

# Summary of the Hall D run & accelerator performance during Spring 2020

A. Deur  
Jefferson Lab

Information in small fonts are not meant to be read. They are here for future reference.

# Summary of the Hall D Fall 2019/Spring 2020 run

A. Deur  
Jefferson Lab

Fall 2019/Spring 2020 run plan: [https://halldweb.jlab.org/wiki/index.php/Run\\_Coordination\\_Meetings:Fall2019\\_Run](https://halldweb.jlab.org/wiki/index.php/Run_Coordination_Meetings:Fall2019_Run)

Spring 2020 run coordinator summaries: [https://halldweb.jlab.org/hdops/wiki/index.php/Summary\\_Spring\\_2020\\_Run](https://halldweb.jlab.org/hdops/wiki/index.php/Summary_Spring_2020_Run)

Run period summaries: [https://halldweb.jlab.org/hdops/wiki/index.php/Hall\\_D\\_Runs](https://halldweb.jlab.org/hdops/wiki/index.php/Hall_D_Runs)

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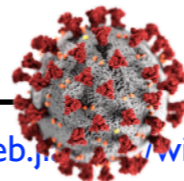
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**March 17th: MedCon 5**  
(4 single-person 6h shifts/day)



# Spring 2020 run

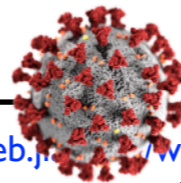
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**March 24th: MedCon 6**

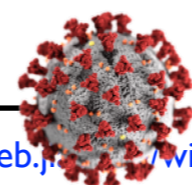
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**Physics Division Liaisons:** Benedikt Zihlmann/Lubomir Penchev.

**Analysis Coordinator:** Alexander Austregesilo.

Run coordination, subsystem status, data quality monitoring, offline analysis are discussed at **daily RC meetings** (8:45am, counting house).



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Run time loss may be partly recovered by a 2020 summer run

# Spring 2020 run configuration

- Energy: **11.4 GeV**
  - 4-hall ops, 1-pass for Hall A, 1-5 pass for Hall B, 1-5 pass for Hall C. D: 5.5-pass. **High beam currents for A & C.**
- Hall D configuration:
  - Both DIRC boxes**
  - Solenoid at 1350A.
  - Rep. rate 250 MHz.
  - Slit shared with C (as in Fall 18&19 and Spring 19. It was with B in Fall 17 and A in Spring 18)
  - Beam current 1 nA-2.1  $\mu$ A.
  - Production Radiator: **47  $\mu$ m J70-105 diamond**; (47  $\mu$ m J70-106 was aligned but not used for production due to early run termination. Used for trigger accidental rate scans done by R. Jones.)
  - 5mm collimator hole;
  - LH<sub>2</sub> target.
  - TPol with 75  $\mu$ m TPol convertor.

