Summary of Fall 2014 Commissioning run

A. Deur
Jefferson Lab

Purpose:

- Summarize the Fall 2014 run;
- Review run to identify possible improvements.

Fall 2014 goals

Our Goals:

- CW beam to tagger with acceptable radiation levels. ✓
- Create unpolarized photon beam and tune it through:
  - Collimators; ✓
  - Target location; ✓
  - Photon beam dump. ✓
- Detectors, DAQ and trigger check out, optimization, calibration and alignment. ✓

Key Performance Parameter (KPP) Goals:

- Full detector running for at least 8h at 1200A, recording data from all subsystems; ✓
- Produce plots with coincidence of the signals in Tagx, TOF, BCal, FCal, ST, PS; ✓
- Event display showing correlations of hits in the CDC, FDC, ST, TOF, BCal and FCal; ✓
- Target position from tracking; ✓
- Demonstration of PID using FCal, BCal, TOF and/or other detectors. ✓

Specifics for Fall 2014 commissioning

- CW e^- beam
  - ~10.1 GeV;
  - Nominal: 50 nA, up to 200 nA.
- Amorphous radiators: 0.2, 1.1 and 3.3 $\times 10^{-4}$ RL.
- Initially, no tagger electronics.
- Secondary collimator initially removed. Then installed.
- Various commissioning targets. Used only 1cm CH_2 disk & Al. barrel  targets at nominal target center (could be positioned between +12cm and -32cm)
  Target history: https://halldweb1.jlab.org/wiki/index.php/Target_Conditions
- Beam Profiler(s). Located either in front of active collimator or photon beam dump. Now part of standard equipment. Added one "active target" during run (first upstream of solenoid, then downstream).
- Radiation monitoring equipment (borrowed from RadCon group) + OSL for cross-calibration/neutron monitoring in Hall D.
  Helpful for beam diagnostic. Will be used again for Spring run, along with new own Hall D monitors.

Organization

Run plan: Prepared before run. Adapted day-by-day basis.

https://hdops.jlab.org/wiki/index.php/Fall_2014_Commissioning_Plan

Daily:

7:45am MCC meeting. RC (Hall Leader, Spokespersons): Accel. ↔ Hall, accel.
Status Status/requests/plan

8:00am MCC meeting. RC (Hall Leader, Spokespersons): Accel. ↔ accel., (Hall)
Status/problems/plan

8:45am RC meeting:

RC ↔ Hall staff/collaboration

- Run update.
- Accel. Status.
- Equipment/manpower problems.
- Runplan adjustments.

- Equipment performances.
- Problems.

https://halldweb1.jlab.org/wiki/index.php/Meetings#Running

Weekly:

Wed. 1:30pm meeting. RC,Hall Leader (Spokespersons): Accel., Hall ↔ Hall, accel.
https://cebaf.jlab.org/files/ops/accboard/

- Weekly summary of events & performances.
- Problems.
- Plan for the next 7 days.

