sPHENIX Status
RHIC Coordination

December 16th, 2025

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sPHENIX Run Coordinator

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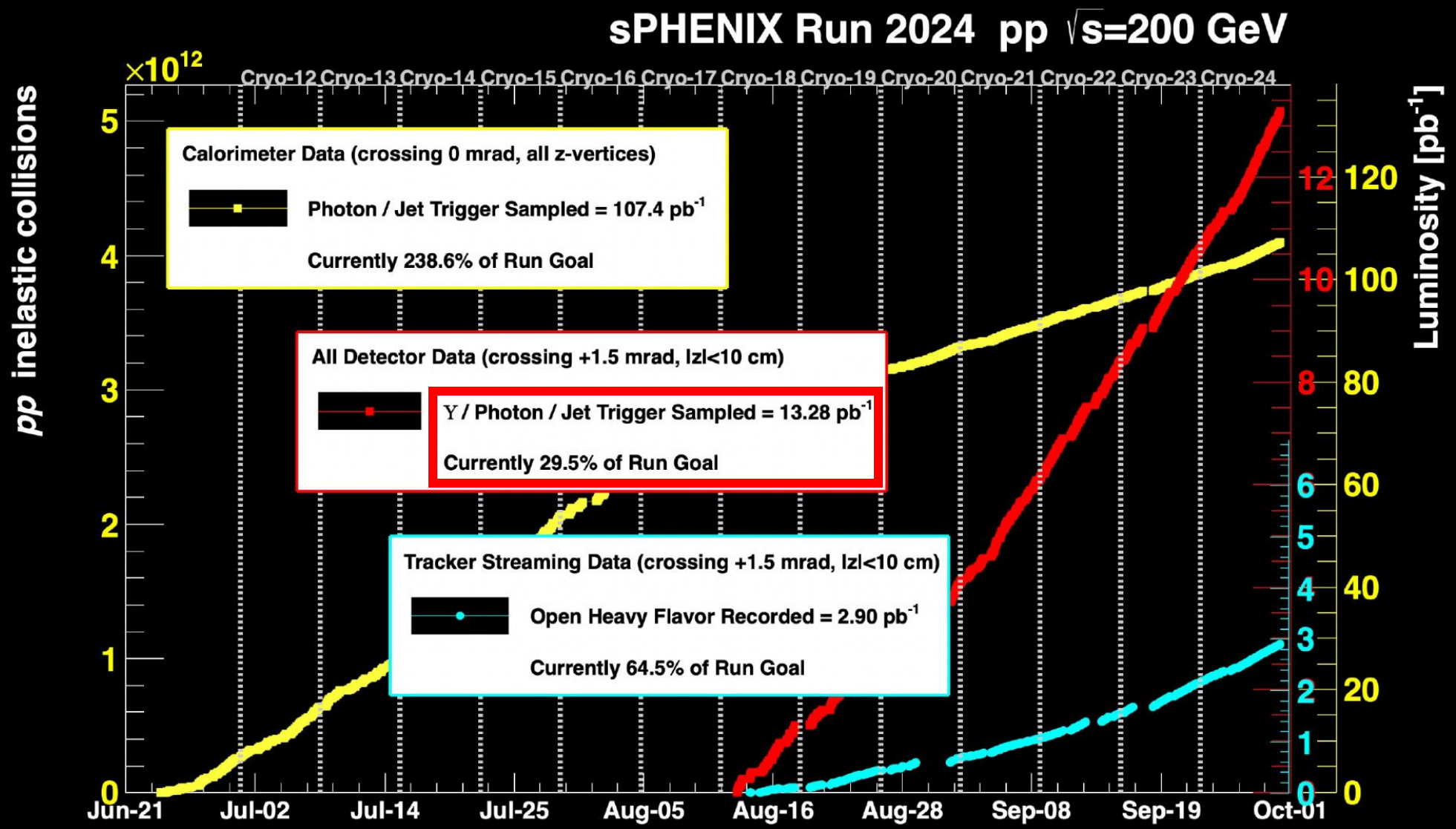
Run 24 Integrated Luminosity



