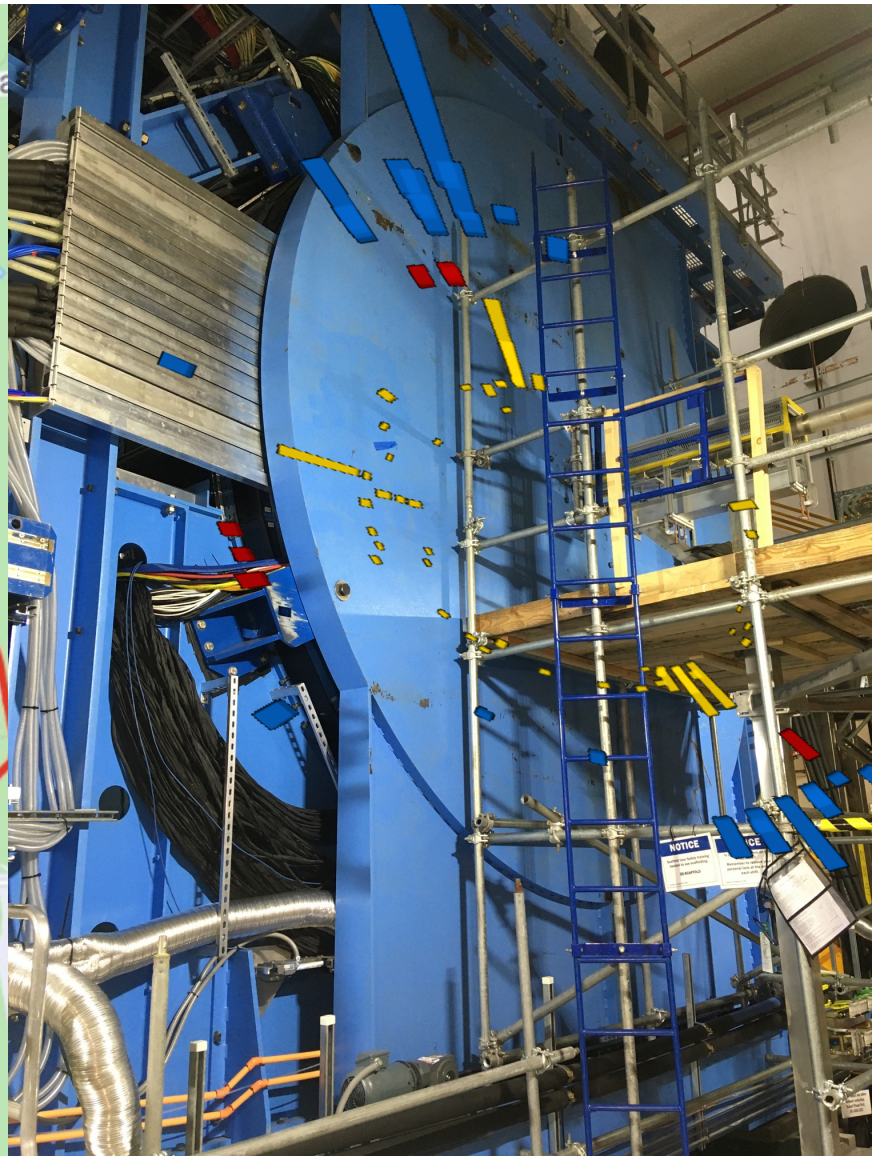
sPHENIX Status
RHIC Coordination Meeting
June 25, 2024