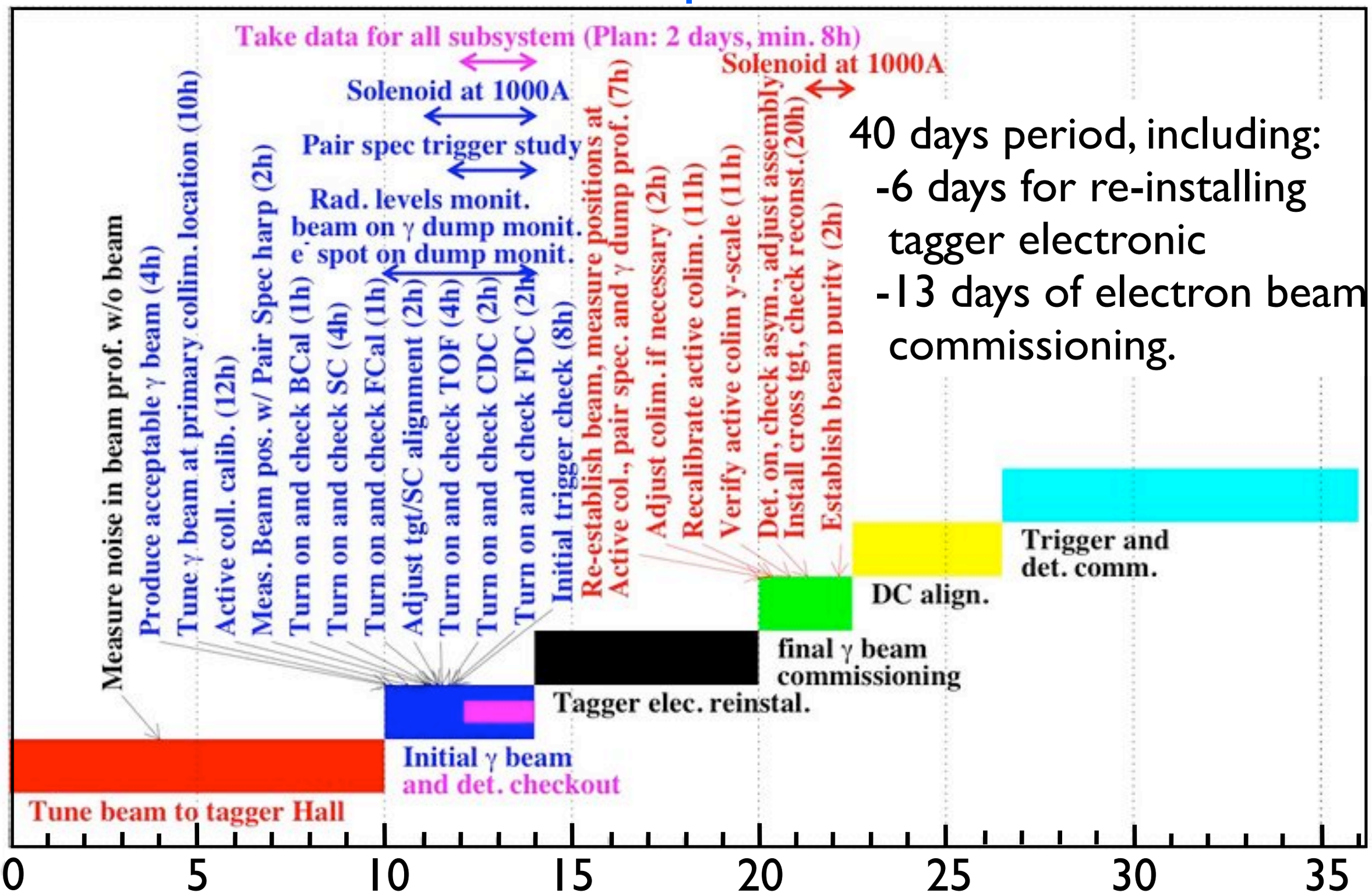
Safety: PDL/(RC/Work coordinator).

Shift manpower: PDL/(RC).

Update to collaboration: RC.