# Spring 2020 runplan

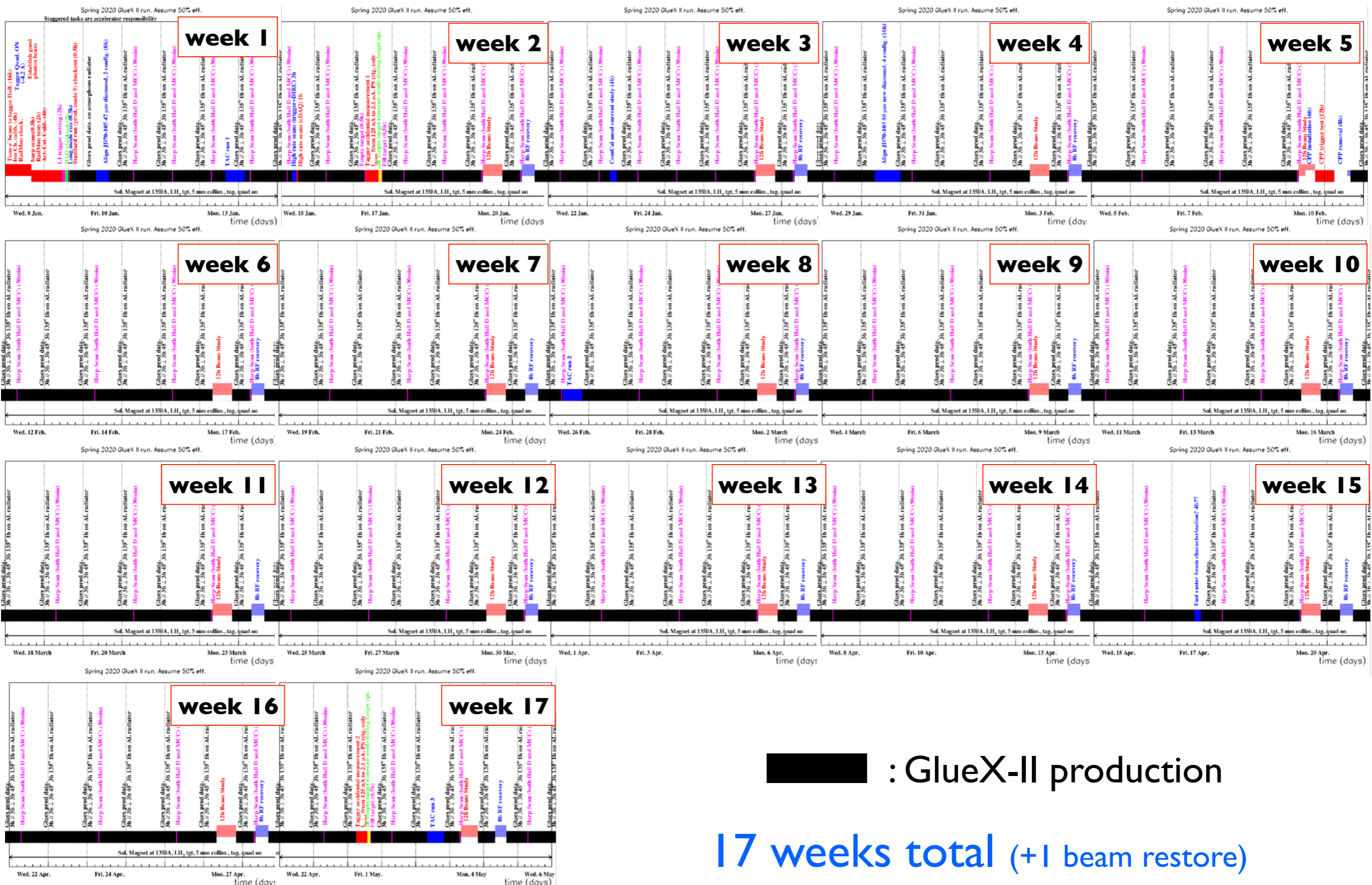
Production







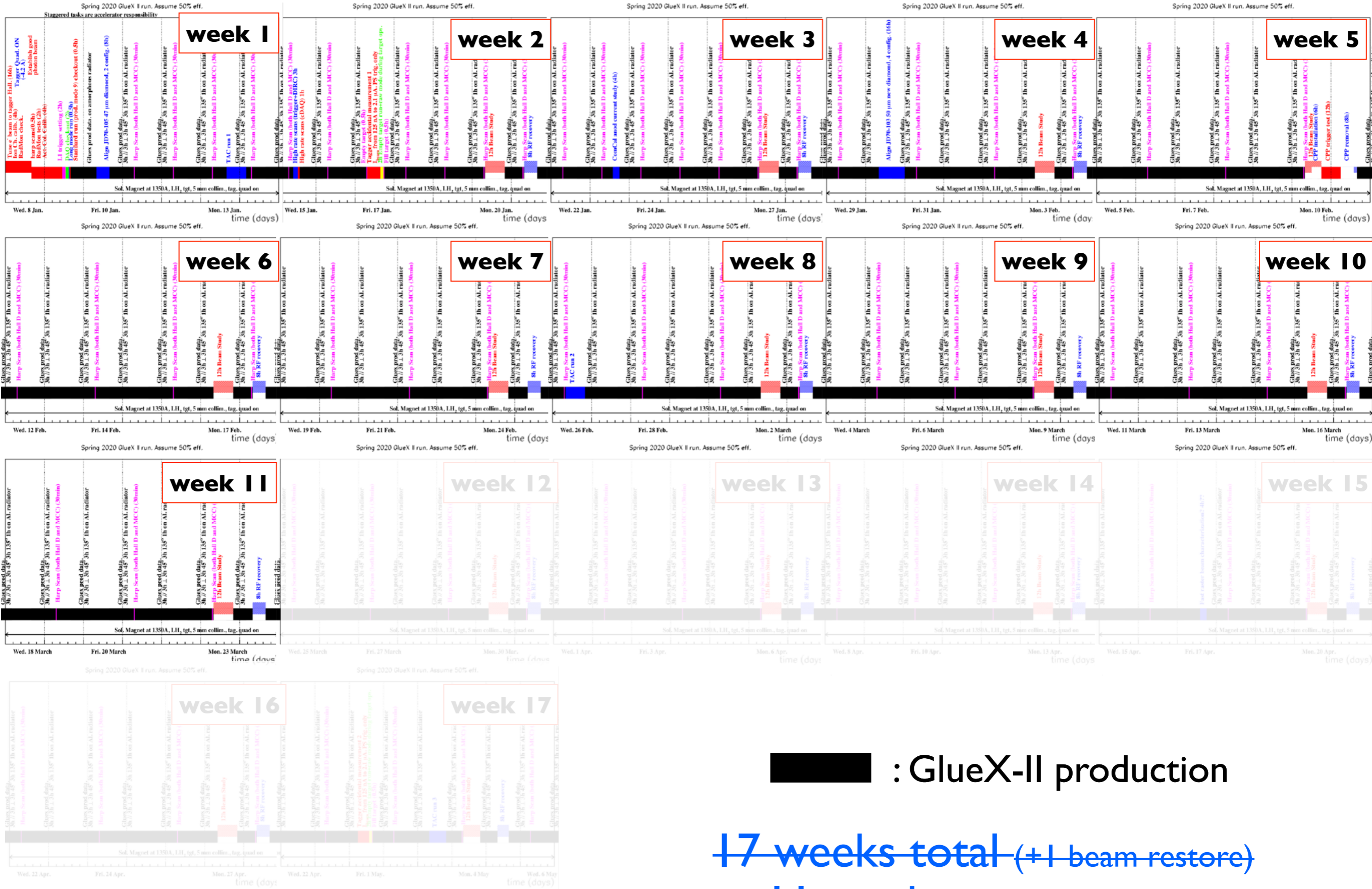
# Spring 2020 original runplan



: GlueX-II production

17 weeks total (+1 beam restore)

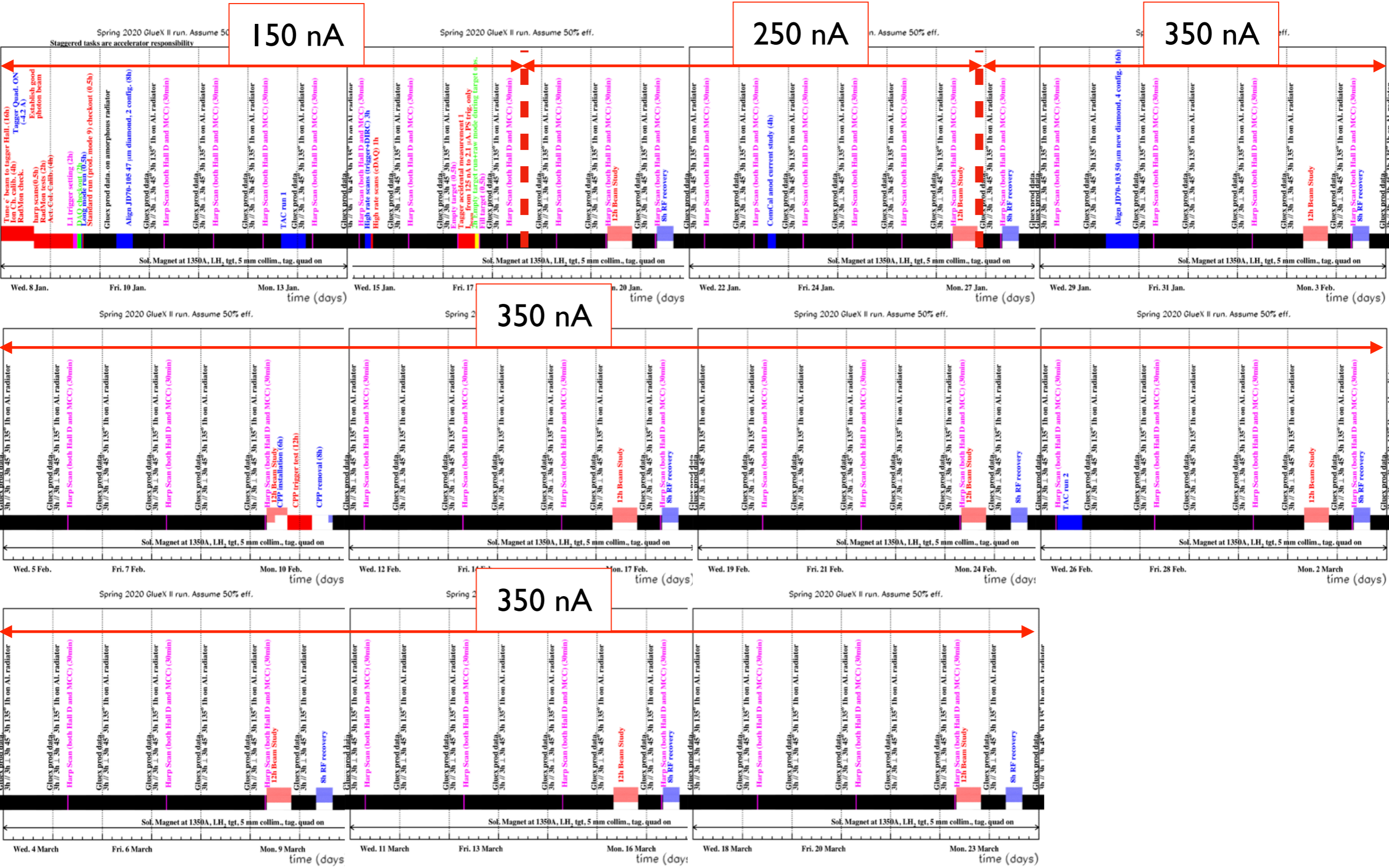
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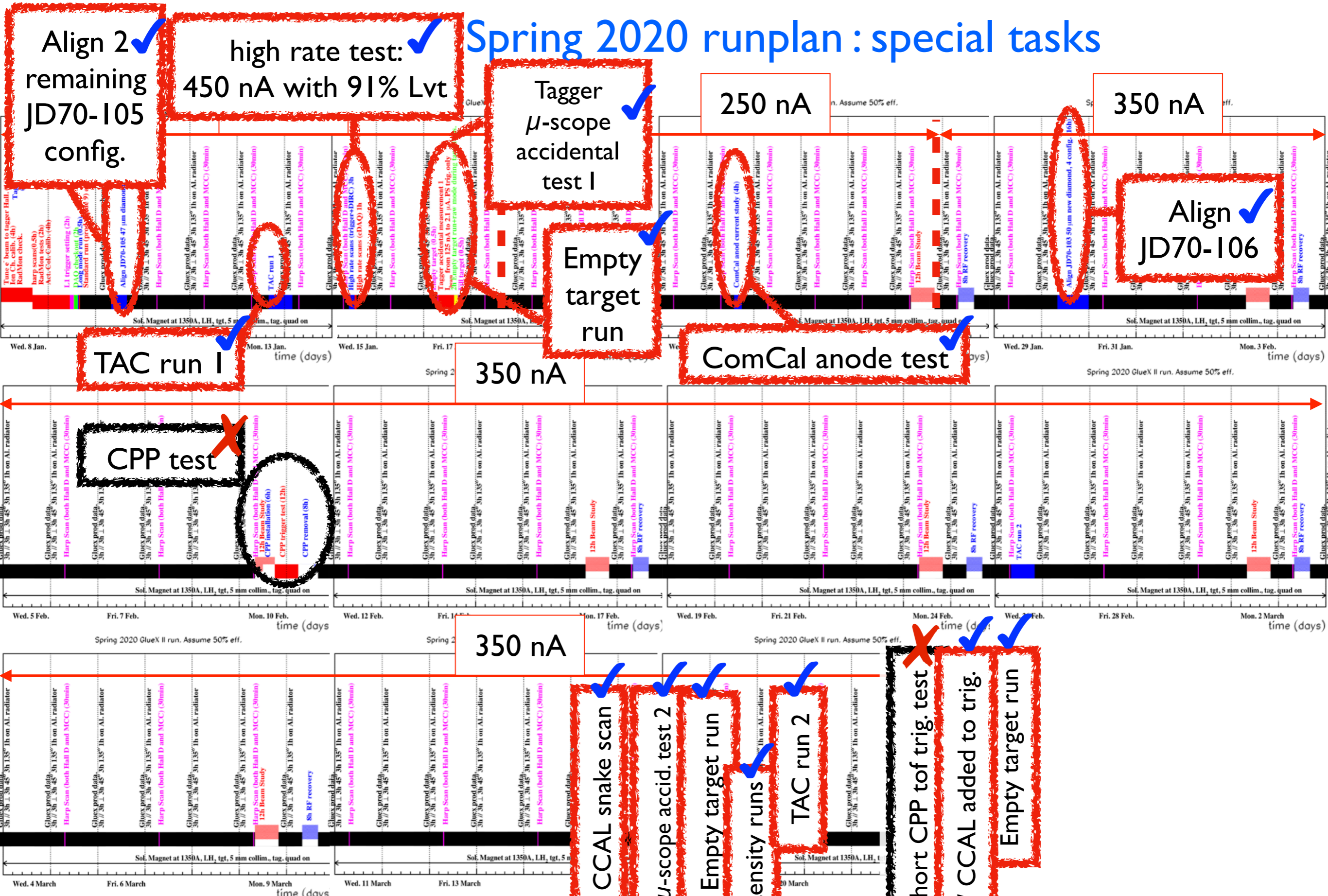
~~17 weeks total (+1 beam restore)~~  
11 weeks (+1 beam restore)