Jamie Nagle
University of Colorado Boulder
sPHENIX Run Coordinator

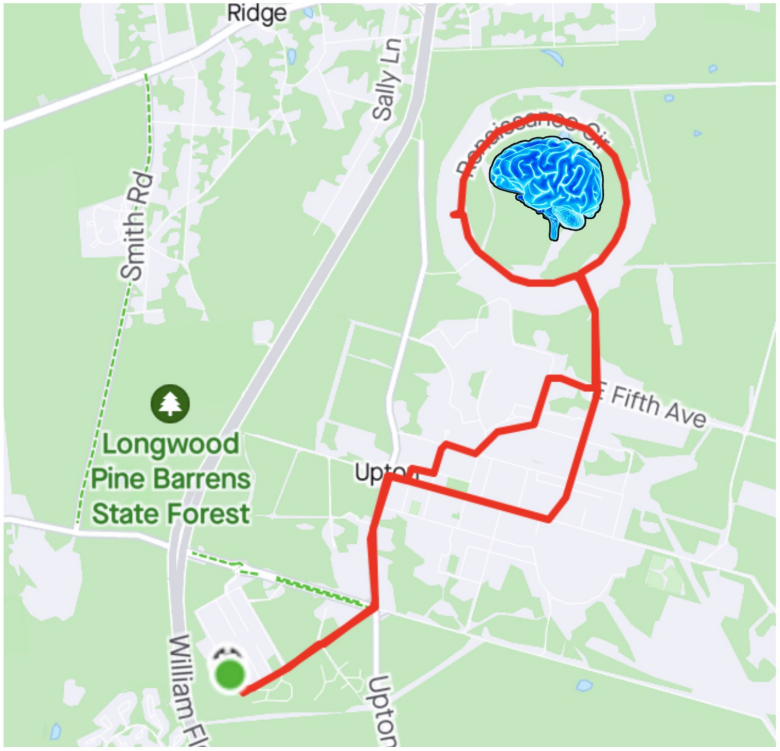


Reminder from last week's RHIC Coordination Meeting

Brainstorming…

A few notes from sPHENIX

- Calorimeters can use collisions over all vertices (e.g., γ-jet).
- At low luminosity we can run with smaller crossing angle (but then beam-beam issues).
- Spin is much lower priority for sPHENIX.
- Beginning of store luminosity mostly lost (long time to physics declared).
- Length of store hard to optimize, machine reliability issues.
- At this point, we just want to enable C-AD to check/test things to inform a decision discussion (not today).



Everything on the table for us…

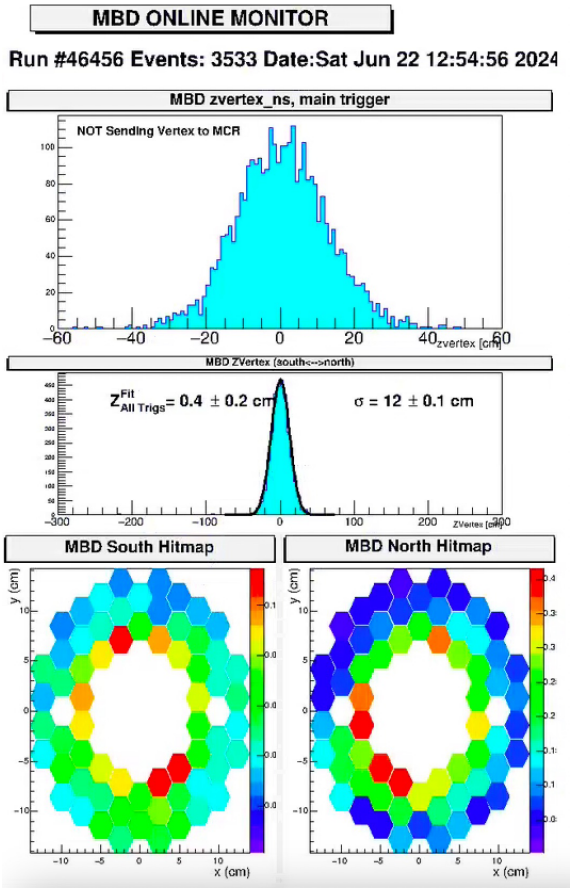
C-AD changed D0 magnet polarity during Thursday, June 20, 2024 Maintenance Day

Then running at +2 mrad crossing, instead of earlier -2 mrad crossing.

Monday, June 24, 2024, ran one store with just sPHENIX at 0 mrad crossing.

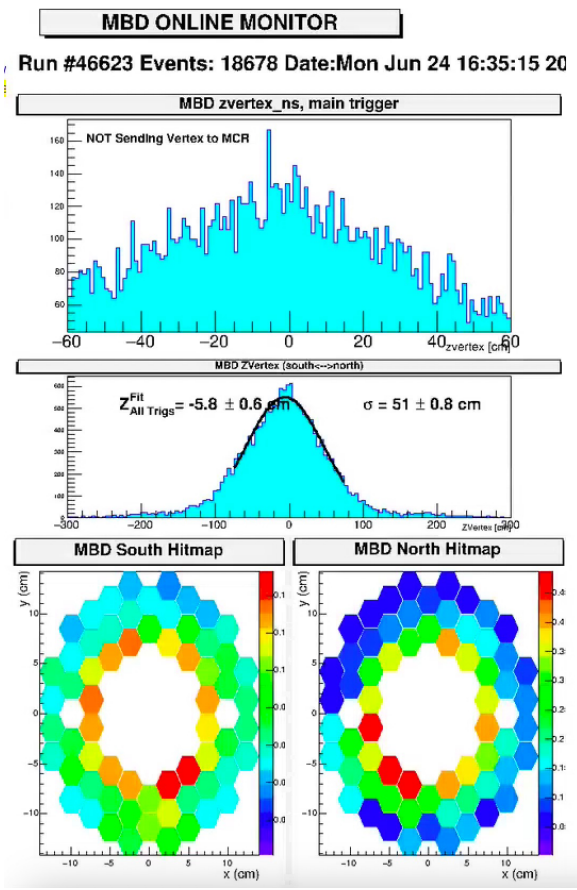
+ 2 mrad has the same z-vertex width as -2 mrad

