

Study of particle production of identified hadrons in Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ GeV using the STAR detector

Arushi Dhamija (for the STAR Collaboration)
Panjab University, Chandigarh, India



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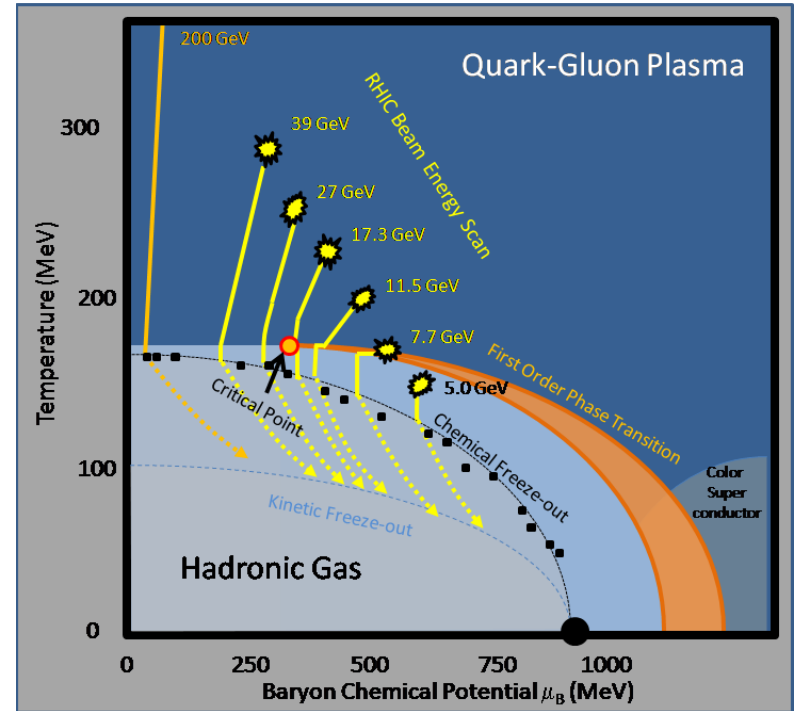
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Beam Energy Scan (BES) program at RHIC

- Study of QCD Phase Diagram
- Search of QCD Critical Point
- Search of the first order phase transition
- **BES I (2010-2014)**
 $\sqrt{s_{NN}} = 62.4, 39, 27, 19.6, 14.5, 11.5, 7.7$ GeV
- **BES II (2017-2021)**
Collider mode: $\sqrt{s_{NN}} = 54.4, 27, 19.6, 17.3, 14.6, 11.5, 9.2, 7.7$ GeV
Fixed target program: $\sqrt{s_{NN}} = 13.7, 11.5, 9.2, 7.7, 7.2, 6.2, 5.2, 4.5, 3.9, 3.5, 3.2, 3.0$ GeV



The main idea behind the BES Program is to vary the collision energy and look for the signatures of the QCD phase boundary and QCD critical point.



