# STAR Run 24 Report

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For the STAR Collaboration


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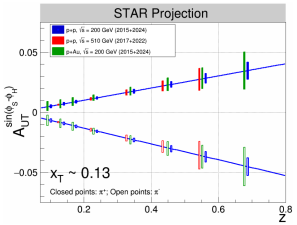
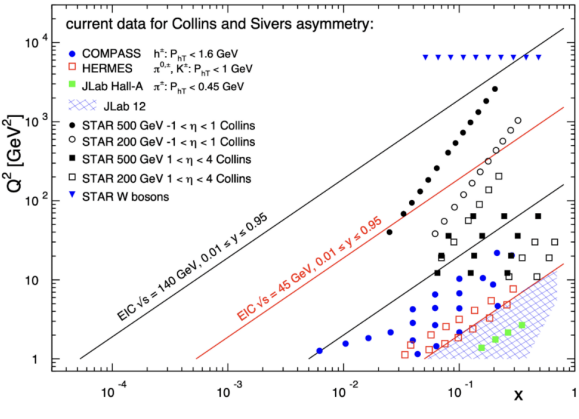
# Physics case for p+p at 200 GeV

- Radial (horizontal) polarization, previous such polarization was just for 6 days in run 17
- Most overlapping $x$ region with 200 GeV p+p, also the greatest statistical precision
- Important for future comparisons to $ep$ data at EIC

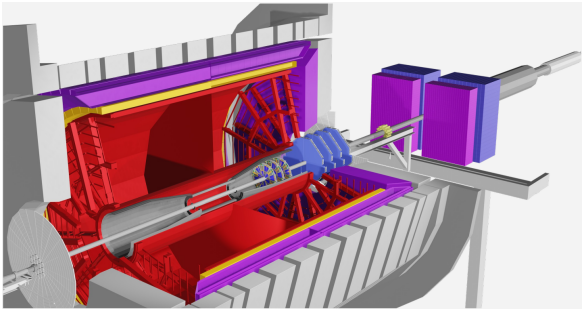



Triggers for high-$p_T$, forward detectors and UPC, dedicated set for low-luminosity running

# STAR data taking in 2024 p+p run

- Configuration with forward and DAQ5k upgrades from last year
- Trigger upgrade, reached 7 kHz
- Last opportunity for p+p with iTPC + forward and DAQ upgrades



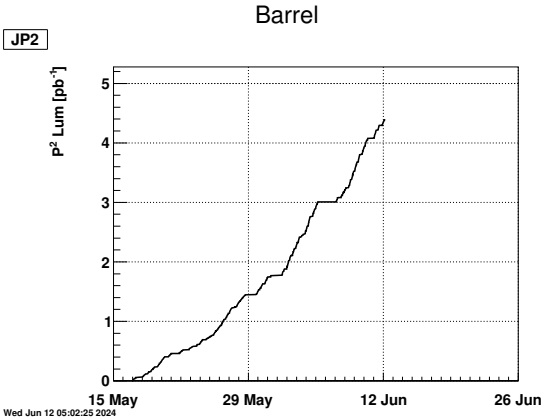
Beam Use Request for Run 24

| $\sqrt{s_{NN}}$ (GeV) | Species | Number Events/ Sampled Luminosity | Year |
|---|---|---|---|
| 200 | $p$+$p$ | 142 pb$^{-1}$/12w | 2024 |
| 200 | $p$+Au | 0.69 pb$^{-1}$/10.5w | 2024 |
| 200 | Au+Au | 18B / 32.7 nb$^{-1}$/40w | 2023+2025 |