σ ~ 12 cm



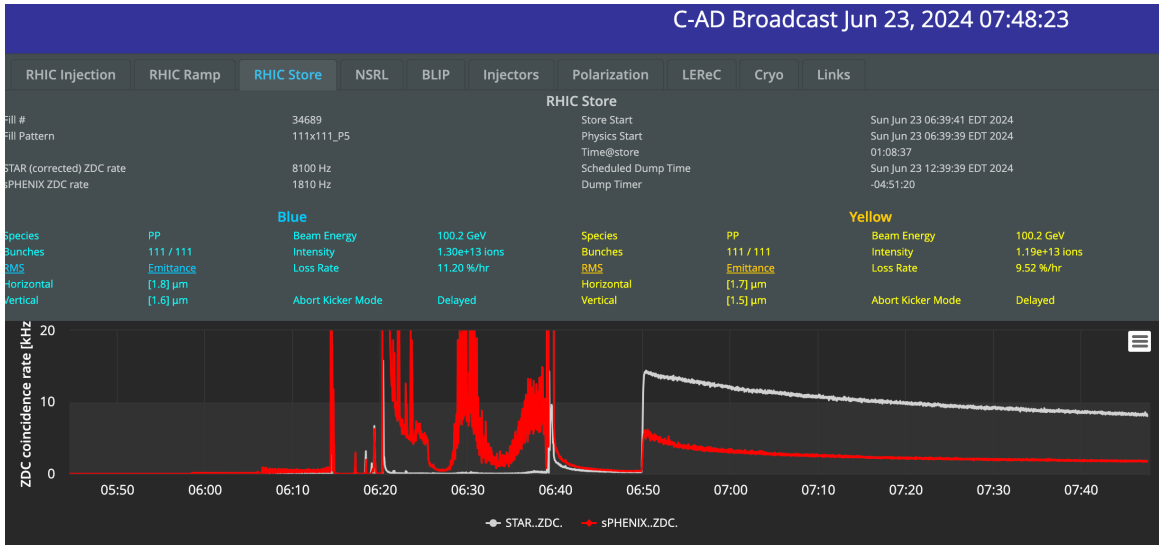
+ 0 mrad has a very wide z-vertex distribution