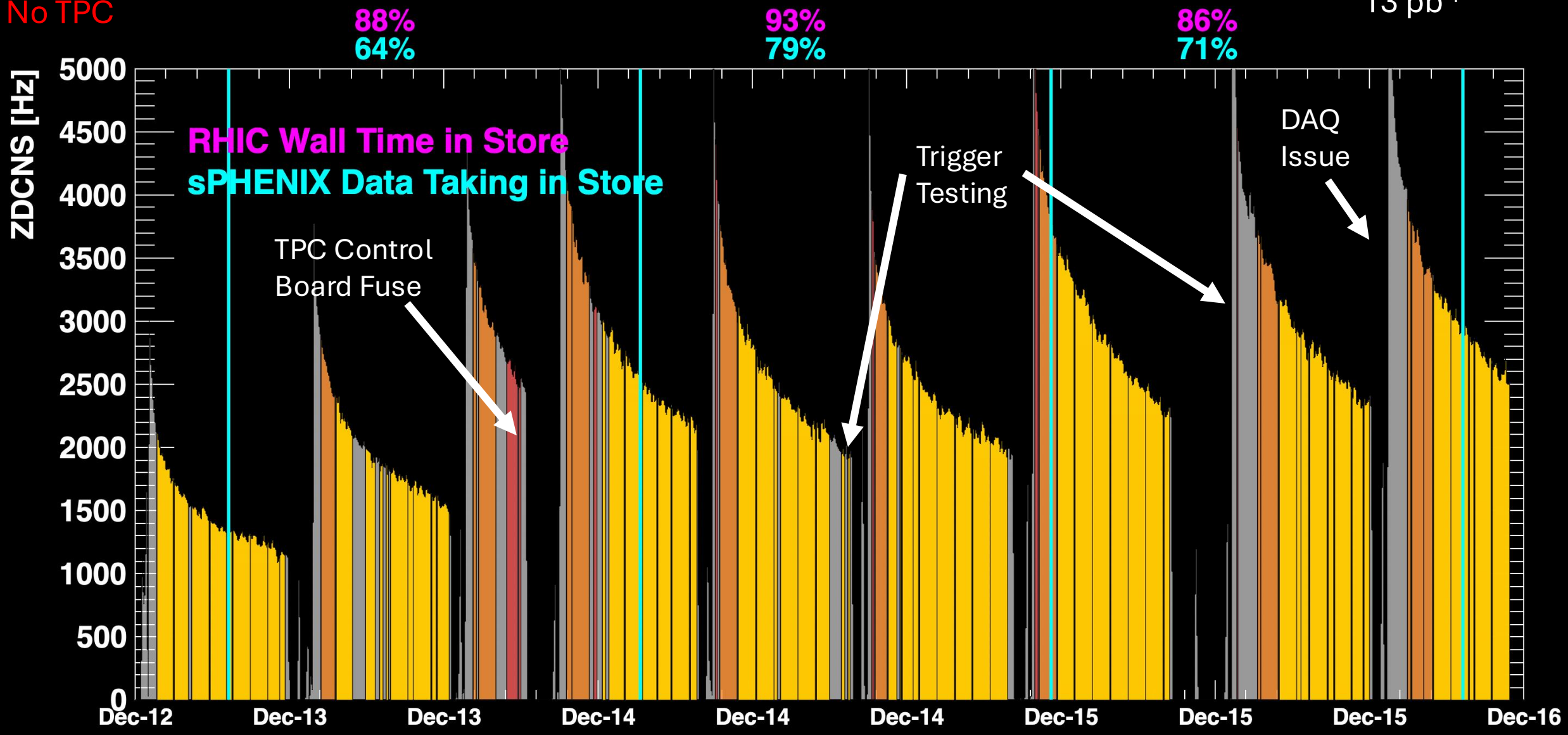
Run 25 p+p sPHENIX Commissioning Activities

- sPHENIX needs 1 week of commissioning time in order to
  - Commission TPC HV PS (new for Run 25)
    - Nearly complete
  - Commission 100% streaming mode with new bufferboxes and other improvements
    - Needs full luminosity in order to establish operational boundary
  - Commission trigger set up
    - Calorimeter Look Up Tables (LUTs) have changed since run 24
    - In progress