Assuming 24 physics weeks / year

So far smooth running so far with good utilization of beam time

# Sampled luminosity till now



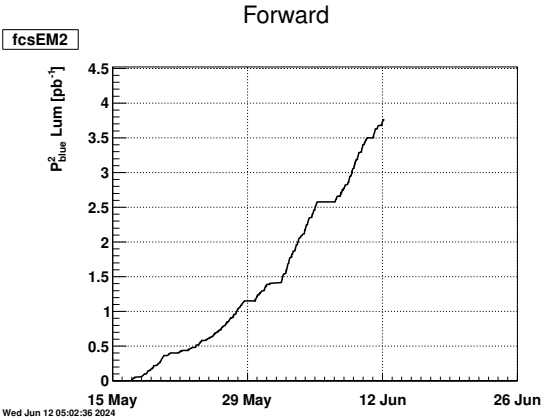
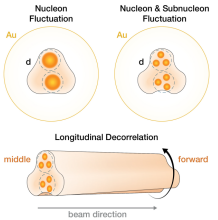
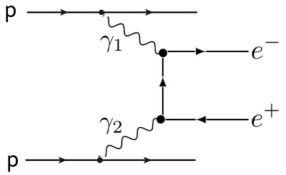




Figure of merit FoM polarization squared times sampled luminosity for barrel (JP2) and forward (FCS) triggers

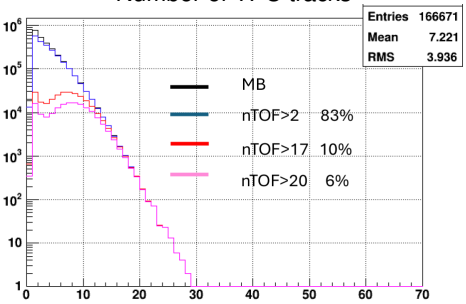
# Low-luminosity data taking at the beginning of the run

- Initial 2 weeks of the run
- Minimum bias trigger as a reference to heavy-ion data
- High multiplicity trigger for collectivity and net proton fluctuations
- Low multiplicity trigger for UPC studies (vector mesons and lepton pairs)



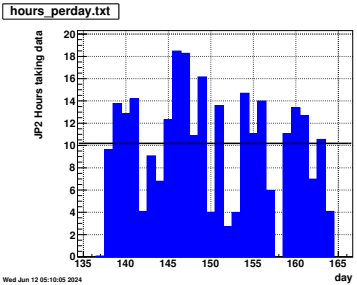

Number of TPC tracks

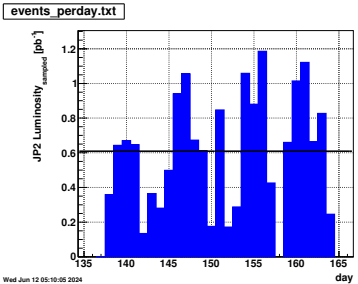



Over 1.5B events for min bias and 1.5B events for high-multiplicity collected

# Data taking performance

- Hour of data taking and sampled luminosity per day for JP2 trigger
- Looks similar for other triggers

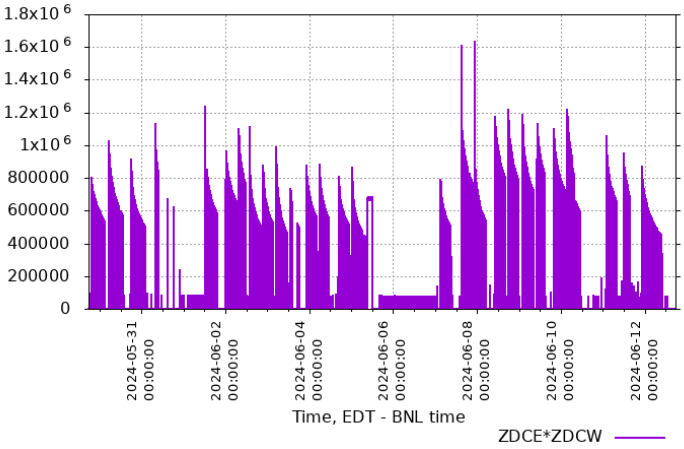



Smooth operation, >10 hours of data taking per day on average

# Collisions at STAR

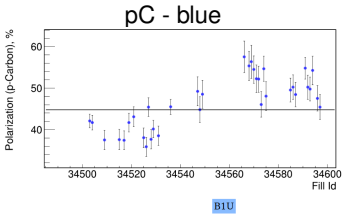
- ZDC coincidence, delivered rates by CAD