Offline analysis: Analysis coordinator.

Run plan



40 days period, including:

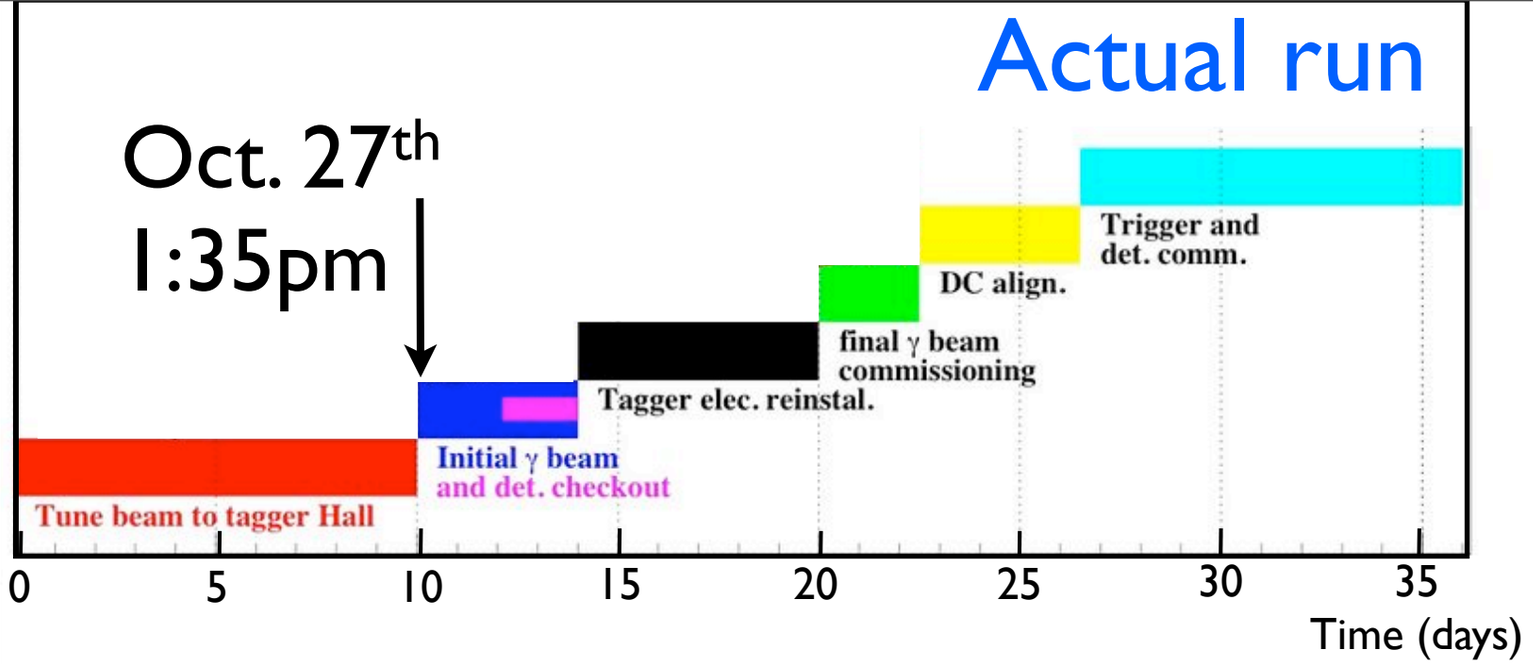
-6 days for re-installing tagger electronic

