Light-Flavour Hadron Production and Baryon Stopping at High Baryon Density

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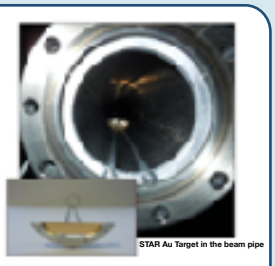
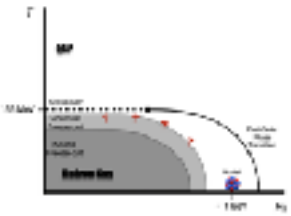
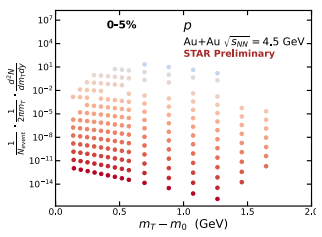
Introduction

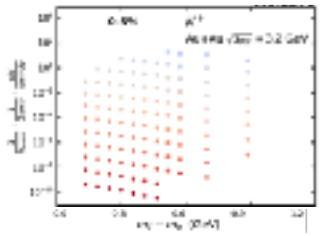
- Light hadron (π, K, p) production measurements can constrain the equation of state of the medium produced in heavy ion collisions
- Changes in the trends of baryon stopping have been proposed as a signature of a first order phase transition between a hadron gas and Quark-Gluon Plasma *(Yu B Ivanov, "Alternative scenarios of relativistic heavy-ion collisions. I. Baryon stopping". In: Physical Review C 87.6 (2013), p. 064904.)*
- The Fixed-Target program at STAR allows us to study hadron production in a high baryon density region where the QCD critical point may exist

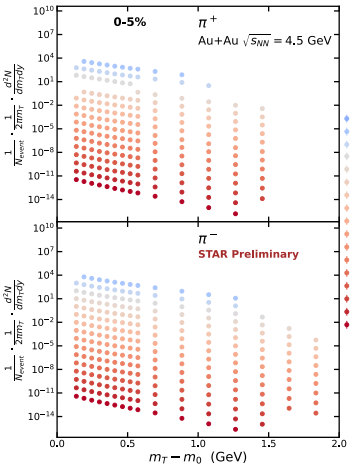

STAR Au Target in the beam pipe



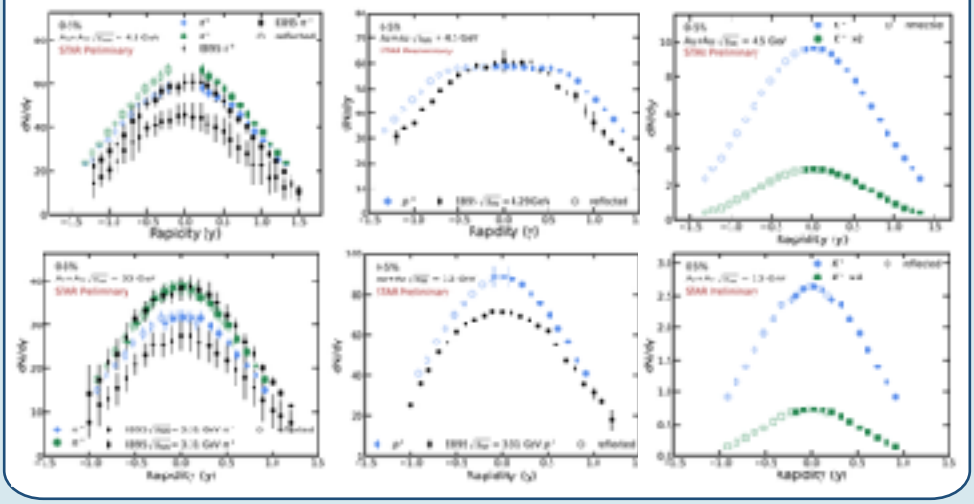
Inclusive $m_T - m_0$ Spectra



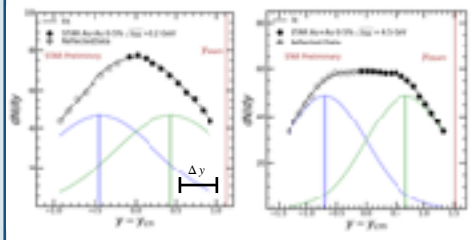




Inclusive dN/dy

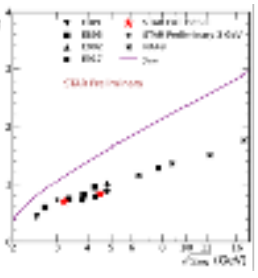


Baryon Stopping

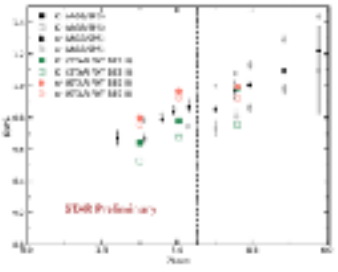


- Δy quantifies how much the protons have shifted away from beam rapidity
- A first order phase transition is predicted to have a softening of the equation of state, leading to *less* stopping
- If the protons have completed shifted to center of mass rapidity, then Δy - y_{beam}

Results



- Preliminary results help resolve the tension in baryon stopping measurements between E895 and E917



- Widths of Kaon dN/dy measured for the first time in this energy region

Conclusion

- Au+Au collisions analyzed at STAR at $\sqrt{s_{NN}} = 3.2$ and 4.5 GeV
- Transverse mass spectra and rapidity density distributions for π, k p reported
- Preliminary results show consistency in baryon stopping trend and agree with E895 measurement
- First measurement of Kaon dN/dy width in this energy

Next Steps:

- Continue measuring π, K, p spectra in FXT
  $\sqrt{s_{NN}} = [3.2, 3.5, 3.9, 4.5, 5.2, 7.2\ 7.7]$ GeV
- Estimate feed-down contribution from V0-type particles

Supported in part by the U.S. Department of Energy Office of Science

The STAR Collaboration