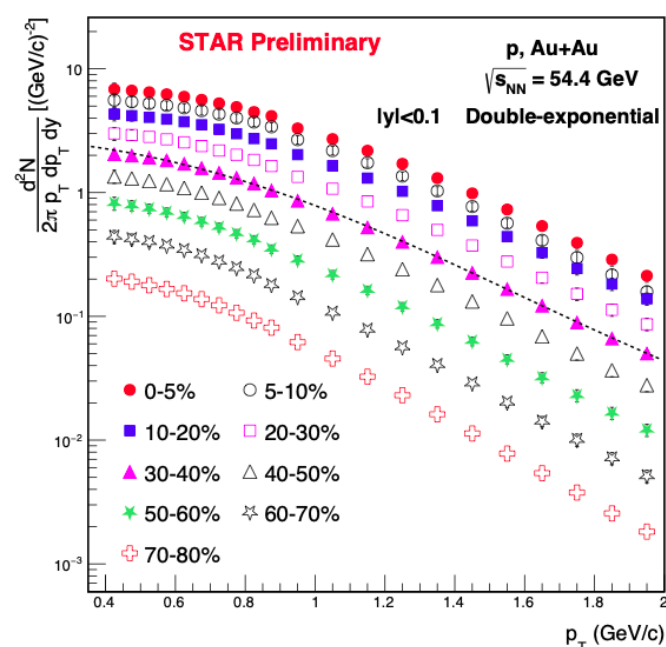
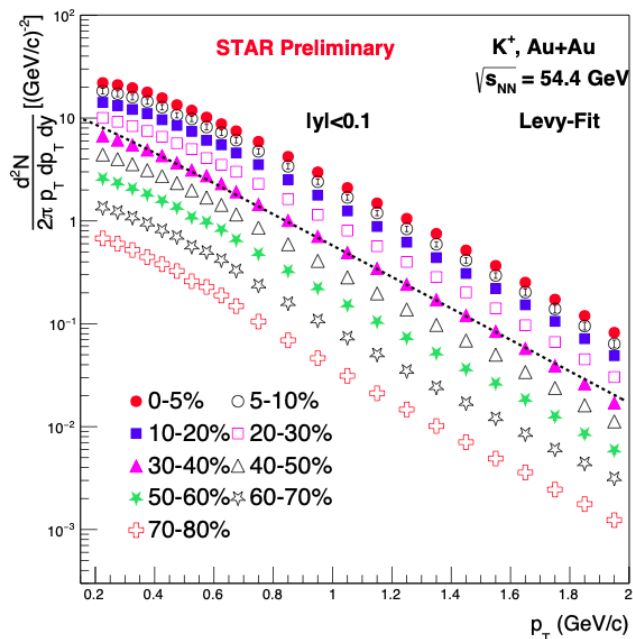
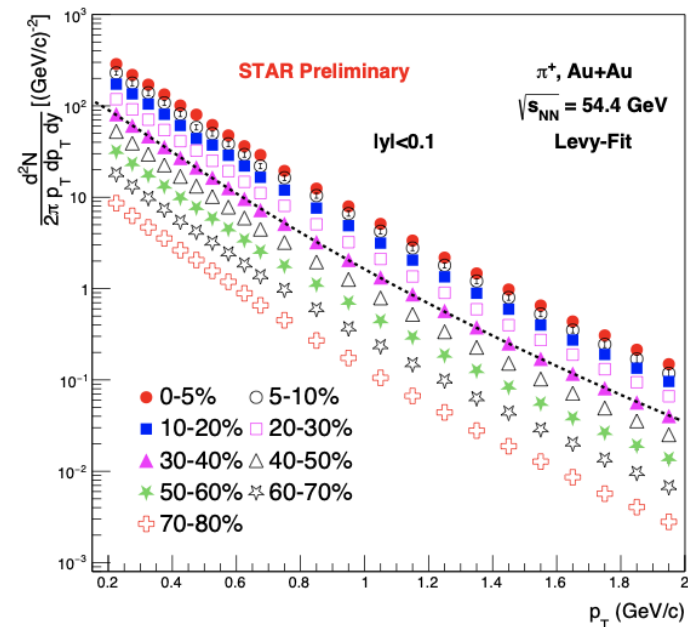
Data set and transverse momentum spectra