# Spring 2020 runplan



# Spring 2020 runplan : special tasks



Align 2 ✓  
remaining JD70-105 config.

high rate test: ✓  
450 nA with 91% Lvt

Tagger μ-scope accidental test I ✓

250 nA

350 nA

Align ✓ JD70-106

TAC run 1 ✓

Empty target run ✓

ComCal anode test ✓

350 nA

CPP test ✗

350 nA

CCAL snake scan ✓

Tagger μ-scope accid. test 2 ✓

Empty target run ✓

low intensity runs ✓

TAC run 2 ✓

Short CPP tof trig. test ✗

run w/ CCAL added to trig. ✓

Empty target run ✓

Tests added b/c of early end of run →

# Production Spring 2020 run

Scheduled run time: 2880h (120 days): Jan 10<sup>th</sup>-May 6<sup>th</sup>

Acceptable beam used: **968h**

⇒ Running efficiency for Spring 2020 period: **33.6%** (delivery eff.: 37.5%)

We gathered **208B triggers**, split in:

- 22% at 0° diamond orientation;
- 22% at 45° diamond orientation;
- 22% at 90° diamond orientation;
- 22% at 135° diamond orientation;
- 12% on Al. radiator.

# Accelerator performance

## Excellent CEBAF operations:

- Correcting for early shut-down: Actual Hall D operation efficiency: **53%**  
(delivery eff.: 62%)
- Very stable beam convergence. Credited to M. Tiefenback taming of rogue quadrupole
  - Essentially no need to call for beam refocusing (it was every few days for previous run periods)
- No scheduled beam studies nor RF recoveries. Done when needed



# Accelerator performance

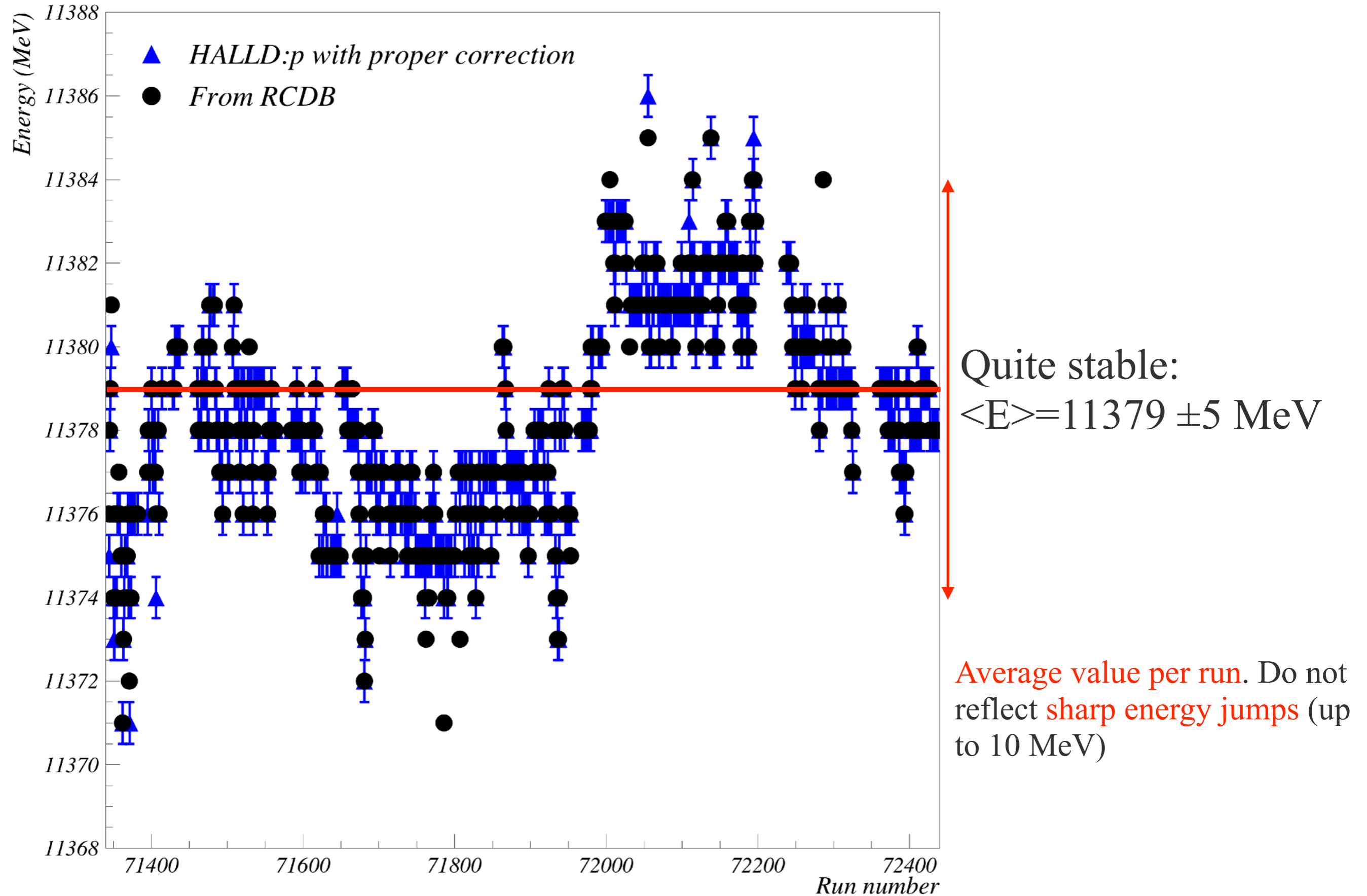
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## Some recurrent problems:

- **~10 nA bleedthrough**
  - **Spray particles during radiator ops  $\Rightarrow$  damaged electronics?**
  - **No TAC run** unless one of the other halls is down. Even though, tried on March 16 (Hall A down) but had to abort TAC run. Blamed on too high Bleedthrough.
  - **Cumbersome new procedure (dumplette insertion) for radiator ops**
  - **Bleedthrough beam characteristics different from main beam?**
- **Frequent few-hour long drops (up to 25%) in photon beam transmission**
  - Many tests done to discover its origin, but it is **not clear yet** (more on this latter).

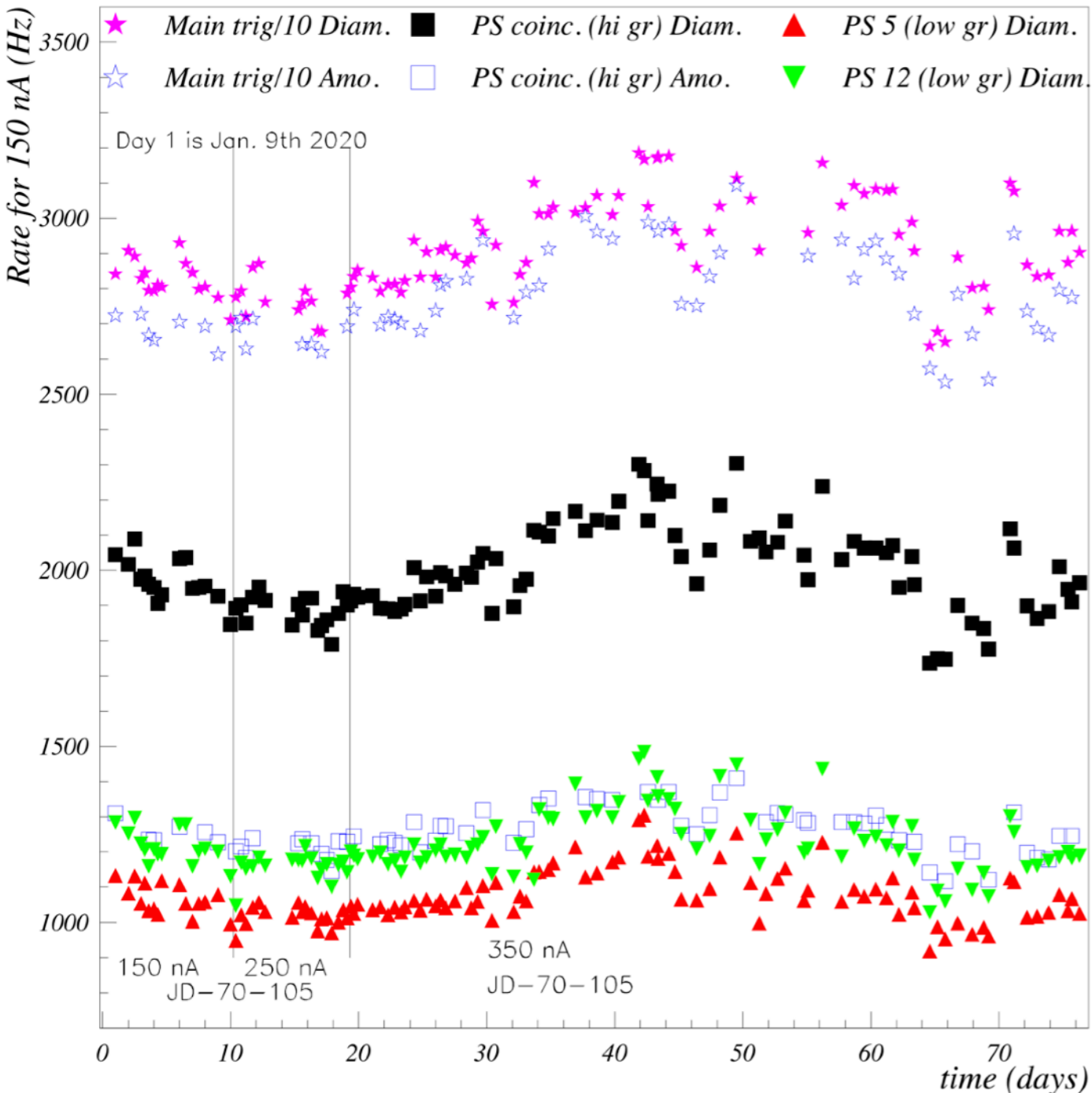
# Hall D beam Energy (Fall 2019/Spring 2020)



# Beam transmission (Spring 2020)

## Rates, normalized to 150 nA

Very stable compared to previous run periods (except for few hours long dips. More on this shortly)



These data exclude periods with "dip" problems.  
See summary at <https://logbooks.jlab.org/entry/3809040>