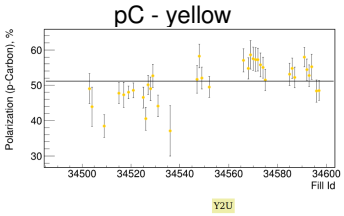



Stable data taking with varying rates

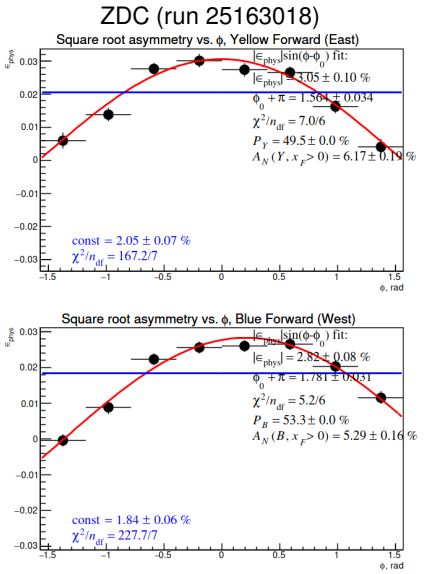
# Polarization

- H-jet, pC and local ZDC polarimetry



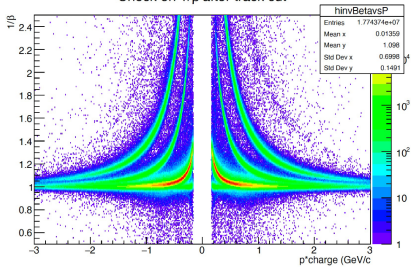

Improvement over more recent fills for both beams



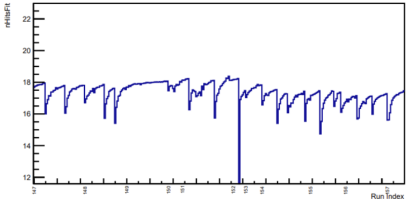
# Data QA - online and offline QA to monitor data quality

TOF identification

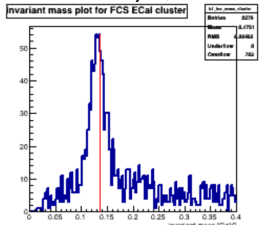
Check on 1/β after track cut



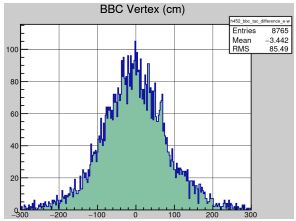

TPC hits for track fit

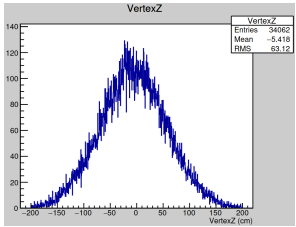



FCS, fast offline (∼1 day from taken), $\pi^0$ reconstruction, monitored by QA shift



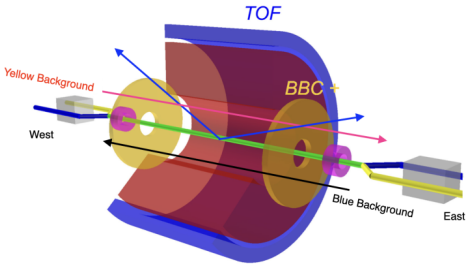

Beam Beam Counter (BBC) and online tracking vertex

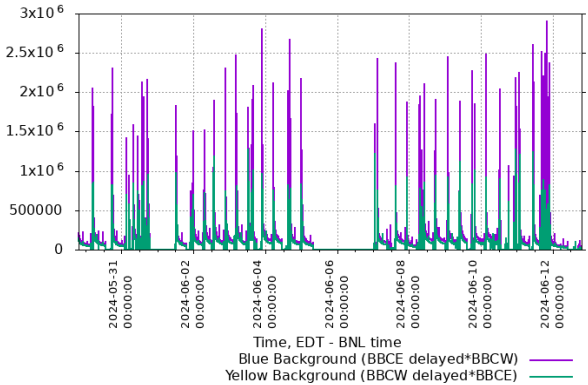


# Beam backgrounds

- Rates by BBC delayed coincidence (interactions outside nominal interaction point)



