Identified particle spectra in isobaric collisions of Ru+Ru and Zr+Zr at $\sqrt{s_{\rm NN}} = 200$ GeV with the STAR experiment

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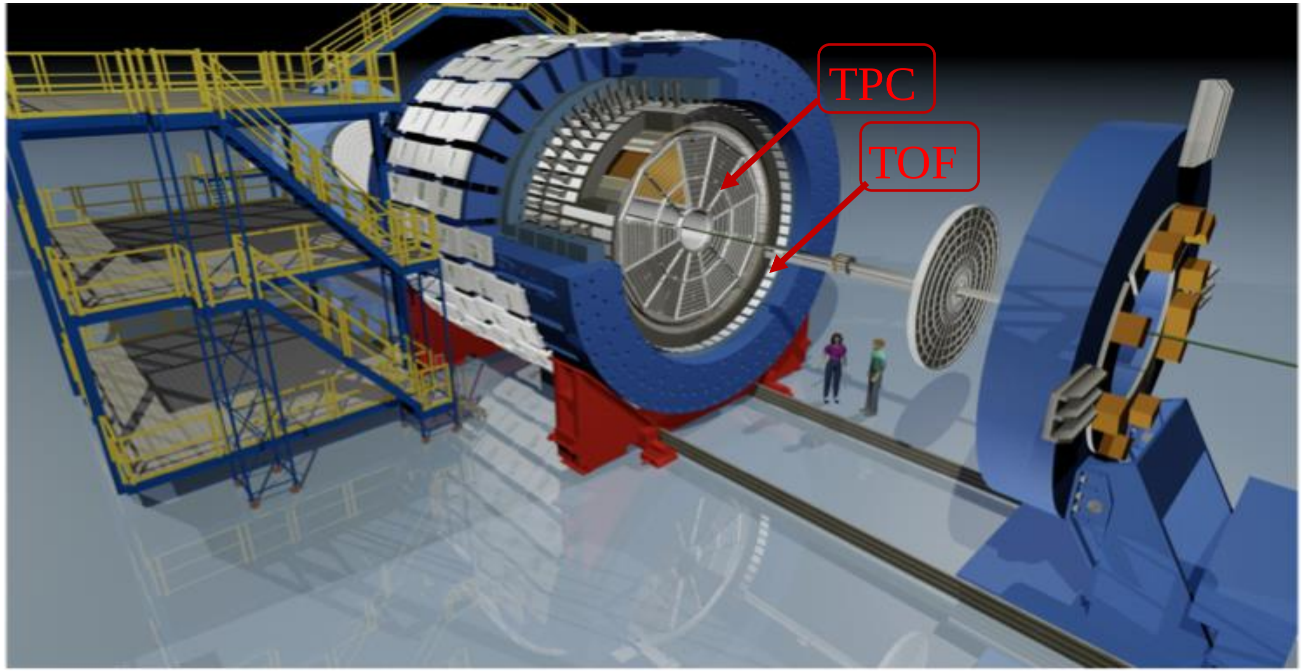
Motivation & STAR detector

- Motivation: transverse momentum distributions of identified hadrons contain information of transverse expansion of the system and reveal the freeze-out properties of the matter created in relativistic heavy ion collisions.