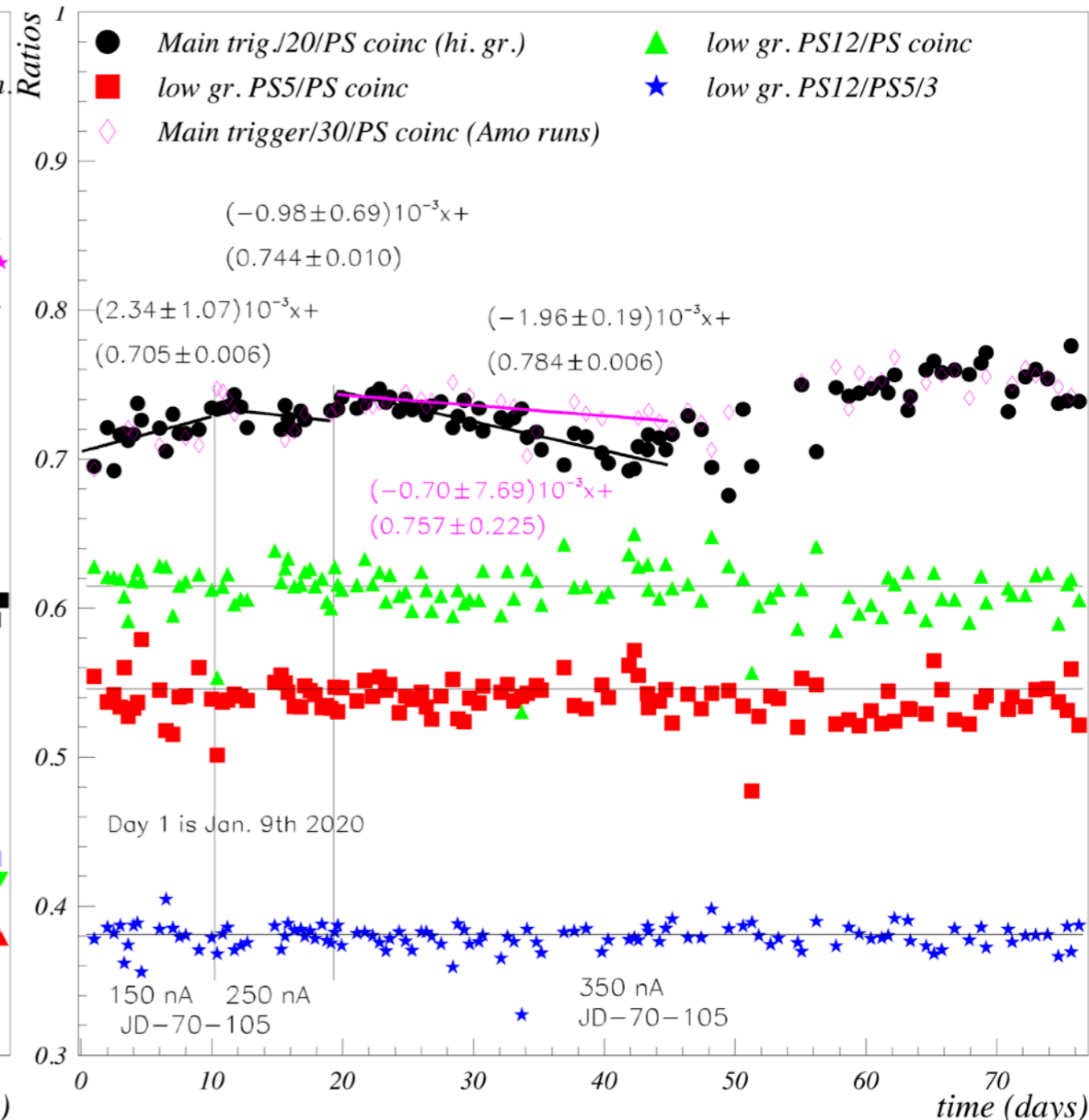
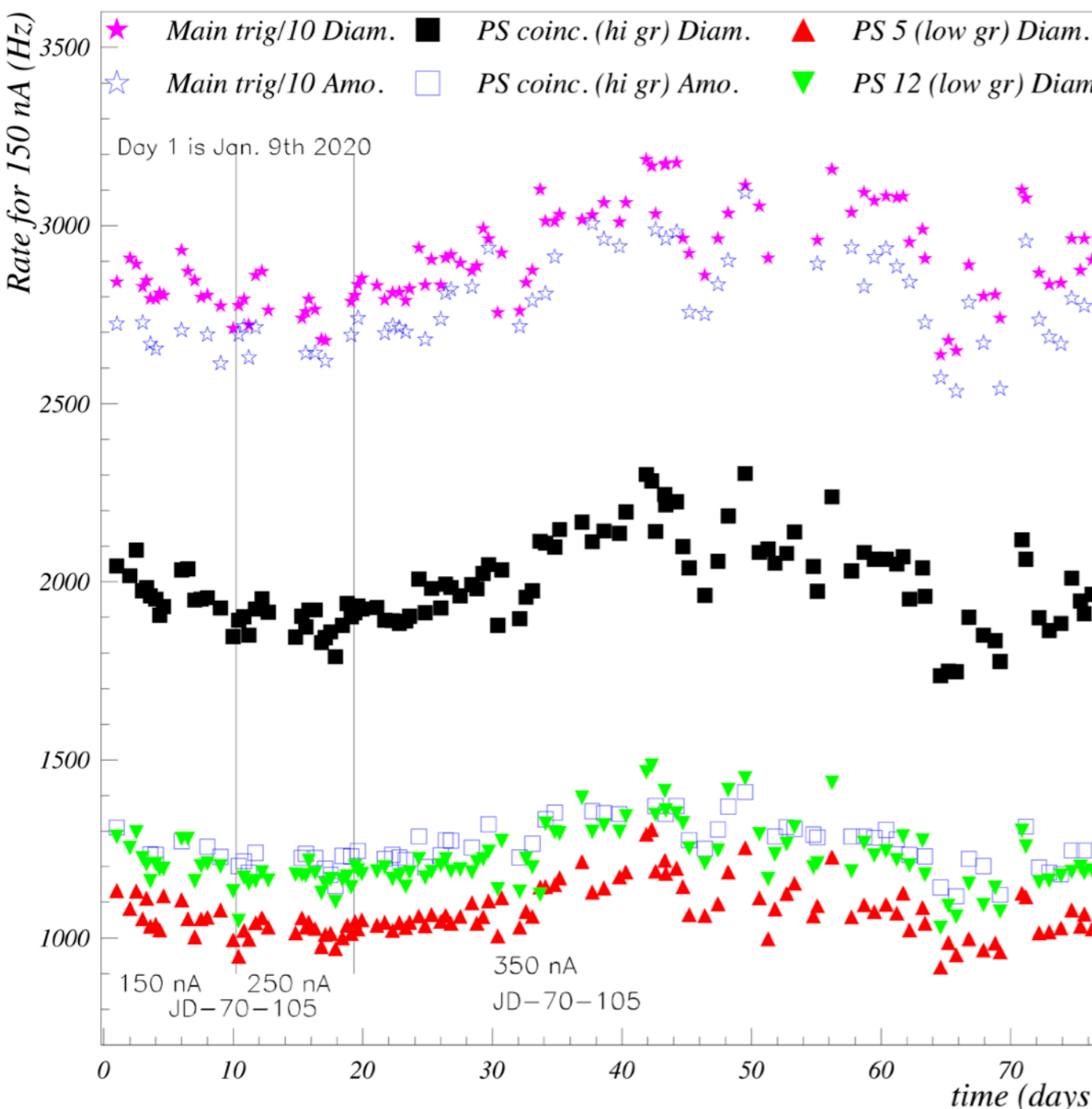
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## Rates ratio