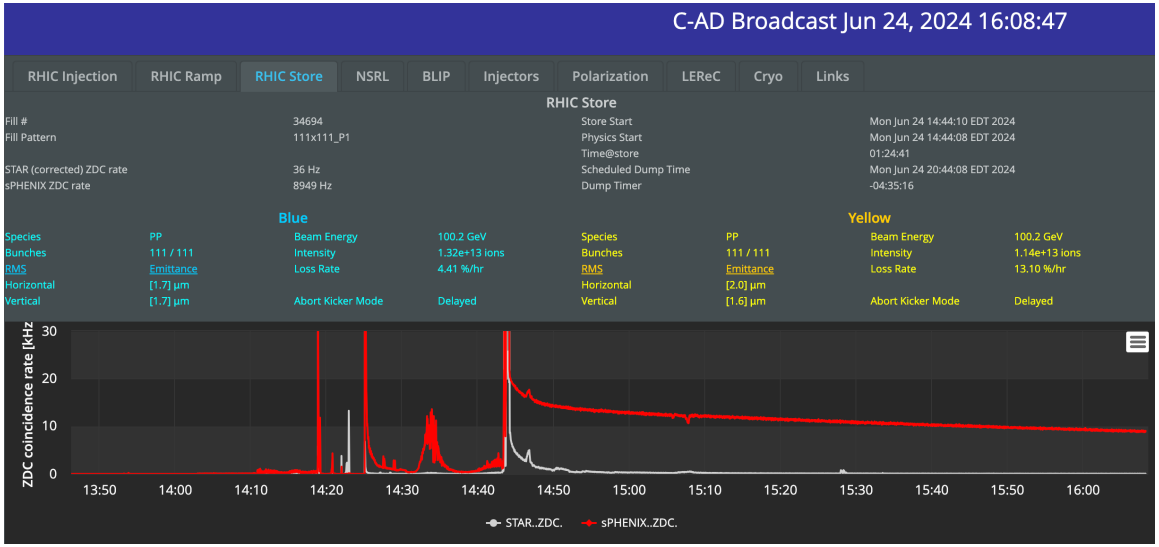
σ ~ 50-60 cm

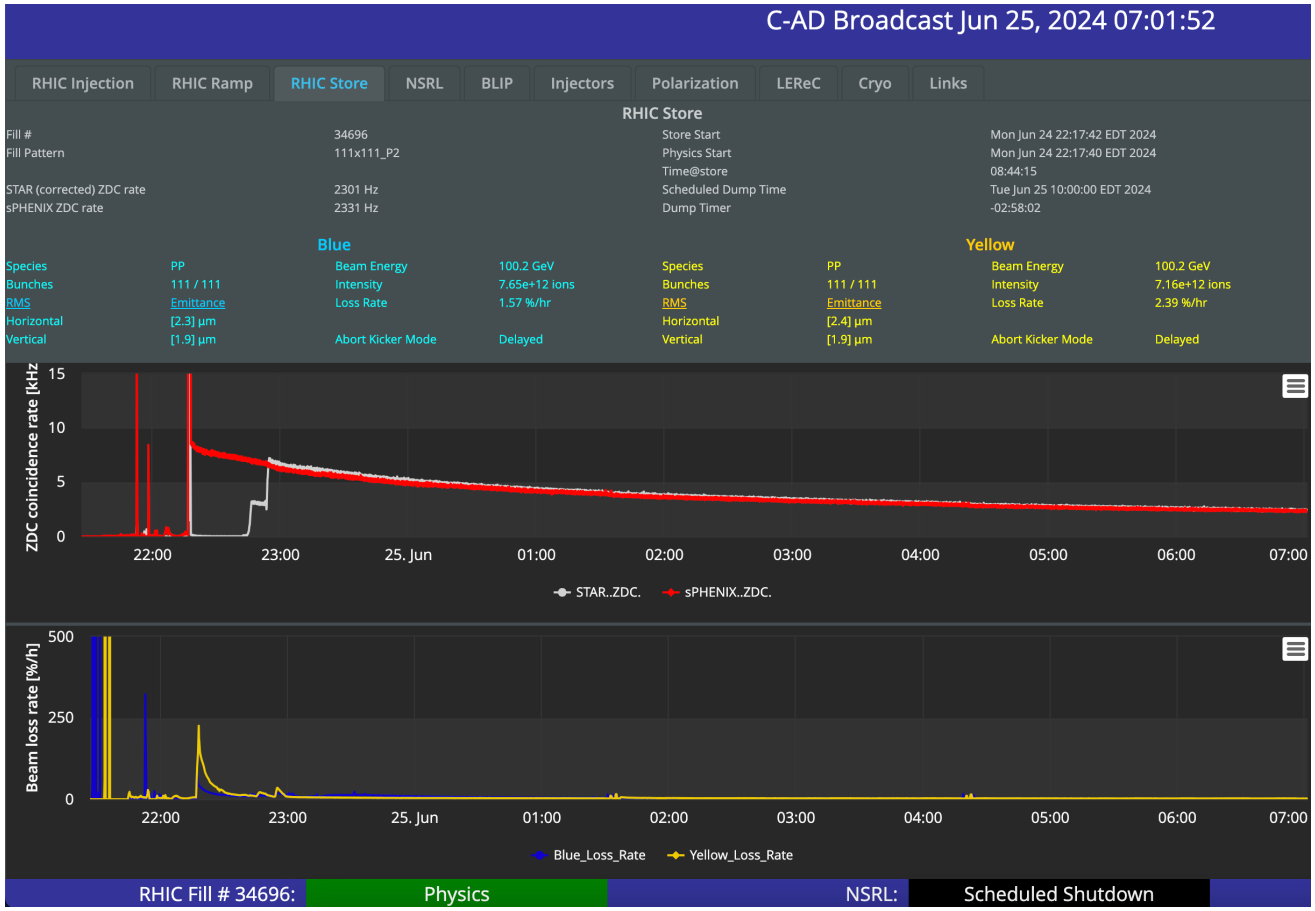


+ 2 mrad yielded some improvement in luminosity over -2 mrad; however, gains are modest in the stores over the weekend ZDCNS 5 kHz to start, but dropping very quickly to 2-2.5 kHz. Options here?

Running requested sPHENIX 0 crossing with no collisions at STAR.. Started with ZDCNS at 15 kHz and remained above 10 kHz for duration of test.



