

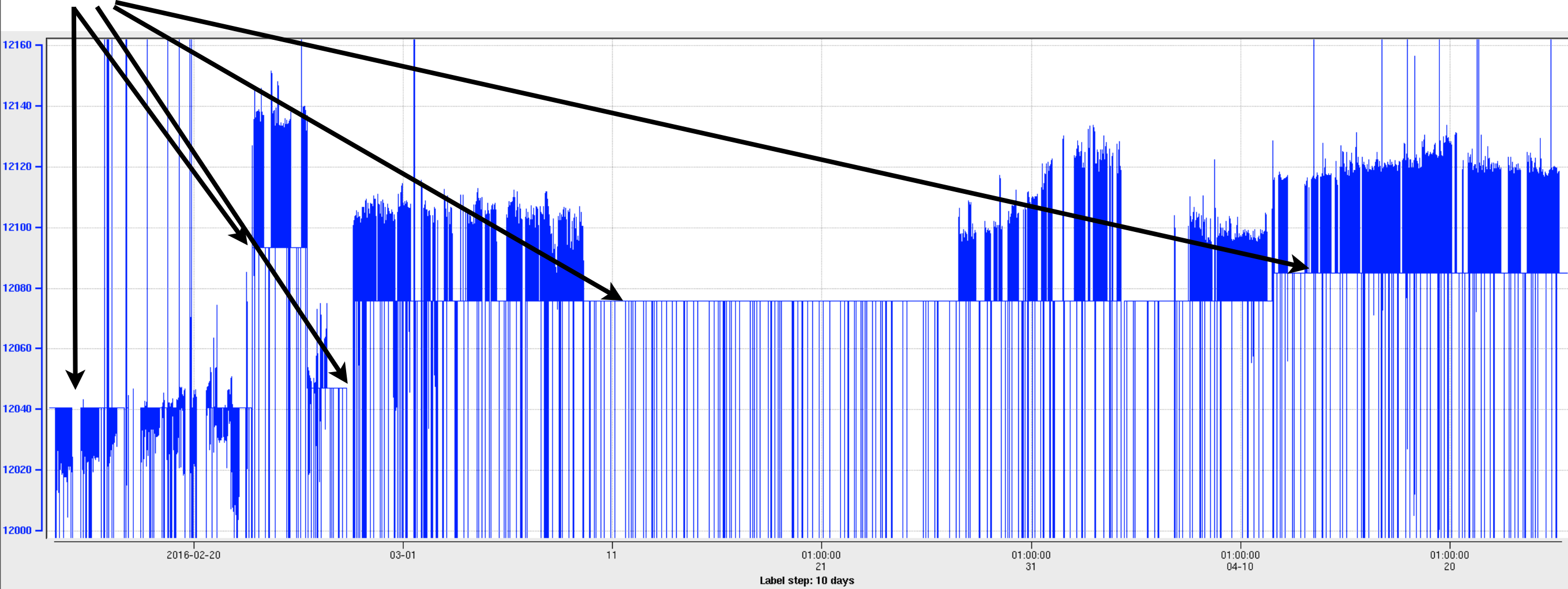
Hall D beam energy during the spring 2016 run

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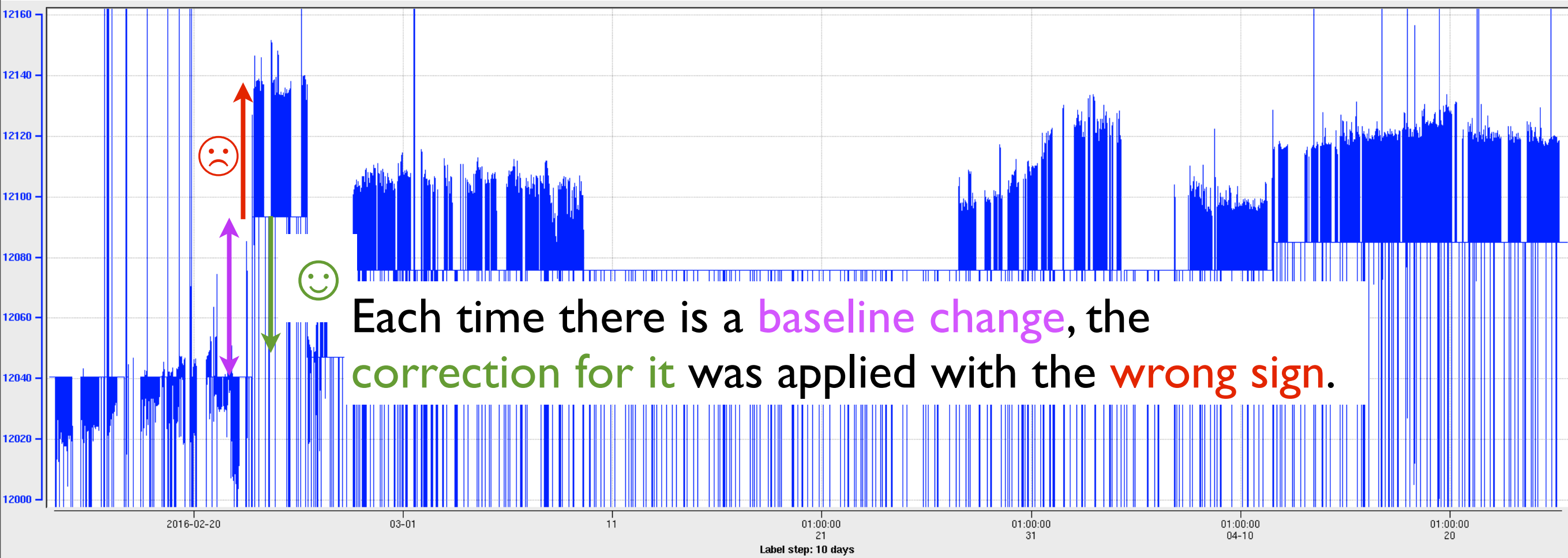
- **Bug found in code to get Hall D energy.**
 - $\text{Energy} = P_0(1 + \delta_{\text{steering}} + \delta_{\text{orbit}})$ but δ_{orbit} had the wrong sign.
 - Accelerator has left-handed convention and model has right-handed. When accounting for the difference ($x \rightarrow -x$), mistakingly did $y \rightarrow -y$ too and since the Hall D ramp bends vertically, δ_{orbit} had the wrong sign.
 - **This explains:**
 - Hall D energy anti-correlation with Hall A and ARC energies;
 - Artificial jumps seen in our energy monitoring (all of them?);
 - “Wrong” sign of AD00c-x after the tagger (bend horizontally).
- Other unexpected features (correlation/no correlations seen with non-dispersive/dispersive BPM) likely to be due to imperfect tune (“dispersion leakage”).
- BPM calibration/position information may not be reliable enough yet to extract energy from Tagger+AD00c. Todd Satogata is also looking into this.
- Accelerator was happy to see our diagnostics.