-13 days of electron beam commissioning.

https://hdops.jlab.org/wiki/index.php/Fall_2014_Commissioning_Plan

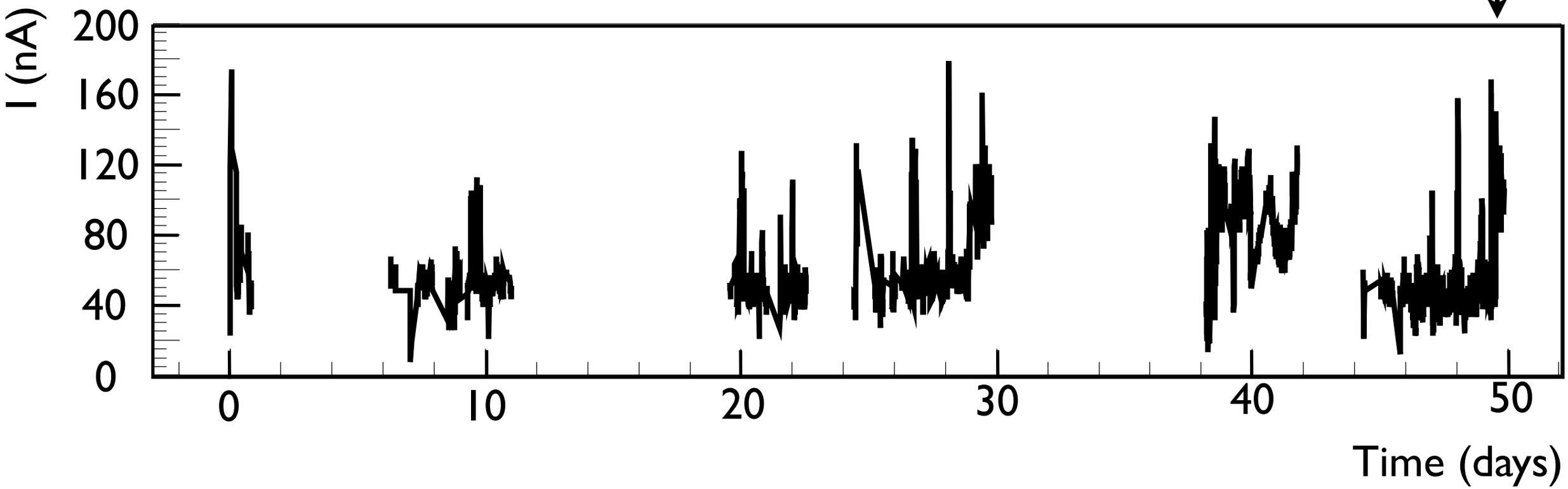
Actual run

Oct. 27th
1:35pm



Then opportunistic beam

Dec. 21st
8:00am



Actual run

- Good radiation levels (both in tagger and Hall) once the beam is tuned. Reproducible. Standard beam delivery procedure established.
- Rates scale with radiator thickness ⇒ Good photon beam. No scrapping.
- Profiler works. Active collimator works and is calibrated.
- Transmission through collimator seemed good.
- Beam line (including target) is well aligned. Diagnostic tools checked (Upstream Profiler, Halo Counters, Active Target, Pair Spec, Start Counter).
- Solenoid ran at 1000A happily for a long time.
- All detectors worked well. Detectors triggered in coincidence. DAQ works.
- FDC alignment data (no/low B-field) taken. (Only one target position).

} Meet our goals and KPP goals

- DAQ rate limited.
- Solenoid trips.
- Beam current drift.
- Beam position unstable.

} Photon flux in Hall varies a lot.

- Downstream Profiler did not work. Replaced by upstream one.
- Upstream profiler(+radiator) creates large noise in Pair Spec.
- FDC cooling system.
- SC slightly tilted. FCal noisy. Non-expert Pair Spec. access. Event display freeze.
- Last accelerator harps not functional.
- Safety: unorthodox access to hall during Controlled Access.