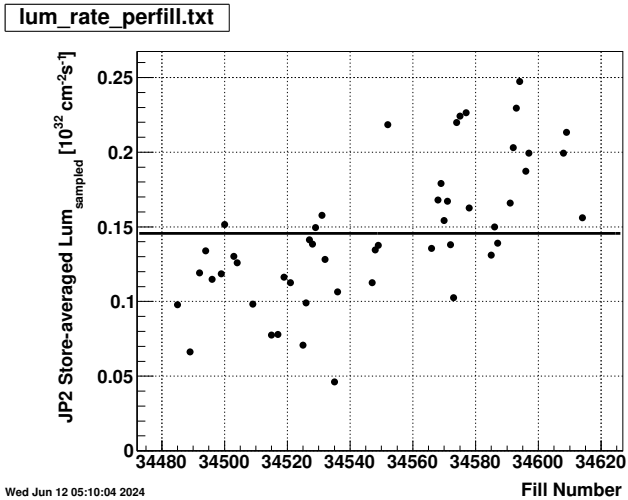




Larger backgrounds for blue beam, especially at the beginning of the fill

# Sampled luminosity

- Sampled JP2 trigger

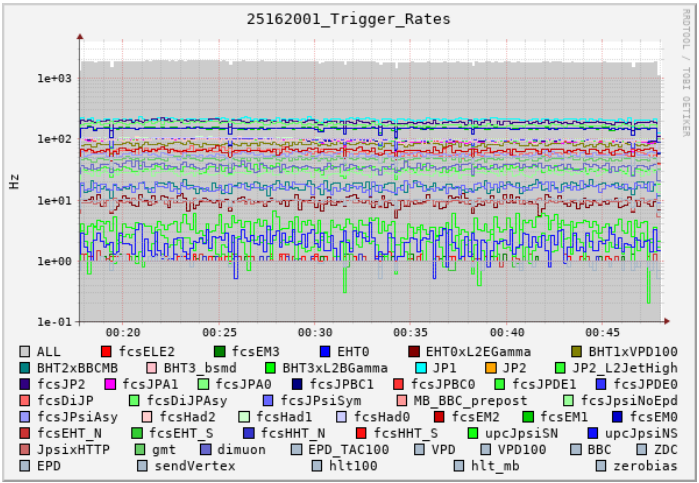
Increasing trend with recent fills



# Trigger rates

- Variety of central, forward and MB triggers

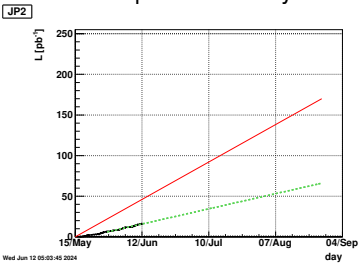
Stable counts for each trigger



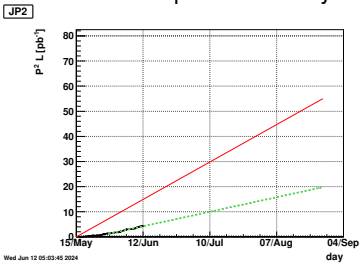
# Projections till end p+p data taking

- Solid red: our goal consistent with CAD projection
- Dashed green: projection based of current data taking
- Data collected so far show good quality

Sampled luminosity




FoM $\times$ sampled luminosity




Likely to sample less than anticipated; we expect improvements in luminosity

# Thank you

Big thanks CAD, all the STAR collaborators, and the BNL management for this run