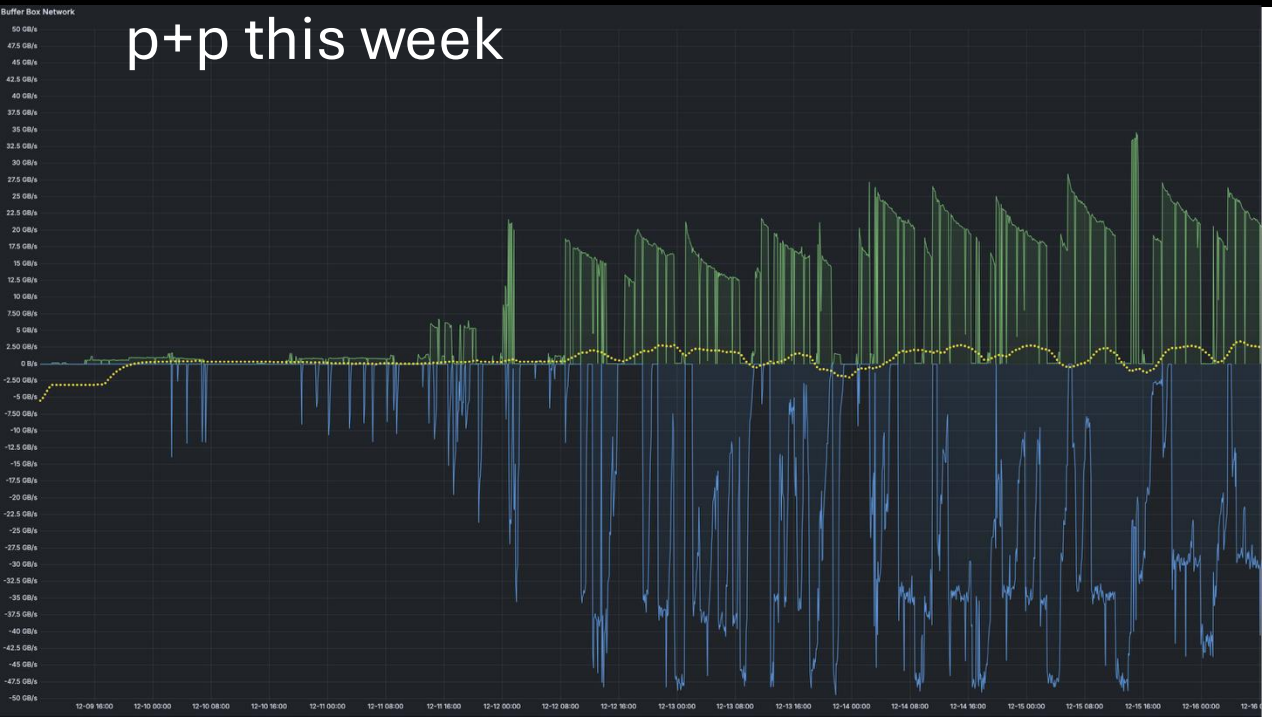
Commissioning Performance

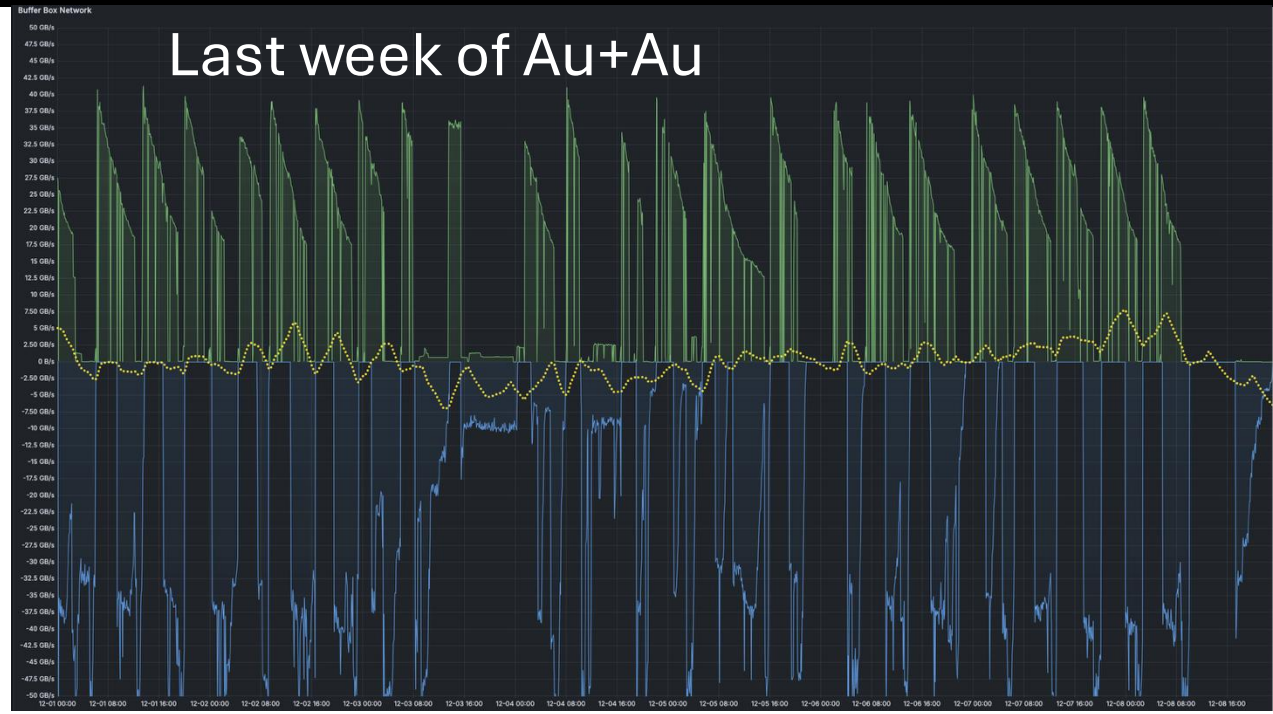
TPC Triggered Mode
TPC Streaming Mode
No TPC

Y/γ trigger
PAC goal is
13 pb^{-1}



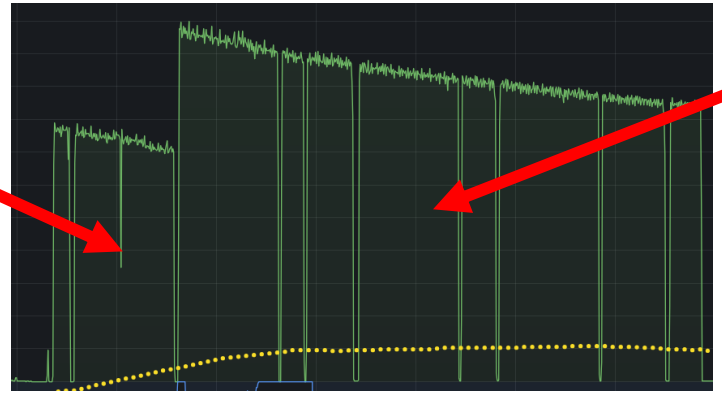
Data throughput: Maximizing our data collection