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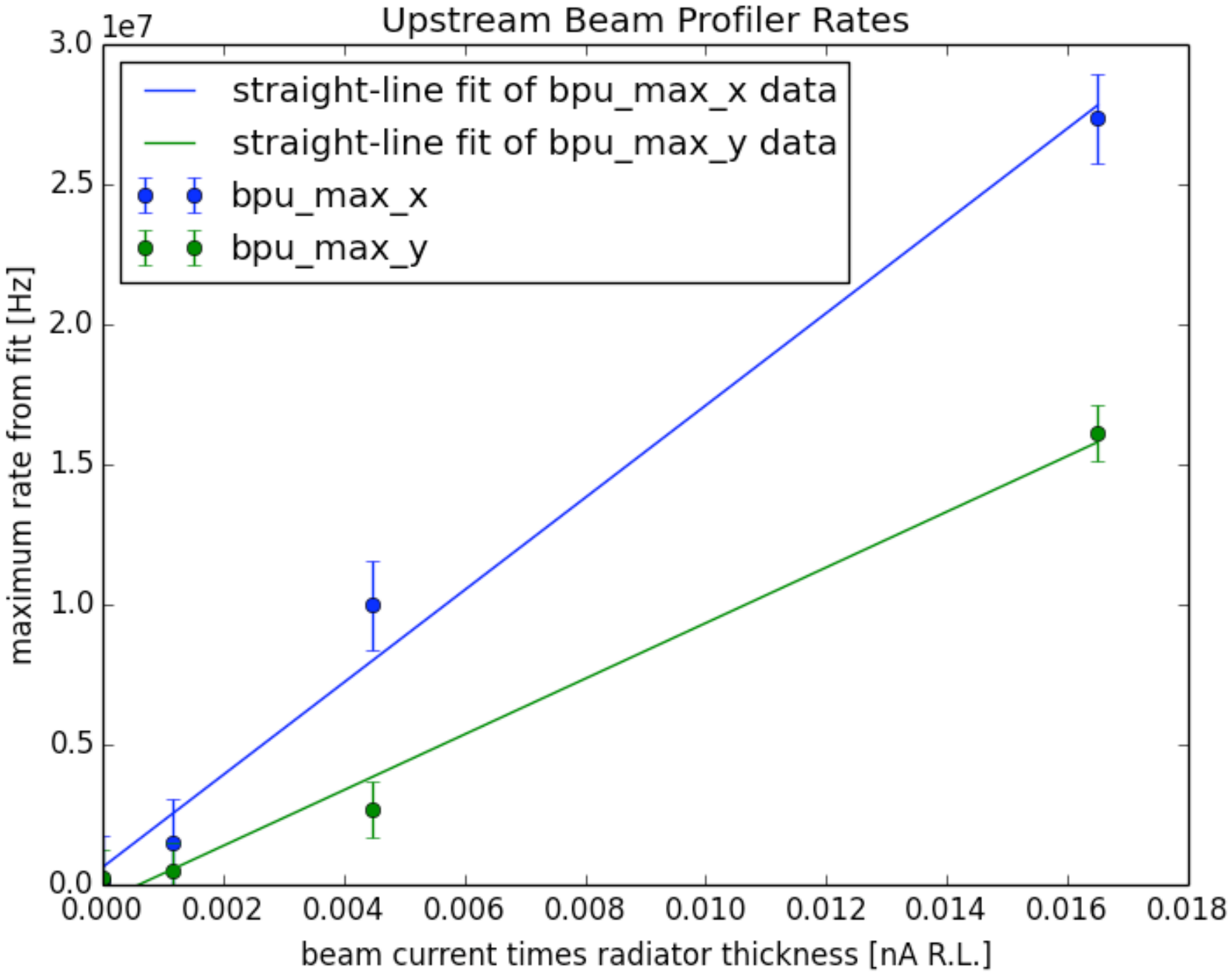