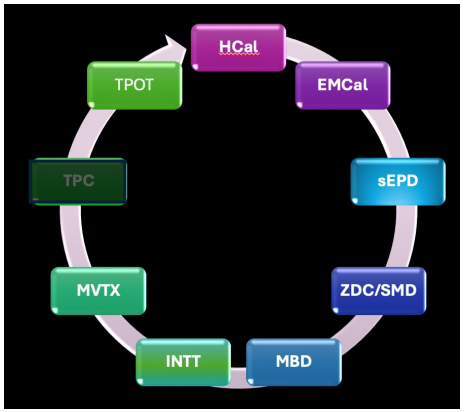


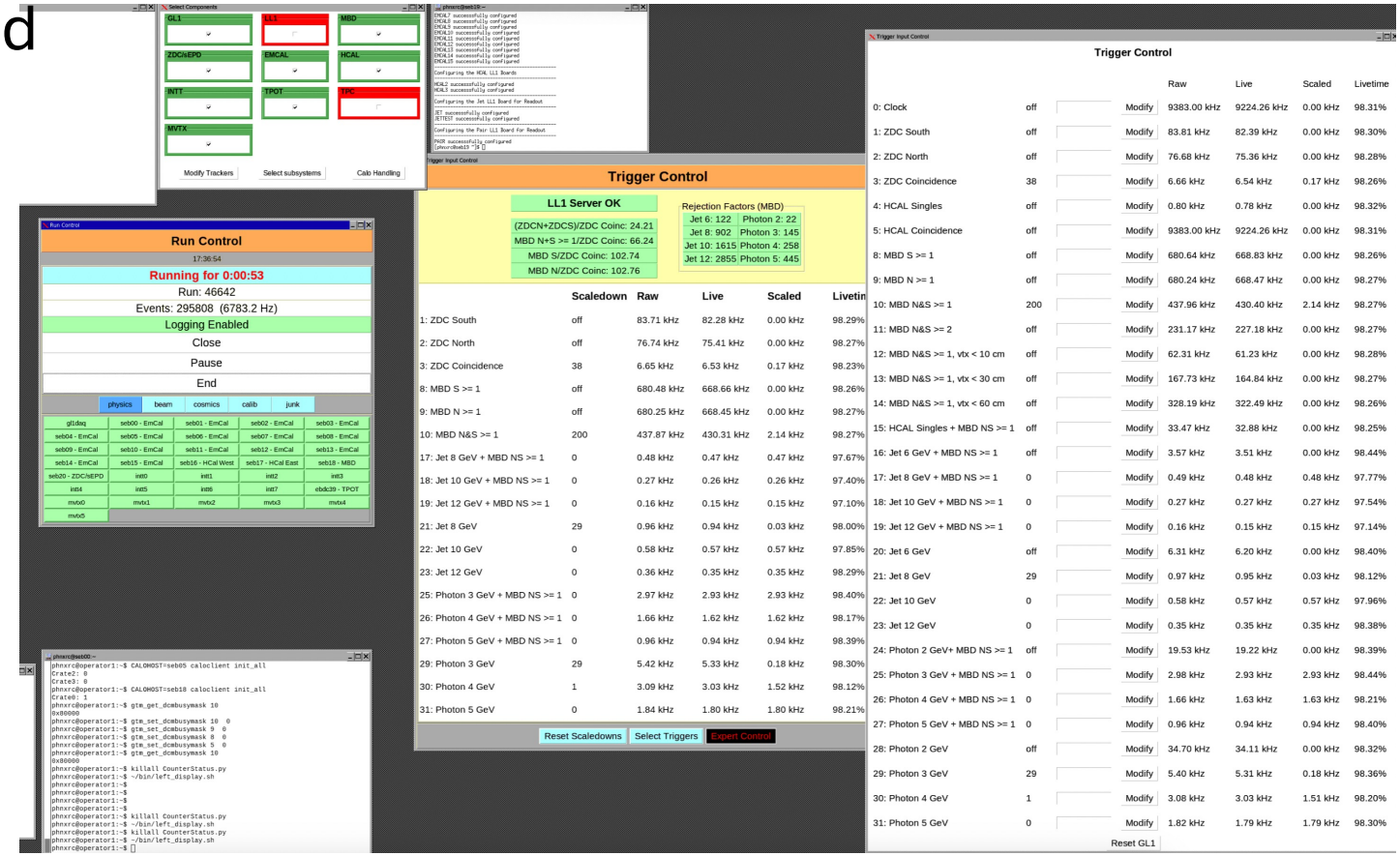


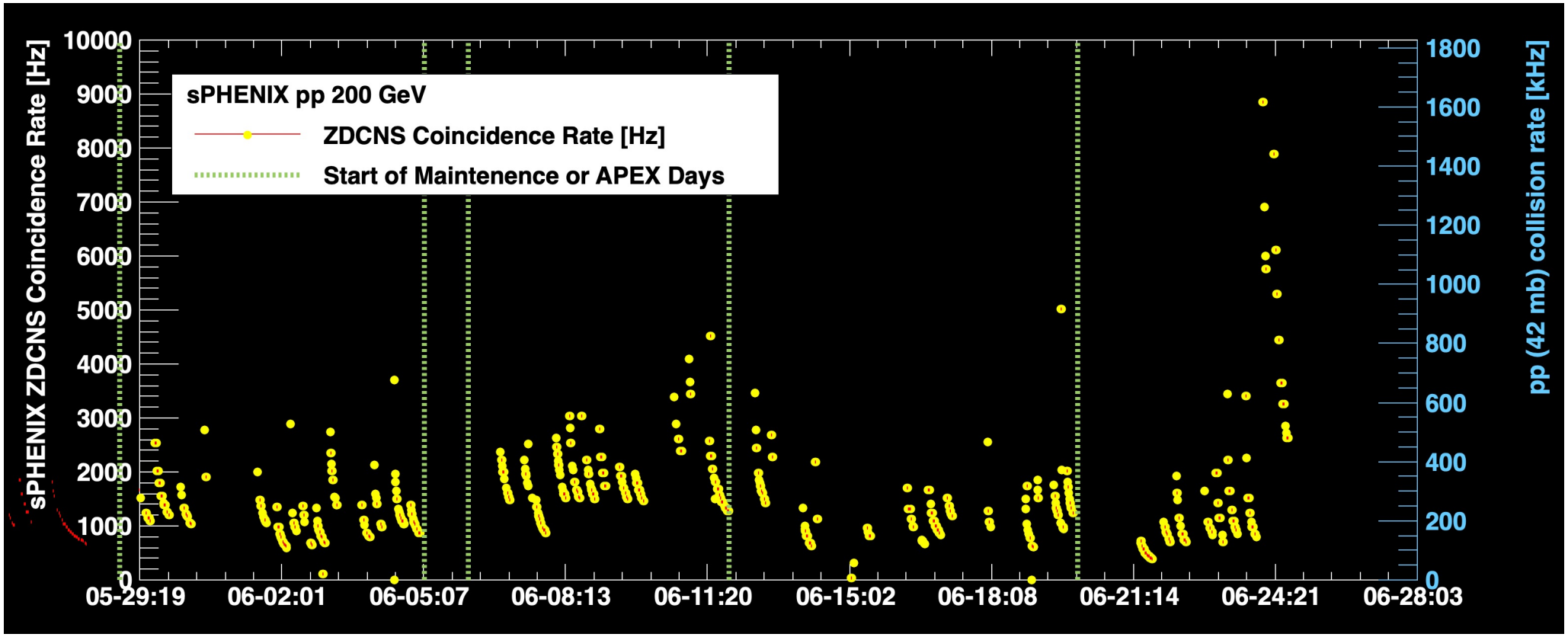
Very stable store last night ramping experiments at different times.
Rates at store approx. ½ of those seem in sPHENIX only test.