Data in
Data out
24 hour ave in - out

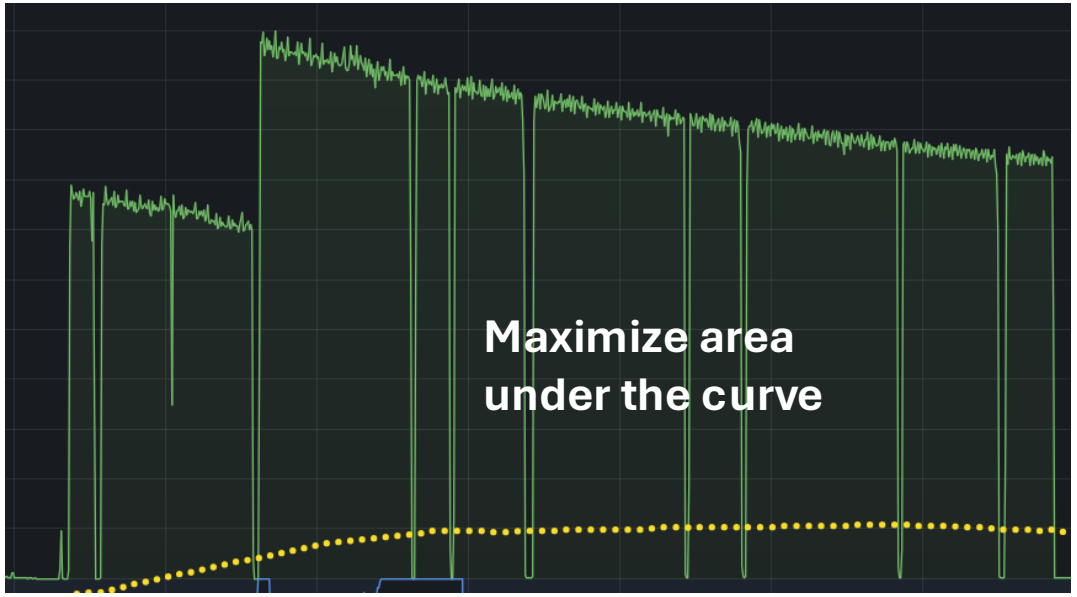
Triggered
Running



Streaming
Running
(Trackers)

Data throughput

- Open heavy flavor program benefits from increased streaming
  - Only requires tracking detectors
- Start of pp data taking, triggered mode maxed at 11 kHz with 36 μs extended read-out for tracking detectors = 39% streaming
  - Increased to 13 kHz, equivalent to 47% streaming (x2 our Run 24 streaming rate)
- Initial guess for max streaming rate based on Run 24 background level: ~300kHz MBD coincidence
  - First streaming physics runs (world's first spin polarized full streaming collider runs): <250kHz MBD Coincidence
- Saturday night (12/13) : background improved CAD, increase limit to 340kHz MBD Coincidence
- Today (12/16): testing operational boundary up to 500kHz
  - Data is 90% TPC, which is dominated by background



1 Fill time scale

- Reducing beam background increases our streaming rate
- Thanks to C-AD for the improved performance, we are already beyond Run 24 signal/background

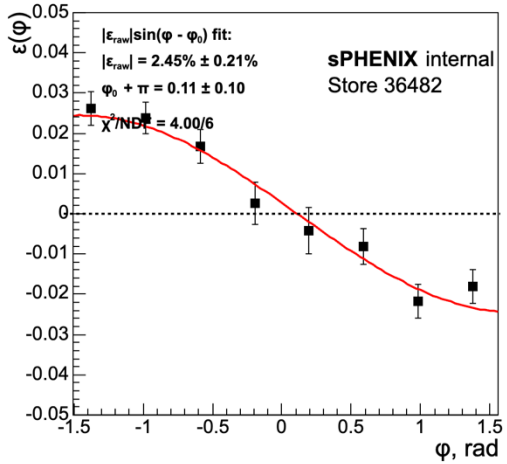
Polarization

Local Pol Average Asym of Fill#36482

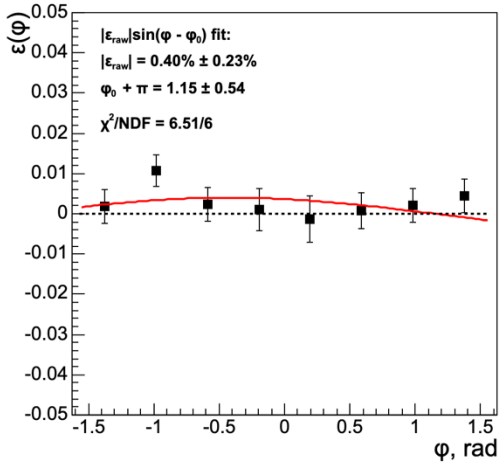
2025-12-13 19:34:02 (Fill#36482 19:00 – 22:30)