Spring 16 Uncorrected Hall D beam energy from MyaViewer (epics name: HALLD:p).

P_0 (baseline)



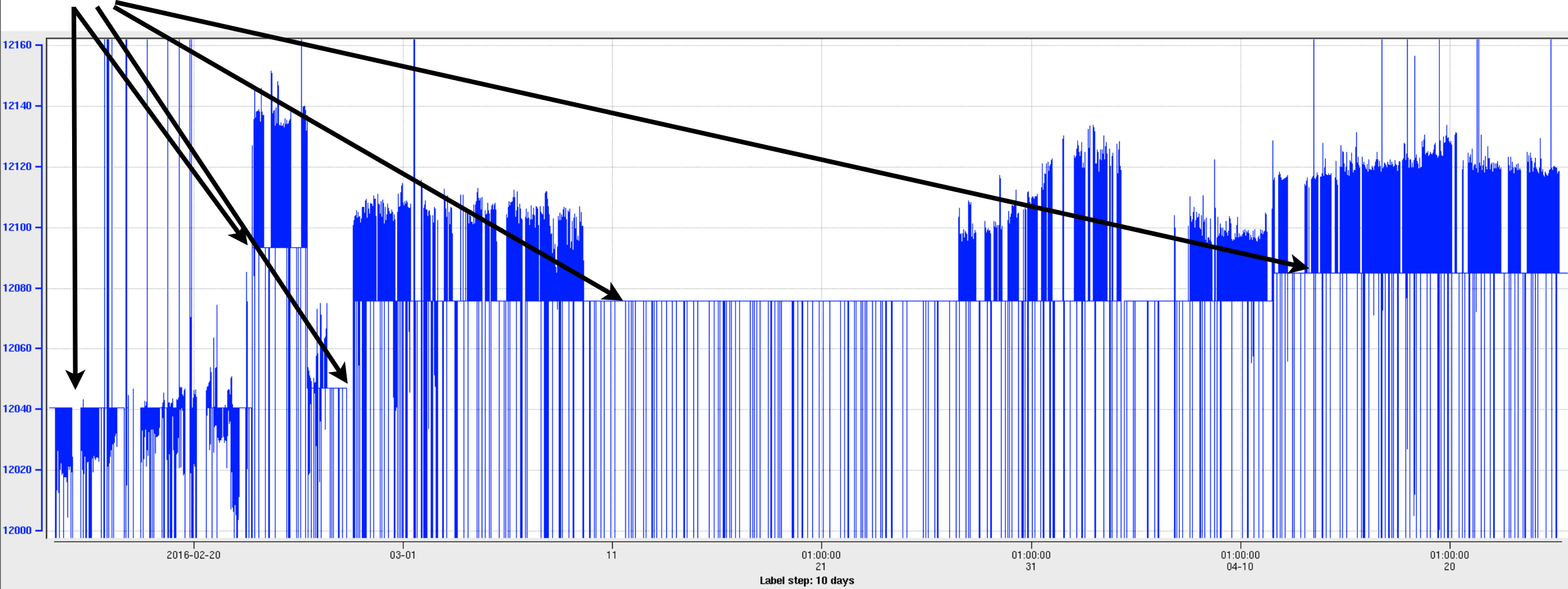
Spring 16 Uncorrected Hall D beam energy from MyaViewer (epics name: HALLD:p).



Each time there is a baseline change, the correction for it was applied with the wrong sign.

Spring 16 Uncorrected Hall D beam energy from MyaViewer (epics name: HALLD:p).

P_0 (baseline)



Summary

- Sign bug seems to explain most of the mysteries seen in the Hall D analysis.
- Need to re-analyze the data (back to square one). Presently re-running code to acquire necessary variables for doing the correction.
- Need to check if all the artificial energy jumps are gone or if some remain.
- Need to provide a new energy table. The energies we are presently using are grossly wrong.
- Need to check if the AD00C position-shift dependence with radiator thickness makes sense.
- Need to check if coherent edge shift with electron beam energy makes sense.
- Need to pursue independent energy determination from tagger+AD00c.
- Need to re-assess uncertainty on Hall D energy.