Data set: Au+ Au collisions

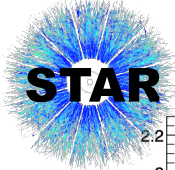
Energy: 54.4 GeV

Particles studied: π^\pm , K^\pm , p and \bar{p}

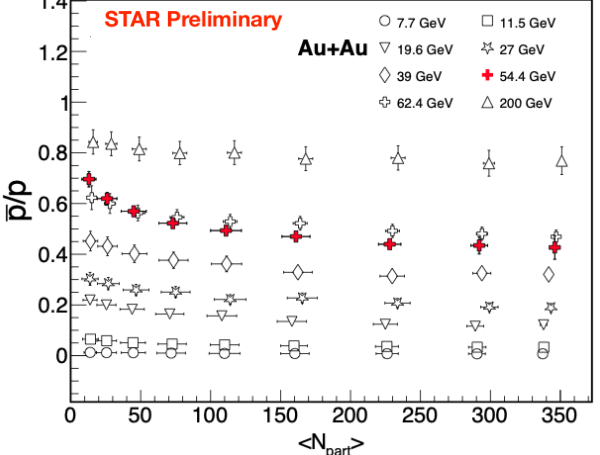
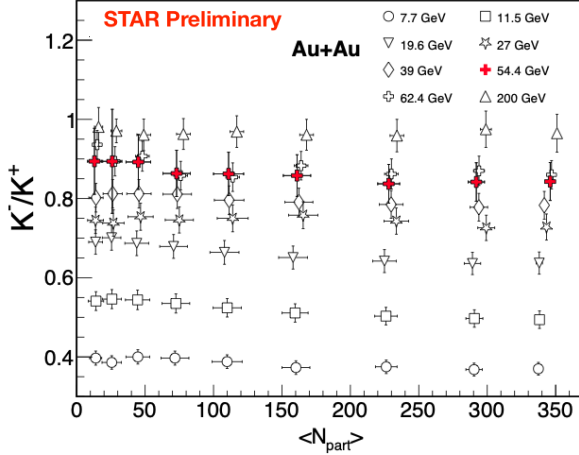
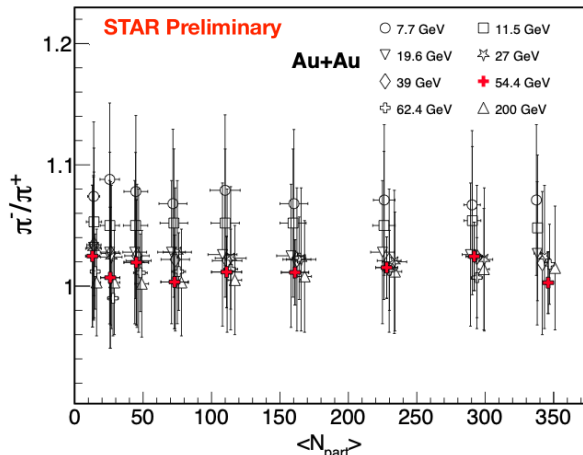
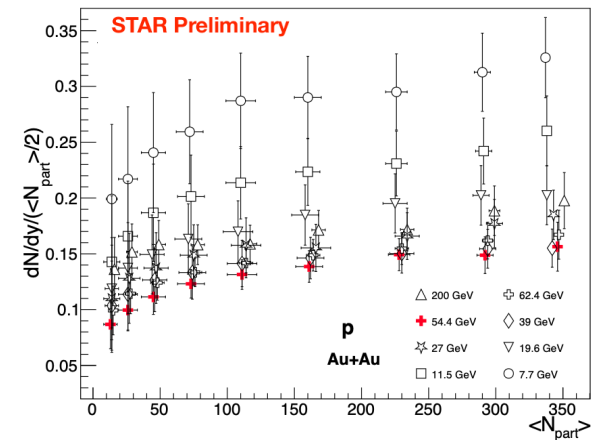
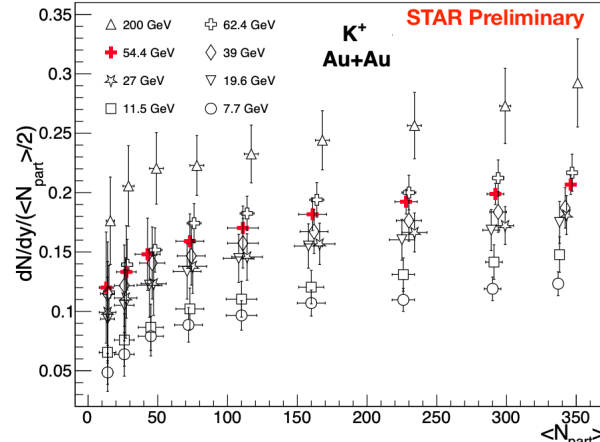
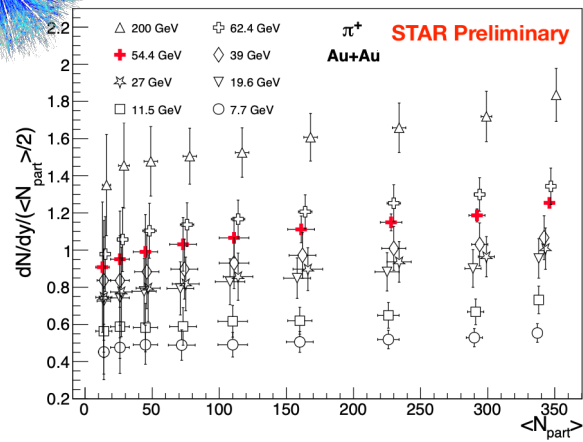
Detectors for Particle Identification: TPC (Time Projection Chamber) and TOF (Time Of Flight)