Diamond Main Trigger/PS stables within  $\pm 3\%$



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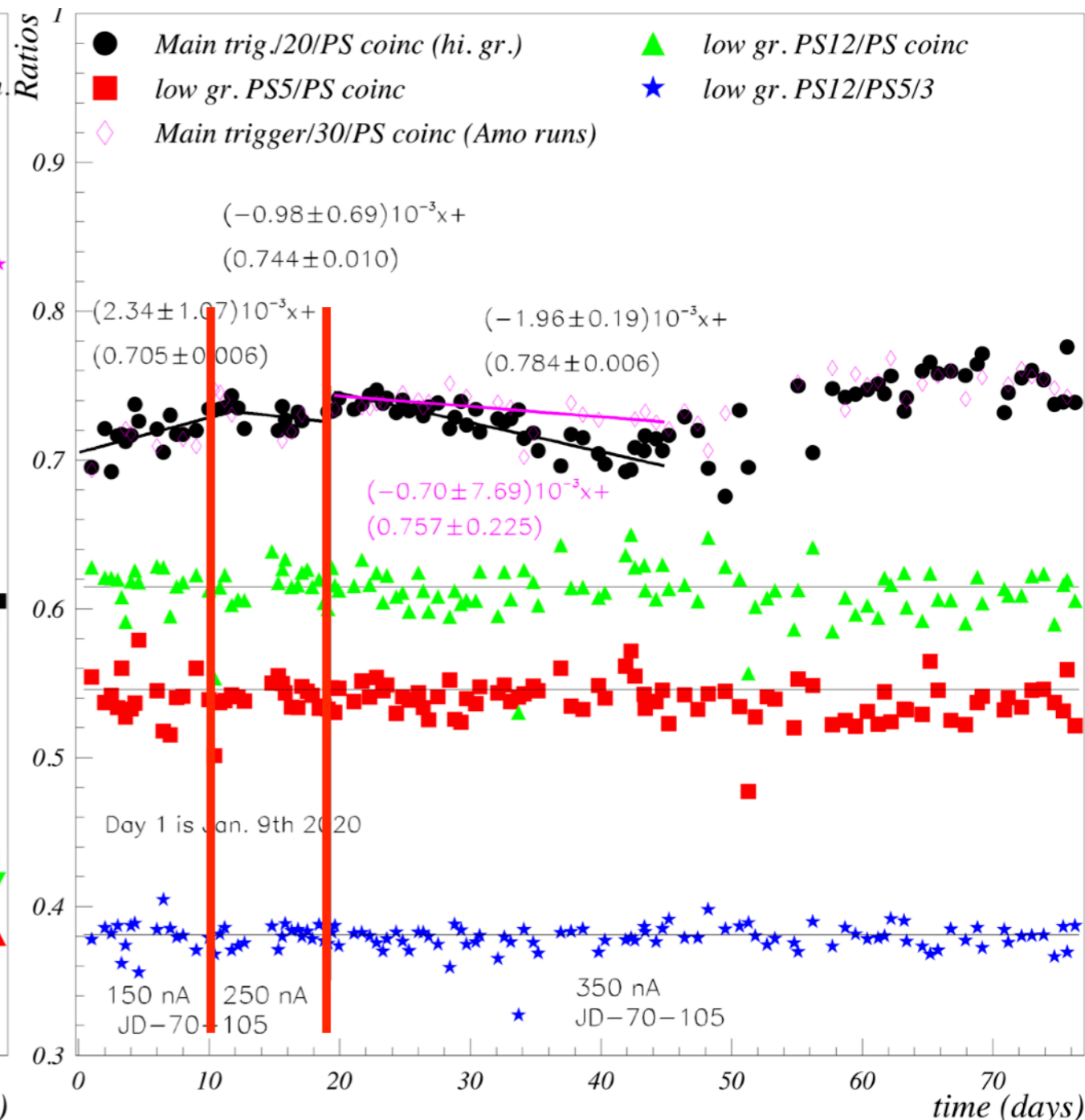
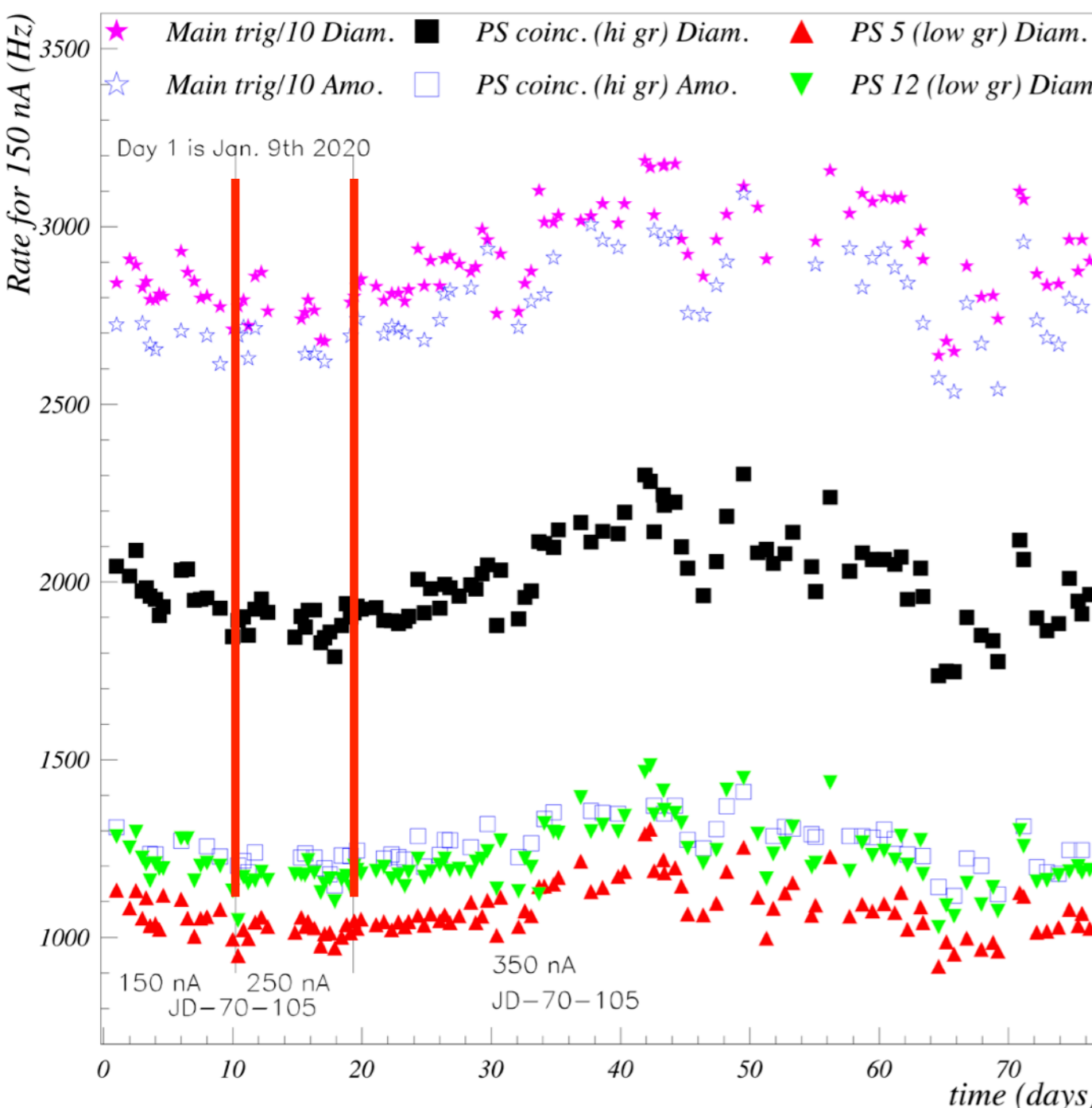
Rates, normalized to 150 nA