Run25

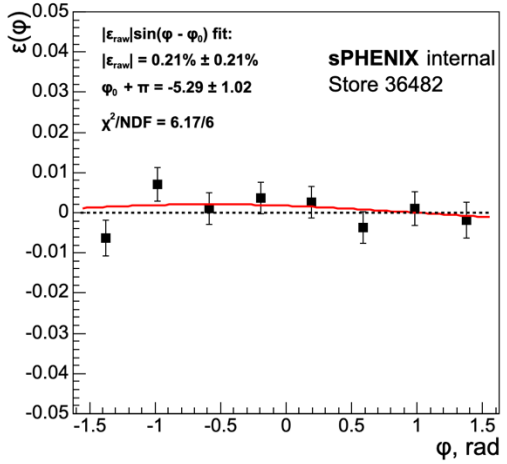
Square root asymmetry Blue North



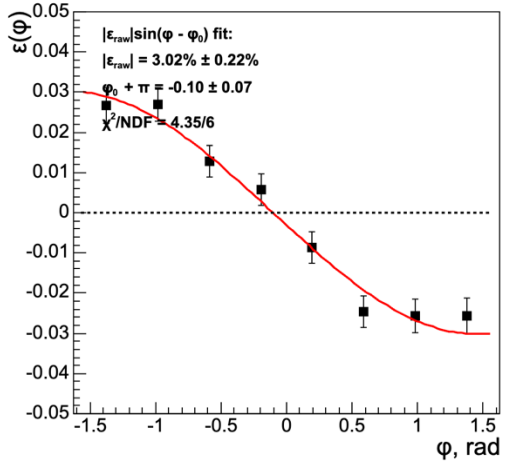
Square root asymmetry Yellow North



Square root asymmetry Blue South



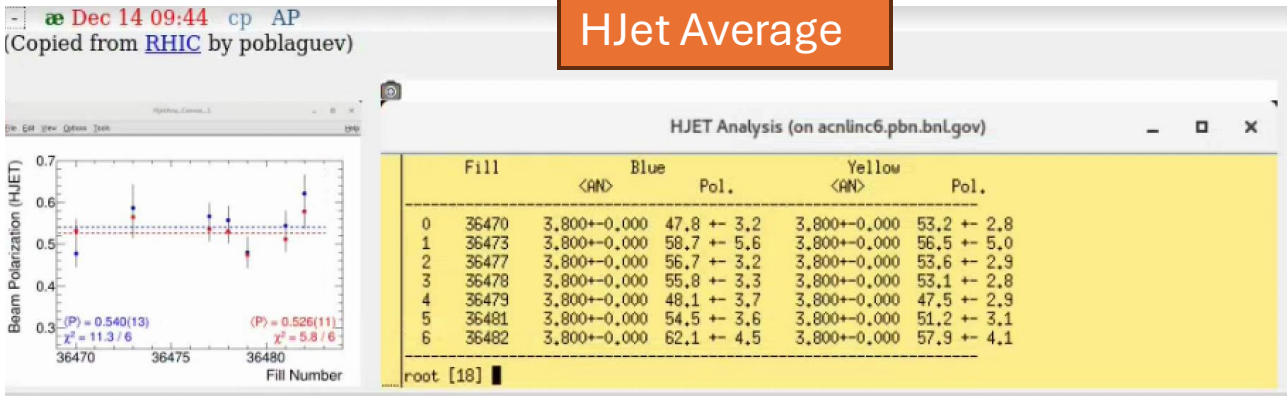
Square root asymmetry Yellow South



pC Average

36477.204	Dec 12, 2025 14:27:31 Fri	B2D	52.2 ± 2.1	6.2 ± 3.3					56/9/56	54,801,934	φ —	v2.2.10M	Dec 12, 2025 14:34
36477.305	Dec 12, 2025 14:26:24 Fri	Y2U	49.0 ± 1.9	3.4 ± 3.2	0.23 ± 0.12	sweep	100.22	V1	56/9/55	57,885,768	φ —	v2.2.10M	Dec 12, 2025 14:34
36477.004	Dec 12, 2025 14:24:39 Fri	B1U	52.6 ± 2.6	0.2 ± 2.8	0.08 ± 0.12	sweep	100.22	H1	55/9/56	56,016,536	φ —	v2.2.10M	Dec 12, 2025 14:26
36477.104	Dec 12, 2025 14:23:28 Fri	Y1D	49.9 ± 2.8	5.6 ± 3.1	0.16 ± 0.18	sweep	100.22	H1	56/9/55	44,204,361	φ —	v2.2.10M	Dec 12, 2025 14:25
36477.304	Dec 12, 2025 12:21:52 Fri	Y2U	49.8 ± 1.9	2.4 ± 3.1	0.26 ± 0.11	sweep	100.22	V1	56/9/55	60,467,943	φ —	v2.2.10M	Dec 12, 2025 12:31
36477.103	Dec 12, 2025 12:20:48 Fri	Y1D	49.1 ± 2.7	3.5 ± 3.1	0.04 ± 0.15	sweep	100.22	H1	56/9/55	46,030,712	φ —	v2.2.10M	Dec 12, 2025 12:22
36477.203	Dec 12, 2025 12:19:55 Fri	B2D	47.2 ± 2.0	3.6 ± 3.6	0.27 ± 0.14	sweep	100.22	V1	55/9/56	56,551,075	φ —	v2.2.10M	Dec 12, 2025 12:29
36477.003	Dec 12, 2025 12:18:15 Fri	B1U	48.9 ± 2.5	10.0 ± 2.9	0.38 ± 0.16	sweep	100.22	H1	55/9/56	57,403,360	φ —	v2.2.10M	Dec 12, 2025 12:20

HJet Average



Polarimeter	Blue	Yellow
