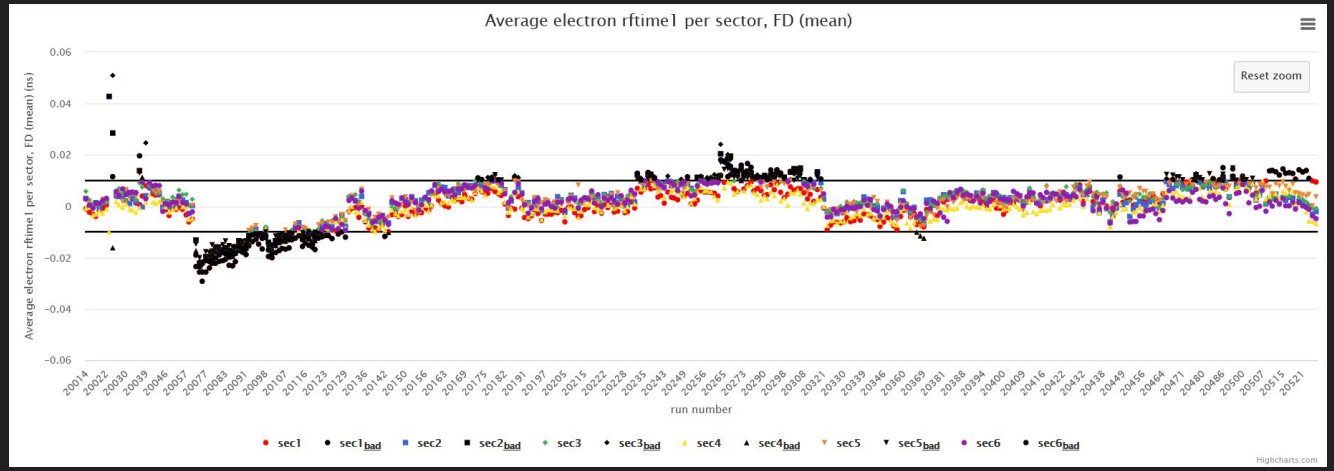
AFTER

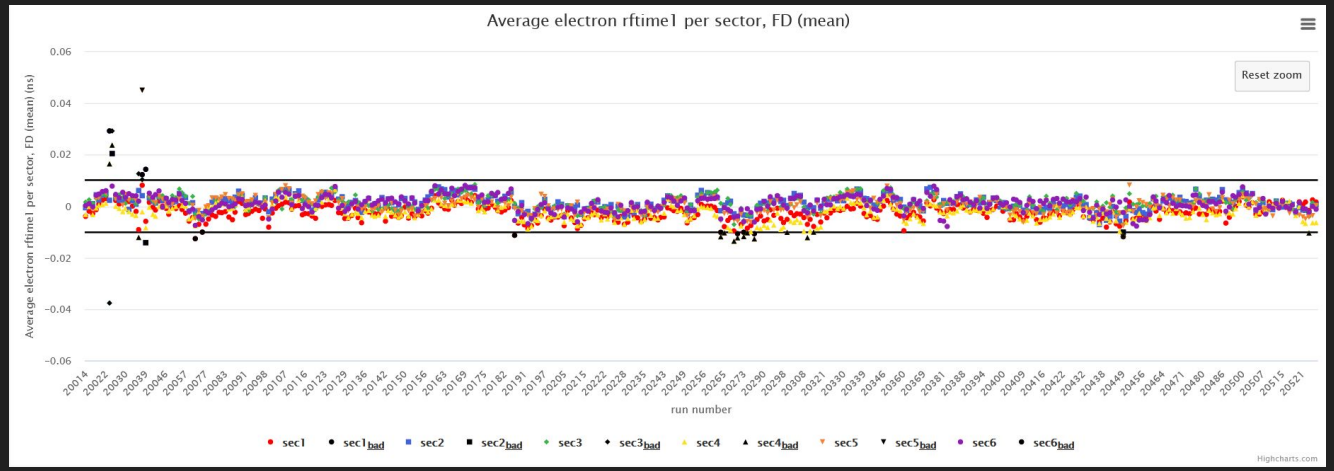


Plots from Yuris' presentation at CALCOM meeting

Timelines pass v0.3 vs v0.6

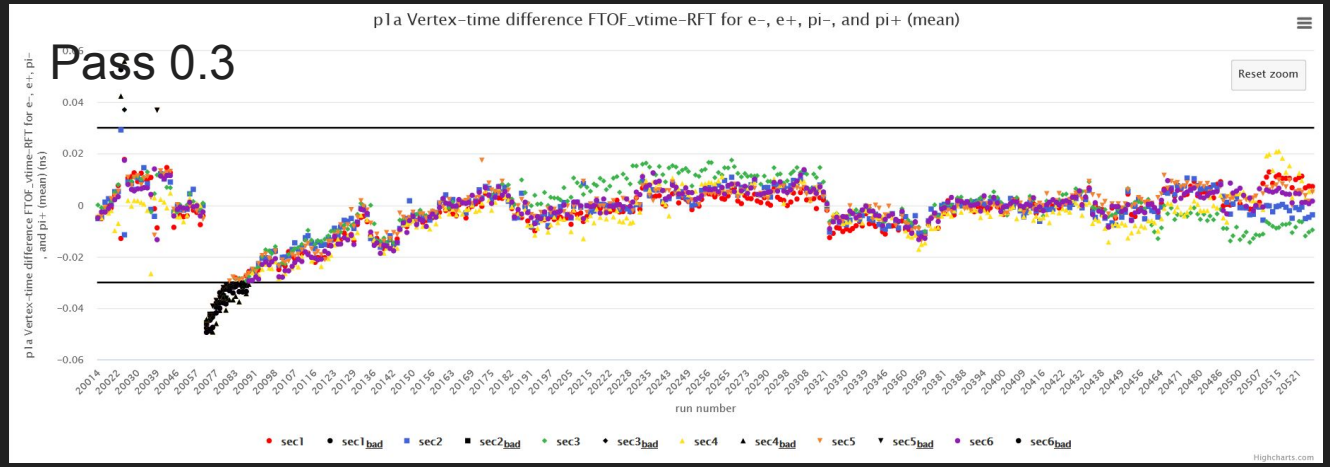
RF
p1b mean QA

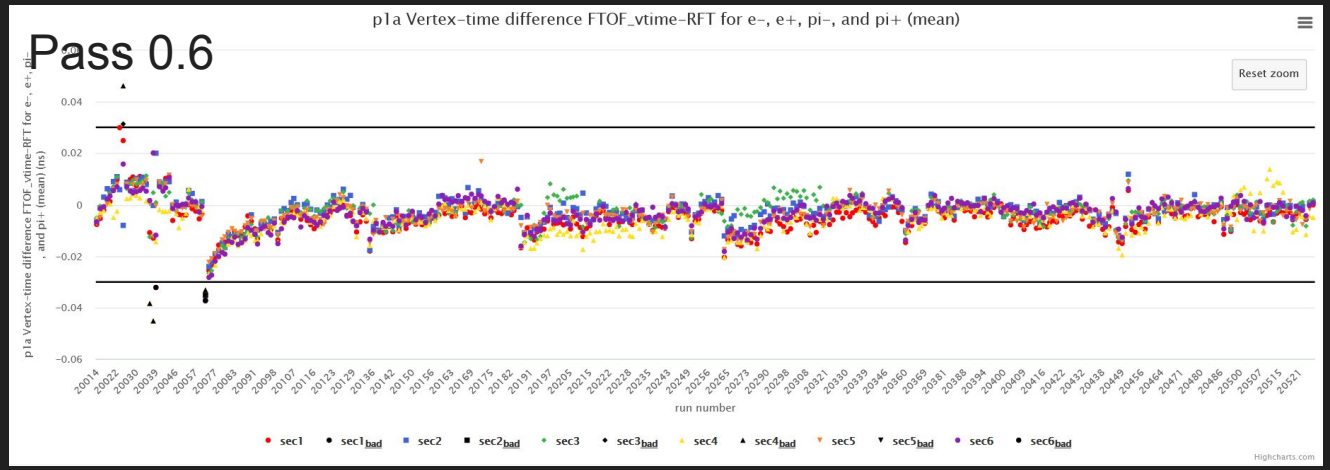