Rates ratio

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Diamond Main Trigger/PS stables within  $\pm 3\%$

No noticeable discontinuities at 150nA  $\rightarrow$  250nA  $\rightarrow$  350nA transitions

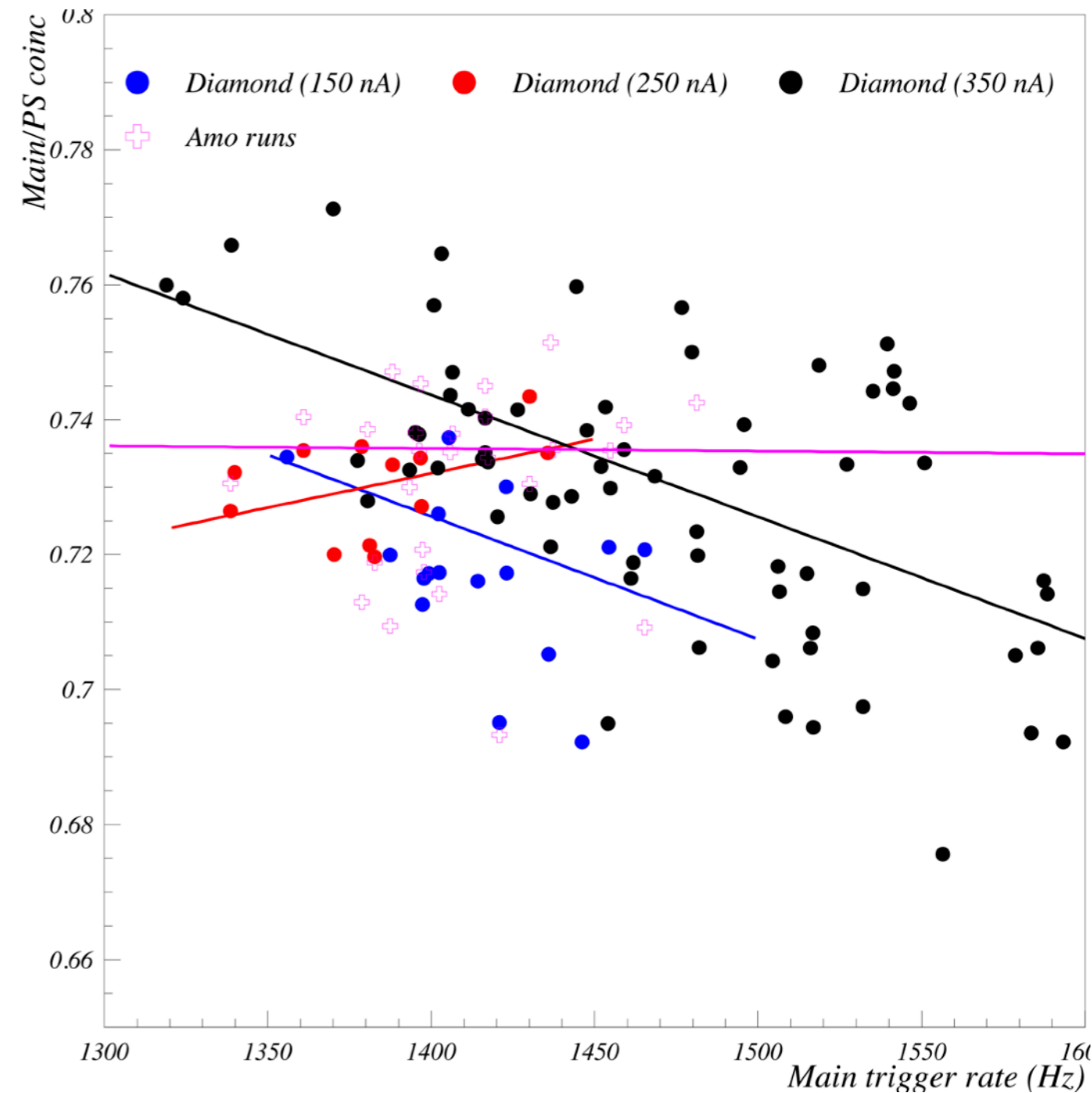


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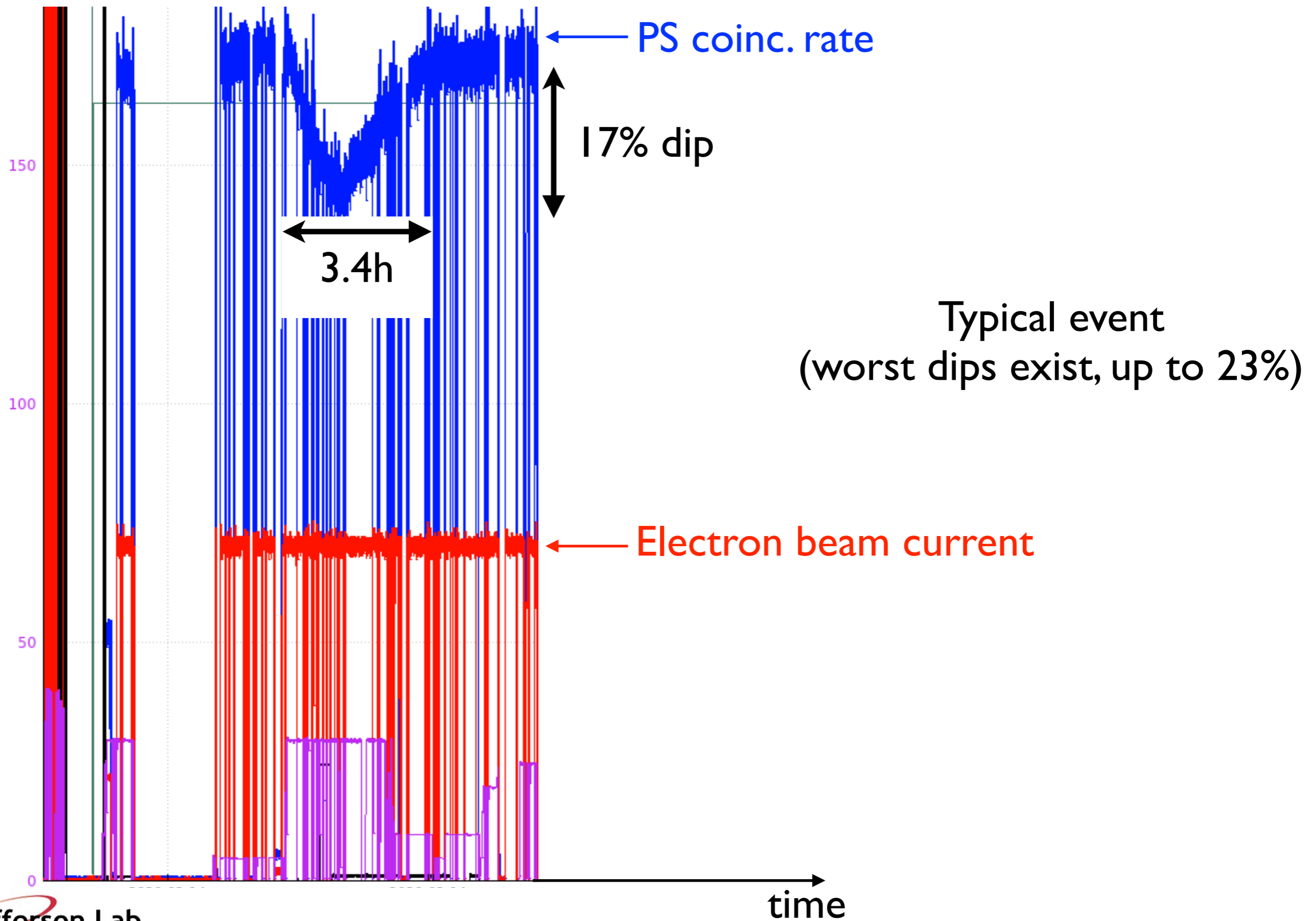
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Possible anti-correlation with absolute rate values