pC/Lpol	48.0/2.45 ~ 19.6	47.9/3.02 ~ 15.9
Hjet/Lpol	62.1/2.45 ~ 25.3	57.9/3.02 ~ 19.2

Analysis by Jaein Hwang

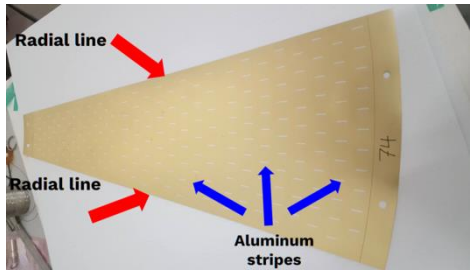
Polarization

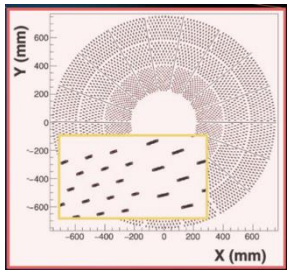
- Do we have a reliable understanding of RHIC polarization?
  - Although Haixin's insight explains the discrepancy between pC and Hjet is within the range of annual normalization, we urge polarimeter group to continue investigation.
  - sPHENIX consistency check of the ratio of local polarimetry to pC and HJet between Run24 and Run25 is ongoing.
- Fast offline analysis of RHIC polarimeters would be a help.
- Need a contact person to interface between sPHENIX and polarimeter group regarding the polarization.

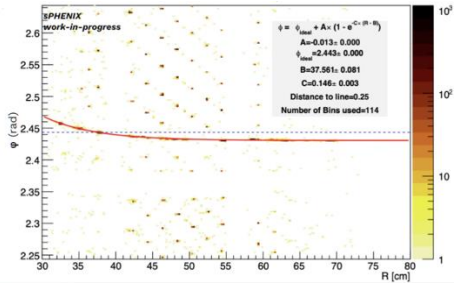
TPC Calibrations – after run
Magnet on

- TPC tracking requires that we understand the distortion of tracks in the TPC
- Three Calibration Systems:
  - Cosmic Rays → No beam
  - Line Lasers → Laser Dances (no beam)
  - Diffuse Laser Pattern on CM → During runs
- Magnet will remain cold until February 9th, which allows us to maximize TPC laser dances
  - Each dance spans a different portion of the TPC
  - More runs = better spatial resolution
  - Each run is 4 hours, requires no beam and 2 hours laser alignment
    - From Jan 28 to Feb 9 = about 25 laser dances
    - 16 complete laser dances so far
- Other subsystem calibrations can easily fit into this window (Calorimeter cosmics, etc)