The yields from TOF are obtained using the variable mass-square (m^2) within rapidity $|y| < 0.1$ for $p_T > 0.7$ GeV/c for pions and kaons, and $p_T > 0.9$ GeV/c for protons .



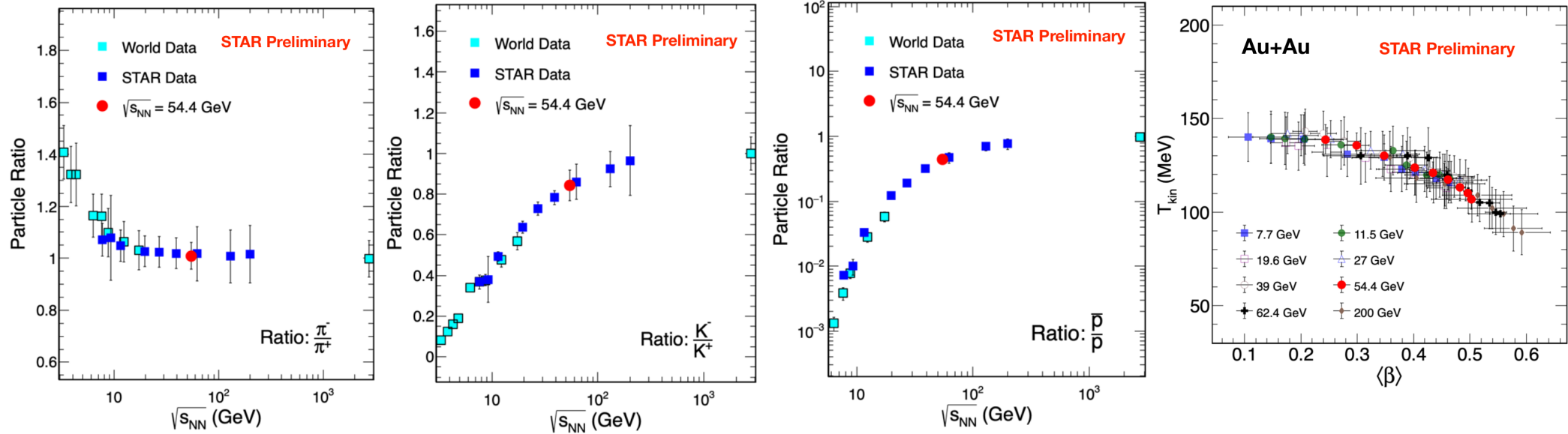
Centrality dependence of particle yields and ratios



- Levy function fitting for π^\pm and K^\pm
- Double exponential fit for p and \bar{p}
- p_T integrated yields and particle ratios obtained from fits.



Energy dependence of particle ratios and kinetic freeze-out



Conclusions:

- Presented π^\pm , K^\pm , p and \bar{p} particle production in Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ GeV.
- The p_T integrated yields and yield ratios are in trend with other energies.
- The kinetic freezeout temperature (T_{kin}) and $\langle\beta\rangle$ are anti-correlated, and in trend with other energies.