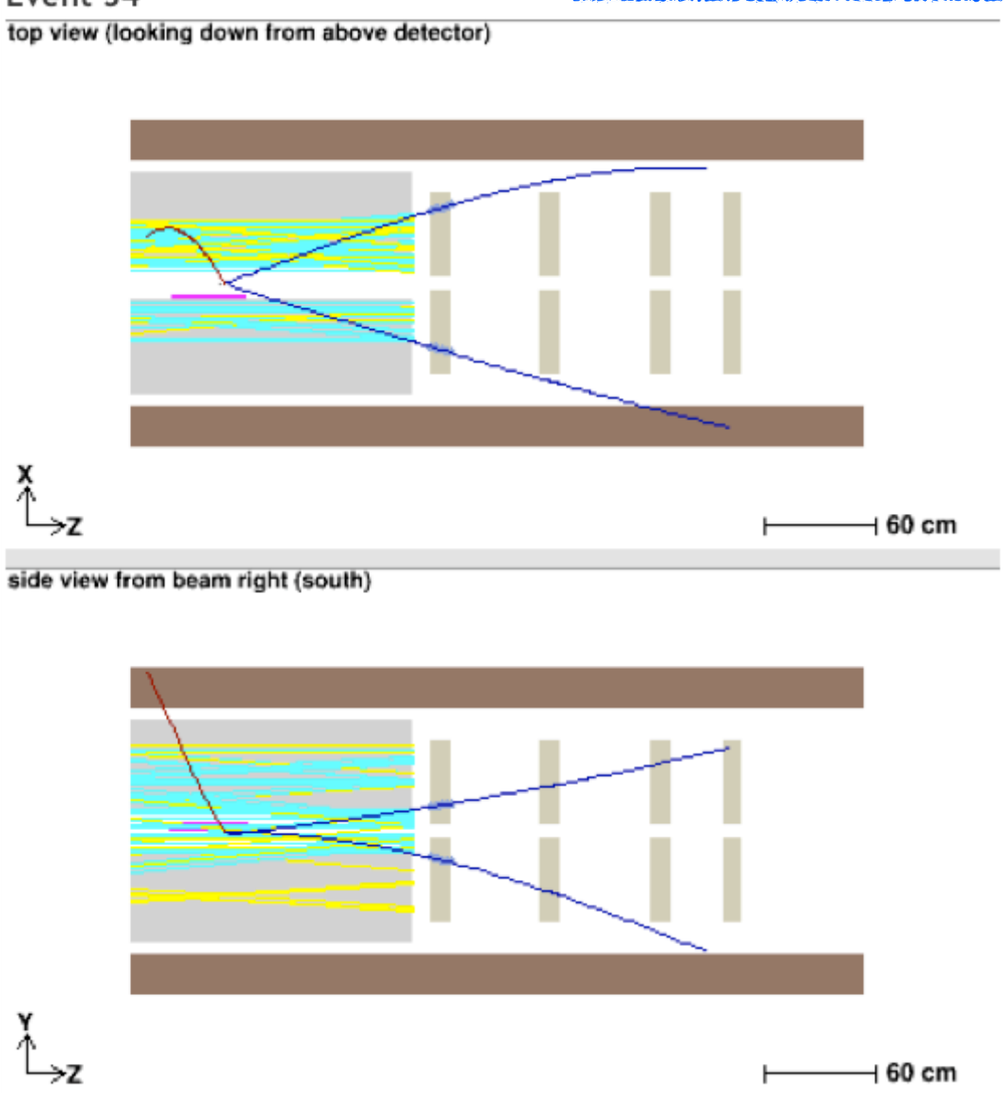
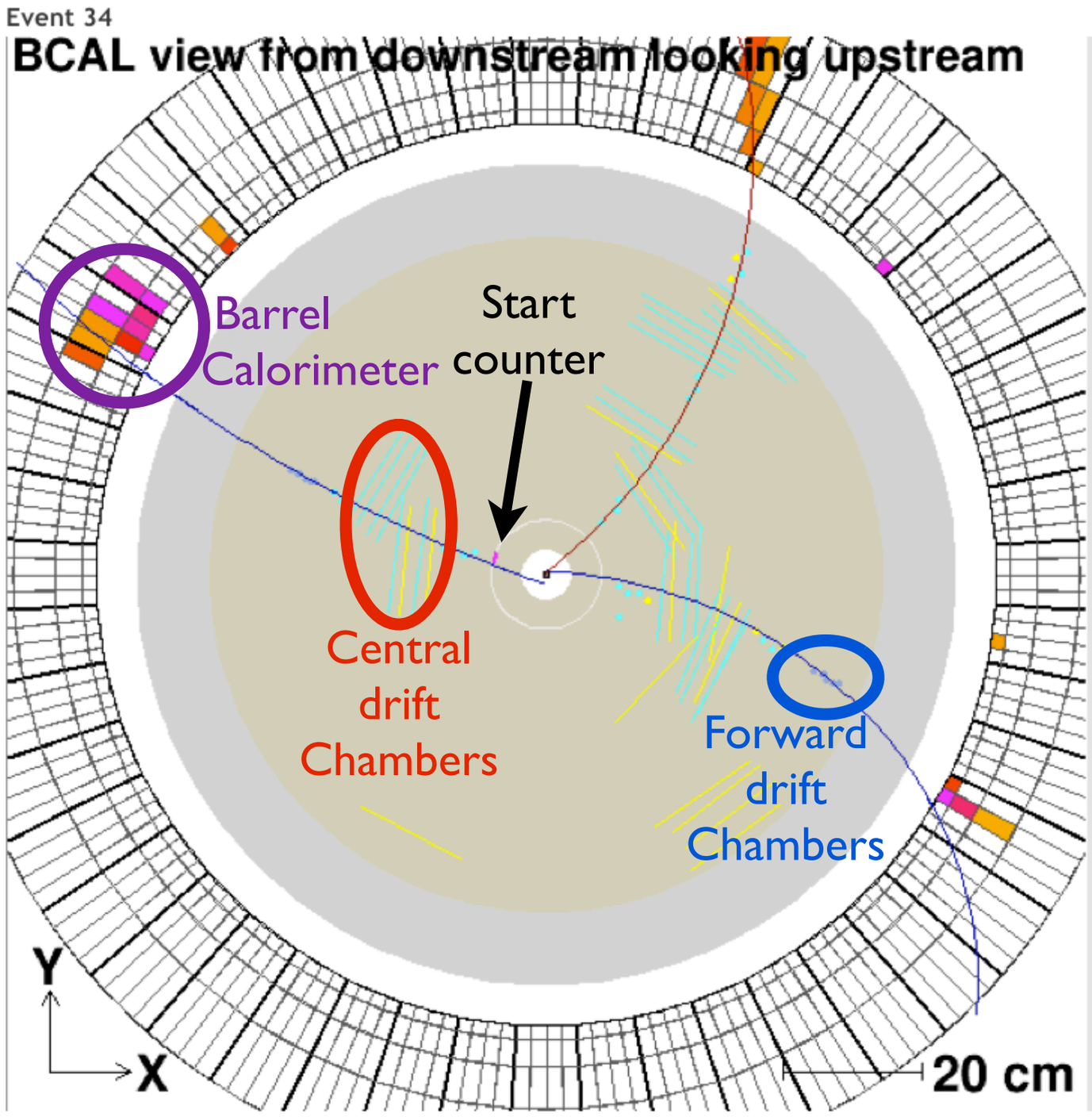