Diffuse Laser on CM → Dots & Lines Pattern

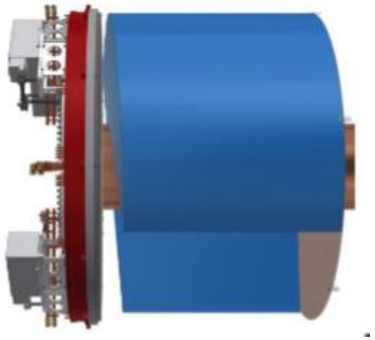


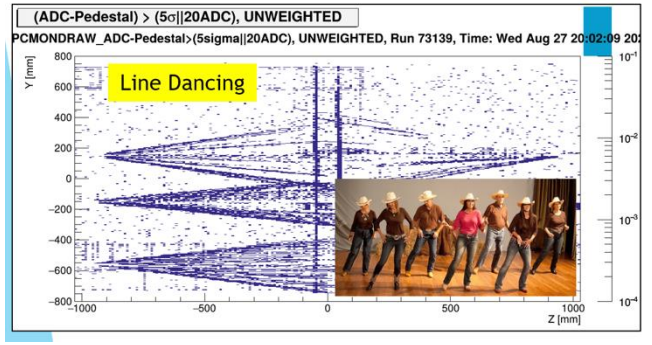




- 266nm light liberates 240X more electrons from Al than Au
- Pattern of Dots and Lines measured in offline

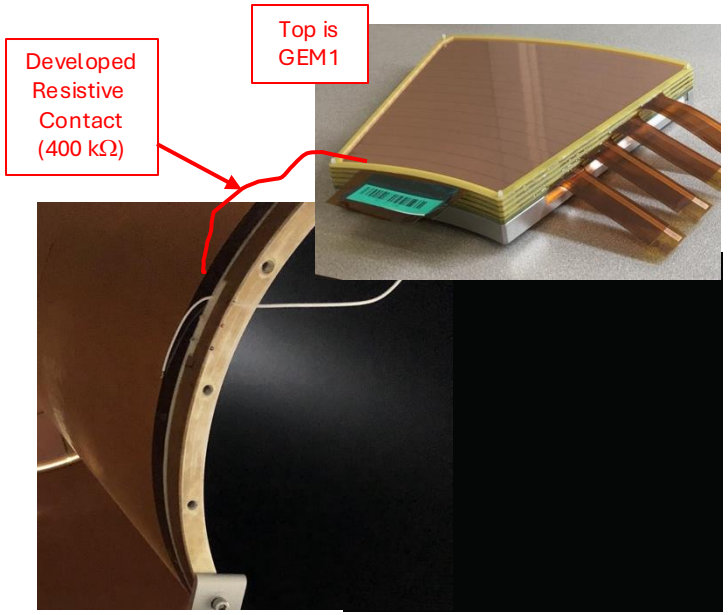
Steerable Line Lasers Send Straight Lines





- 266nm ionizes gas via 2-photon process
- Direction controlled by piezo-electric motors

TPC Calibrations - after run
Field off



After February 9th when the magnet warms up, we can take field off cosmics

- TPC dominates calibration time
- Feb 9 → Feb 23

- Lots of Cosmic data over the years … however:
  - Field cage sets the electron drift field
  - 10-19-2025 GEM ←→ IFC contact distorts the field
  - Limited calibration data following the incident as we continued to run
    - >1000 hours of cosmics before ~46 hours after.
    - 2 weeks (336 hours) to complete calibrations for the “after the field cage” incident
- We will also have field-on cosmics from during the cryo time period

Conclusions

- Thursday crossing angle scan → Can we find an even better running point?
  - Vernier scan in January
- Can we have a polarimeter talk at next week's coordination meeting?
- Assuming 2 pb^{-1} per week of Y/γ trigger data (Run 24 baseline) it will take 6.5 weeks to complete
- Uninterrupted holiday running will be vital to achieve our physics goals
- Field on data until Feb 9 and field off data until Feb 23.
- Survey is beyond the scope of Run Coordination
  - This is not a simple one time process, as subsystems are removed survey needs to come in again and again as we do not have physical access to all subsystem
  - Please discuss with Ed and John H. (This is part of the RR)