Timelines pass v0.3 vs v0.6

FTOF
p1a mean QA





Timelines pass v0.3 vs v0.6

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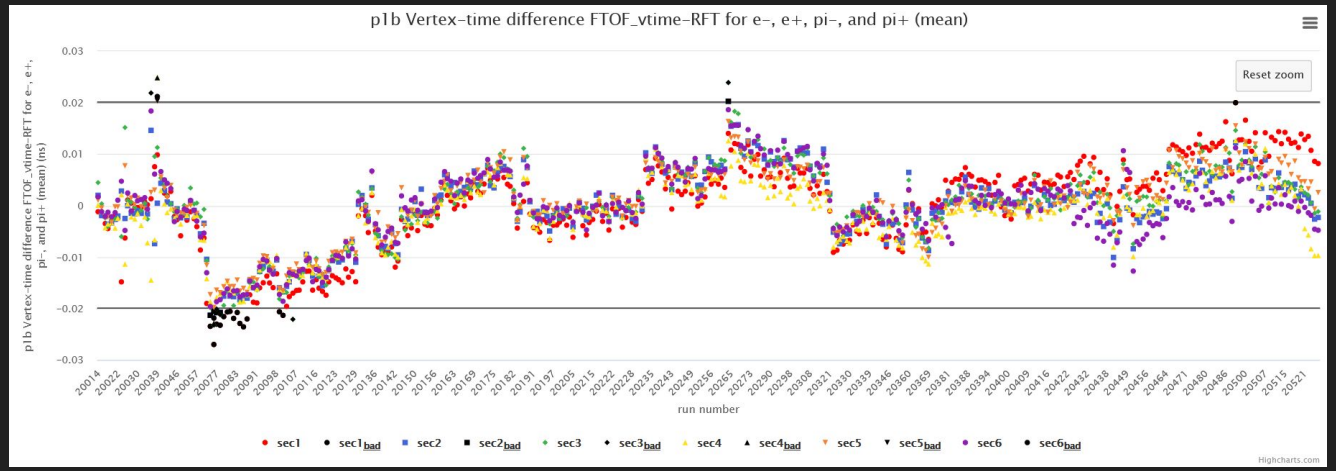

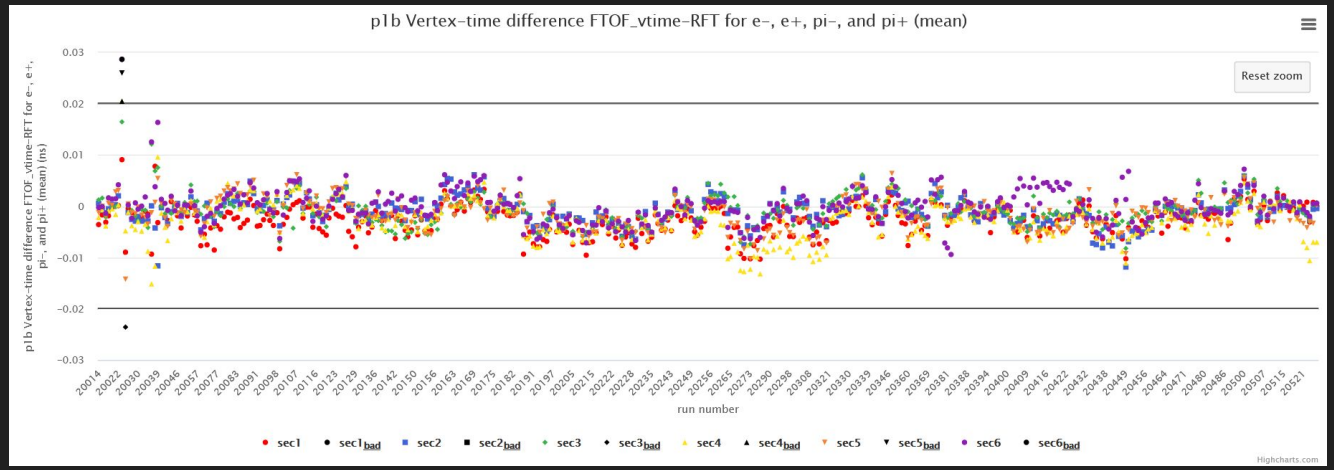

Analyses in progress

- Uditha’s Lambda analysis
- Antonio’s pions MR analysis
- Mike’ proton analysis
- Simon’s BEC for pions analysis
- Sebouh’s Di-hadron Correlations analysis

Summary

- Calibration has progressed significantly since last meeting
- Current state of calibration in very good shape
- Subsystems calibration in progress