sPHENIX w/ 0 mrad crossing – Jet and Photon triggers working well…

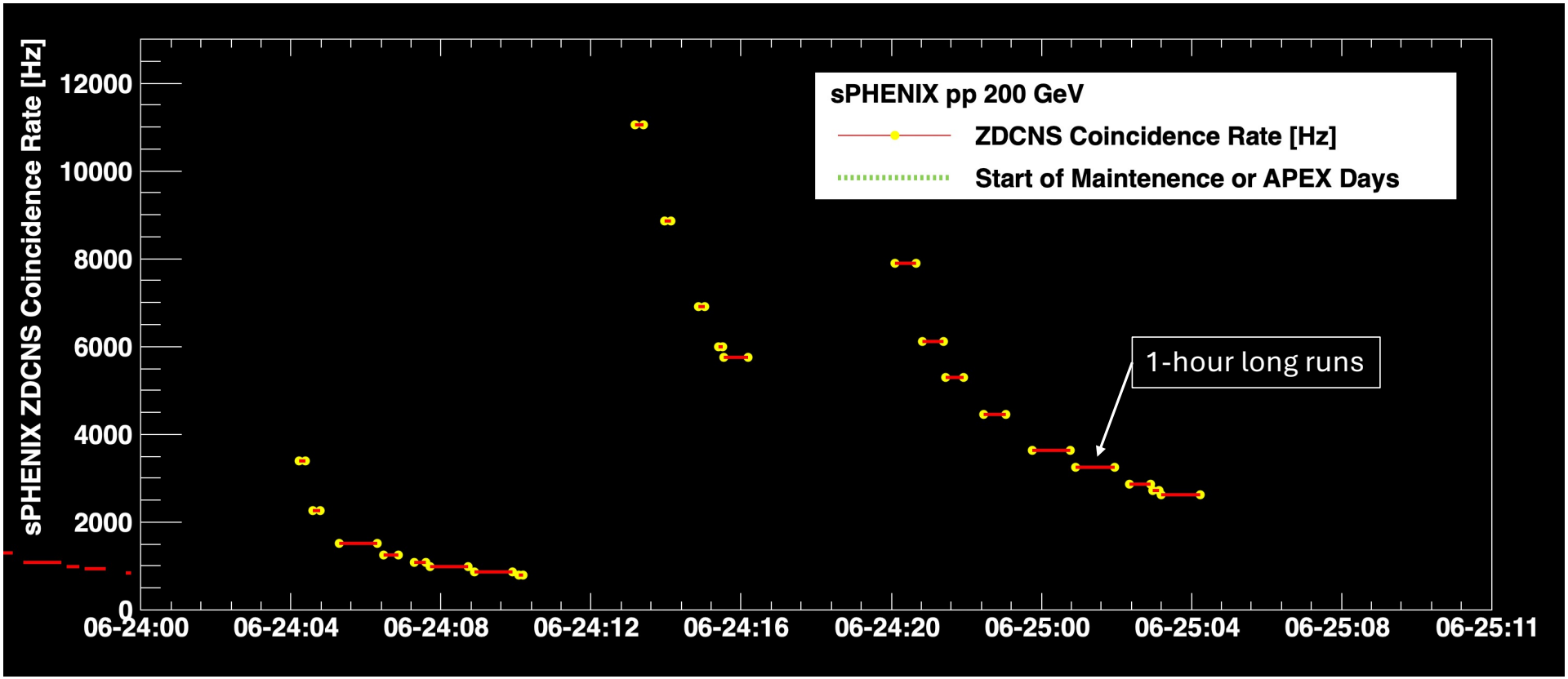
- Sampling full luminosity with significant room to spare
- Running all detectors except TPC
- Backgrounds good