Upstream Beam Profiler Rates
1e7
3.0
2.5
2.0
1.5
1.0
0.5
0.0
maximum rate from fit [Hz]
straight-line fit of bpu_max_x data
straight-line fit of bpu_max_y data
bpu_max_x
bpu_max_y
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
0.016
0.018
beam current times radiator thickness [nA R.L.]

Actual run

Forward Calorimeter trigger

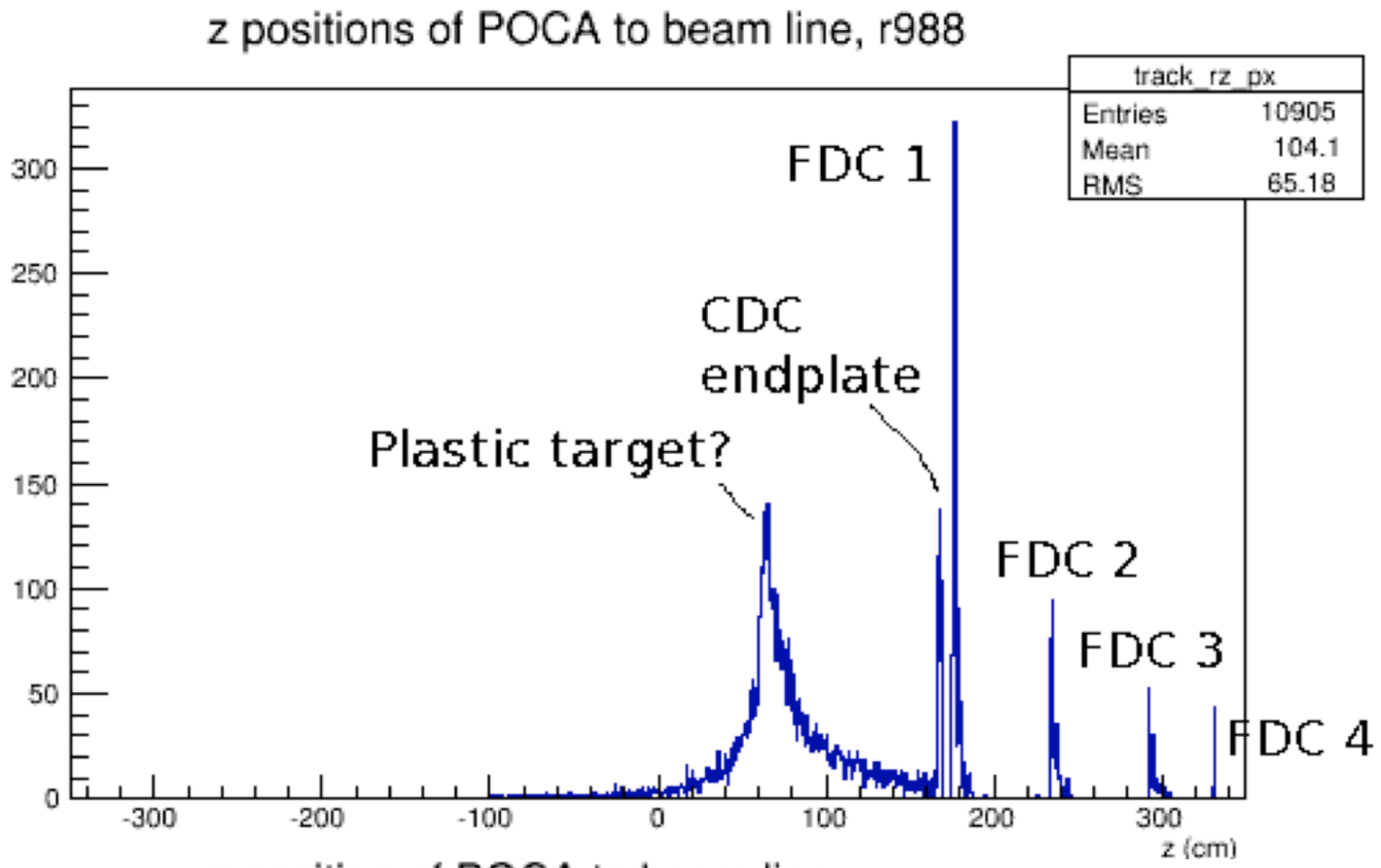




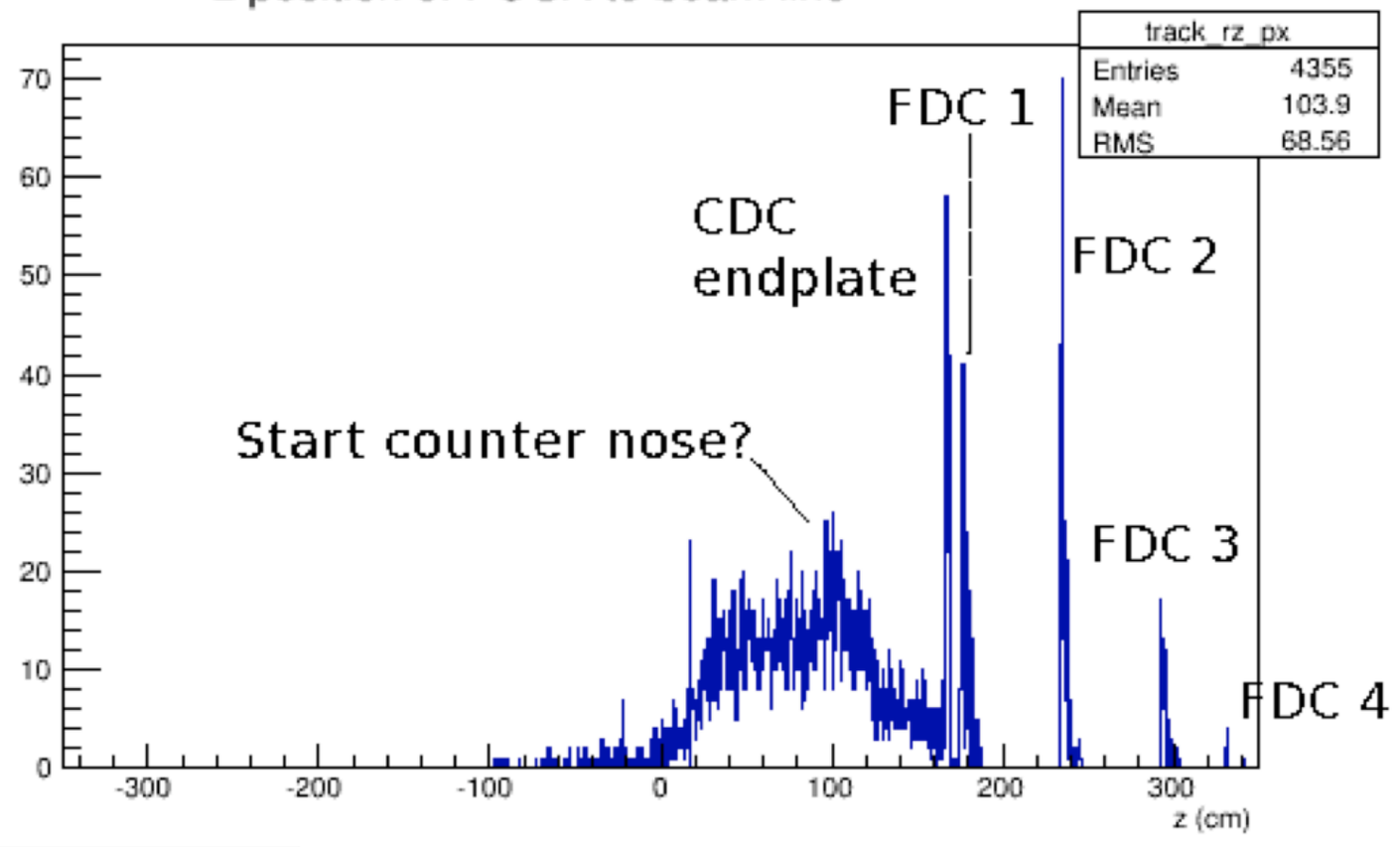
5 GlueX detectors at work!

Actual run

With plastic target:



With triangular hole target:



Actual run

Expected 21 days of solid beam.

We used about 16.5 days of solid beam.

We lost about 2.5 days of good beam (solenoid repairs, configuration changes, etc...).

Good accelerator+Hall D performances while both commissioning.

Data summary (S. Dobbs):

https://halldweb1.jlab.org/cgi-bin/data_monitoring/run_conditions.pl

Total number of useful runs: 809.

Number of "analysis quality" (i.e. for bump hunting, not detector calibration) runs: 97:

- FCAL trigger: 18 runs, 1.6 TB
- BCAL trigger: 28 runs, 4.4 TB
- FCAL+BCAL trigger: 51 runs, 40.0 TB

Total data size:

- EVIO (on tape): 120 TB
- REST: 114 GB

Conclusion

Fall 2014 goals

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- Create unpolarized photon beam and tune it through:
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- Target position from tracking; ✓
- Demonstration of PID using FCal, BCal, TOF and/or other detectors. ✓

Improvements for Spring 2015 run?

- Run preparation meetings;
- Feedback from collaboration.