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# Beam transmission dips (Spring 2020)





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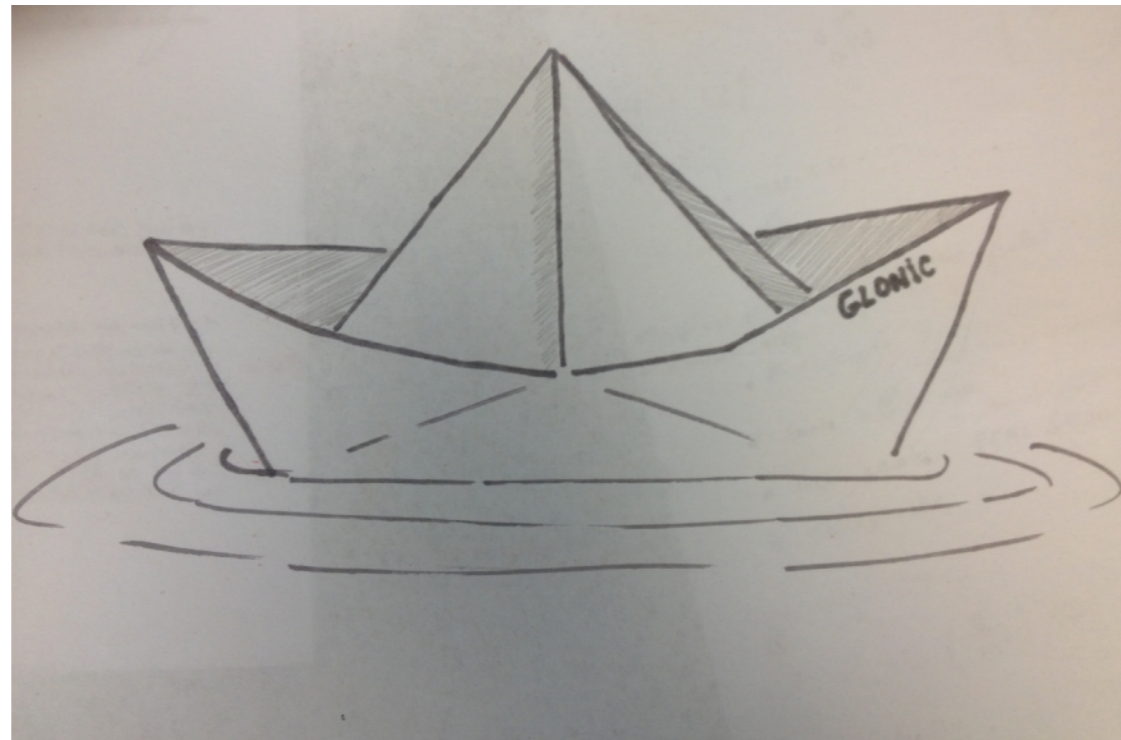
- Up to **25% transmission drop**, on ~hour timescale.
- **New**. Not seen in previous run periods, nor until **Feb. 7<sup>th</sup> 2020** (one month into the run)
- Different than known “Active Collimator charging” issue (also causing dips, but associated with beam restoration after a long down time)
- Seen by in PS, main trigger and luminosity monitor rates, but not tagger counters  
     $\Rightarrow$  **real transmission effect**
- Occurs **both with diamond and Al.** radiators
- Carried several tests. Conclusions:
  - Not due to running at larger current (350nA vs 150nA).
  - Not due to bleedthrough.
- Correlates well with **Active Collimator outer beam y-position** & also (but not as strongly) with **beam position at beam dump** and **photon rad. probe in col. cave**. Other beam positions monitors, radiation monitors or beam current and energy do not correlate.
- Still unclear if due to **beam profile change+position lock** or **Act. Col.** issue.

List of related log entries: <https://logbooks.jlab.org/entry/3808332>, 3804835, 3798434, 3797800, 3793084, 3787973, 3787208, 3785813, 3783813, 3783707, 3783362, 3783363, 3779952

# List of problems during Spring 2020 run

- **Solenoid trip** (02/12/2020 power supply overheating.)
- Surveying incident (02/17/2020): Survey ball attracted by solenoid field. **Broke a BCal module connector**
- **~10 nA bleedthrough** (when Halls A or C are running)
- Fall 2019/Spring 2020: **Energy lowered by ~200 MeV** due to unsustainable RF-trips
- Short term **beam energy drift** of up to 10 MeV: see <https://logbooks.jlab.org/entry/3809061>
- **Transmission dips**
- Recurring drops of **PSS system**

# Comparison with other GlueX runs



Spring 2020

covid-19  
shut-down  
corrected

Actual Run time: 968h  
Run efficiency: 34% (or 53%)  
Production triggers:  $2.1 \times 10^{11}$



GlueX-II  
launched

Fall 2019

Actual Run time: 192h  
Running efficiency: 32%  
Production triggers: 0.



Getting  
ready...

Spring 2019

+PrimEx

Actual Run time: 312h  
Running efficiency: 36% (55%)  
Production triggers: 0.



Preparation

Fall 2018

Actual Run time: 788h  
Running efficiency: 52%  
Production triggers:  $8 \times 10^{10}$



Spring 2018

Actual Run time: 1111.8h  
Running efficiency: 55%  
Production triggers:  $1.5 \times 10^{11}$



Fall 2017

Actual Run time: 10.5h  
Running efficiency: 3%  
Production triggers: 0



Spring 2017

Actual Run time: 354.1h  
Running efficiency: 56%  
Production triggers:  $4.7 \times 10^{10}$



Fall 2016

Actual Run time: 84h  
Running efficiency: 5.4%  
Production triggers: 0



Spring 2016

Actual Run time: 458h  
Running efficiency: 41%  
Production triggers:  $6.9 \times 10^9$



Fall 2015

Actual Run time: 30.2h  
Running efficiency: 20%  
Production triggers: 0



Spring 2015

Actual Run time: 122h  
Running efficiency: 20%  
Prod. triggers: 0 (5.5 GeV run)



Fall 2014

Actual Run time: 324h  
Running efficiency: 34%  
Production triggers: 0



Partly  
commissioning

commissioning



Spring 2020

covid-19  
shut-down  
corrected

Actual Run time: 968h  
Run efficiency: 34% (or 53%)  
Production triggers:  $2.1 \times 10^{11}$



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launched

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Getting  
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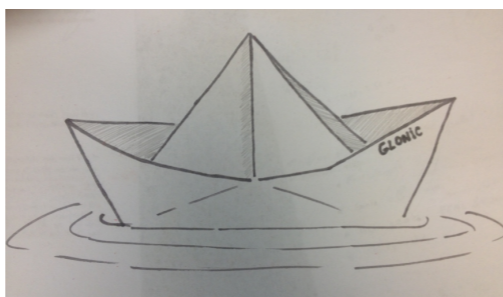
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Thank you