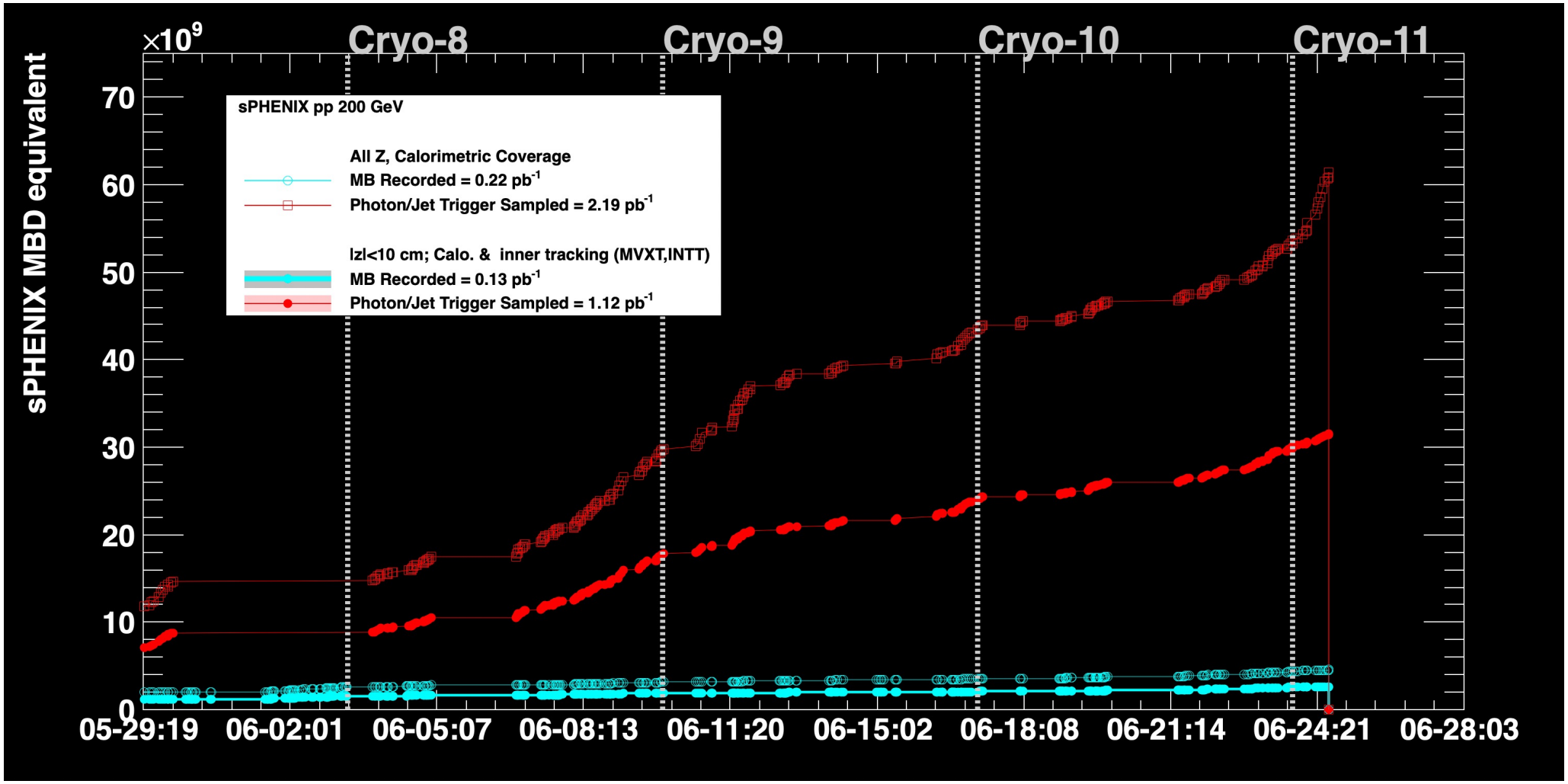




One issue we are investigating, the MBD coincidence rate / ZDCNS coincidence is somewhat low (-15-20%). That might be due to lower MBD efficiency for very large z-vertex values (running simulation now).

