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

![Graph showing current data for Collins and Sivers asymmetry]

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

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

Assuming 24 physics weeks / year

So far smooth running 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

Beam Beam Counter (BBC) and online tracking vertex

FCS, fast offline (~1 day from data taken), π₀ reconstruction, monitored by QA shift

TPC hits for track fit
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
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

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