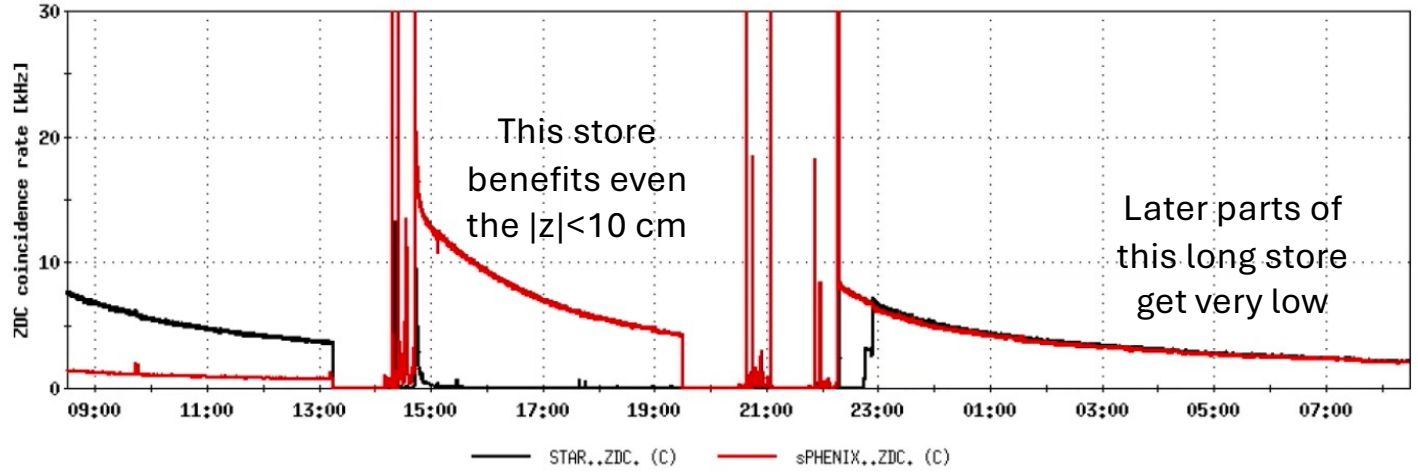


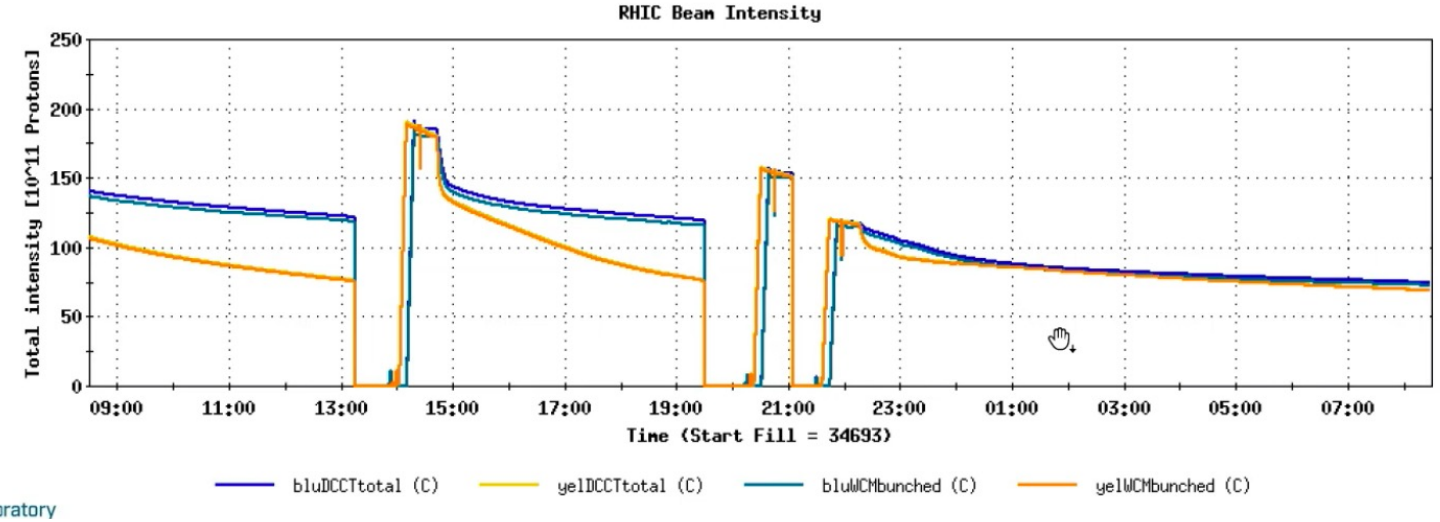
Efficient sPHENIX data taking once set up …



Now showing luminosity sampled separately for All Z and |z|<10 cm

June 25, 2024





Brookl
National Laboratory

TPC update…

We have run TPC at 4.1 kV for a number of multi-hour sessions – not during Machine Development or stores with new conditions. Much of this data taking is with all detector systems included..

Even with nitrogen mixture and lower voltage (4.1 kV instead of 4.5 kV), initial tracking offline checks are encouraging – however, too early to draw conclusions.

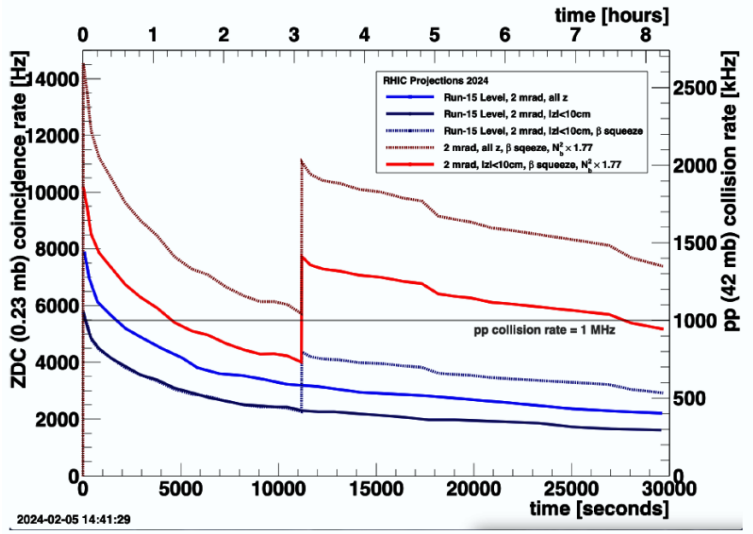
Looking to integrate TPC with zero suppression this week.

sPHENIX is analyzing the safety consequences of 5% isobutane with Brookhaven's Fire Protection Engineer, and will be meeting with Ray Fliller and David Mohammed on Wednesday about our proposal to mitigate risks from isobutane.

Next steps

sPHENIX wants to take maximal data with 0 crossing, C-AD optimizing luminosity / beam-beam effect…

In the next week, bring TPC into data taking
Keep pushing on isobutane option for better working point



Plan was for ZDCNS 10 kHz w/ 65% in |z| < 10 cm.
This has us running near 10 kHz w/ 16% in |z| < 10 cm.

This enables some key parts of the sPHENIX program, and leaves others with a major loss of statistics (75% reduction in B-jets, jet frag. func., Upsilons). Still worth investigating options to recover some of this loss.