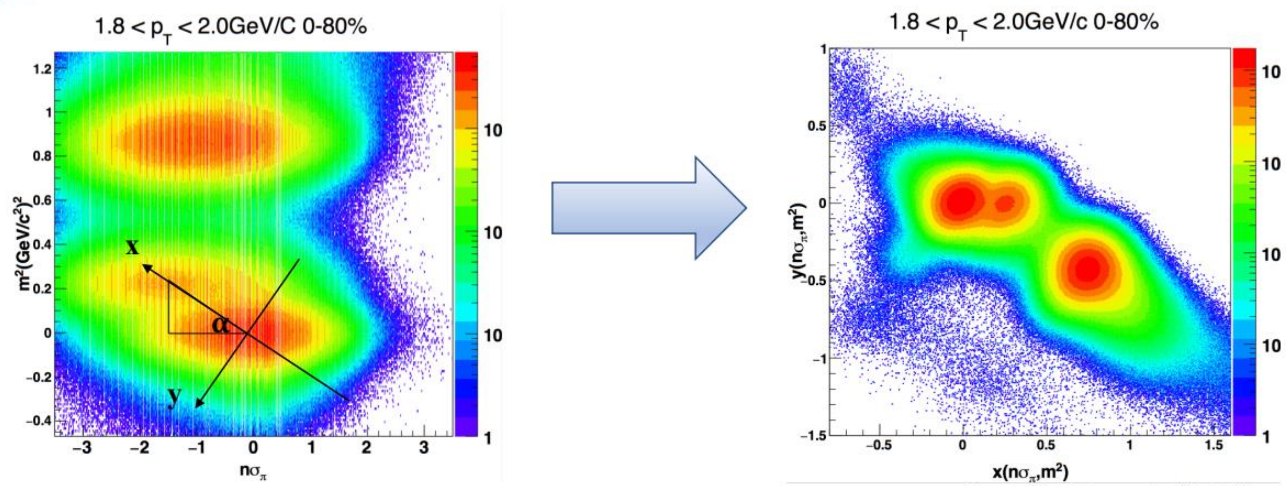
STAR detector



- Time Projection Chamber (TPC)
  - Track reconstruction
  - Energy loss calculation
- Time Of Flight detector (TOF)
  - Particle identification
  - Pile-up rejection

Particle identification

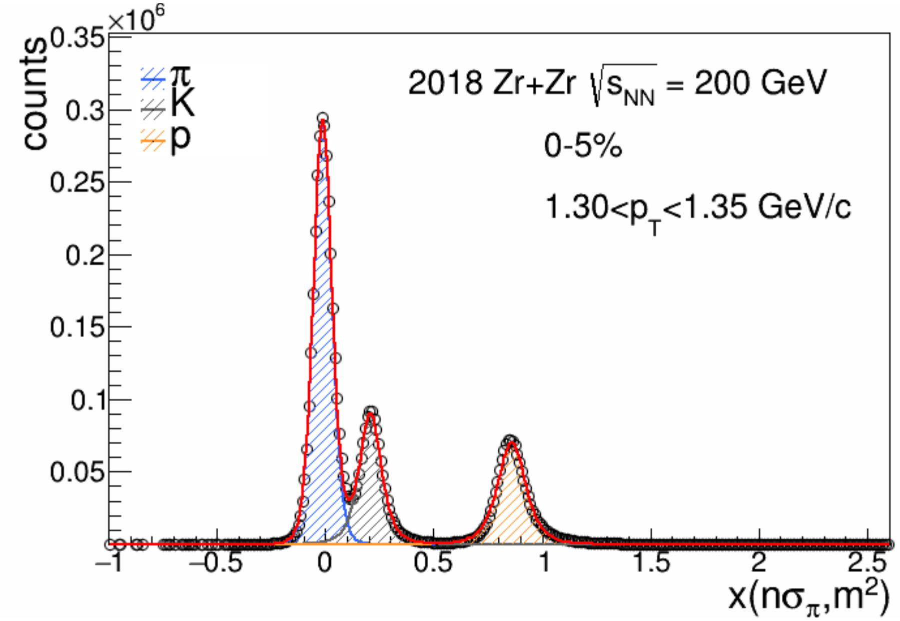
- Particle identification at high momentum region is challenging when using dE/dx or m^2 alone.
- PID capability could be improved if TPC and TOF information are combined.



$$f_{scale} = \sigma(n\sigma_\pi)/\sigma(m^2(\pi))$$
$$x' = (n\sigma_\pi - \mu(n\sigma_\pi))/f_{scale}$$
$$y' = m^2 - \mu(m^2(\pi))$$

Rotation angle: $\alpha = tan^{-1}\left[\frac{\mu(m^2(K)) - \mu(m^2(\pi))}{\mu(n\sigma_K) - \mu(n\sigma_\pi)}\right]$

Rotation : $\begin{pmatrix} x(n\sigma_\pi, m^2) \\ y(n\sigma_\pi, m^2) \end{pmatrix} = \begin{pmatrix} cos(\alpha) & -sin(\alpha) \\ sin(\alpha) & cos(\alpha) \end{pmatrix} \begin{pmatrix} x' \\ y' \end{pmatrix}$



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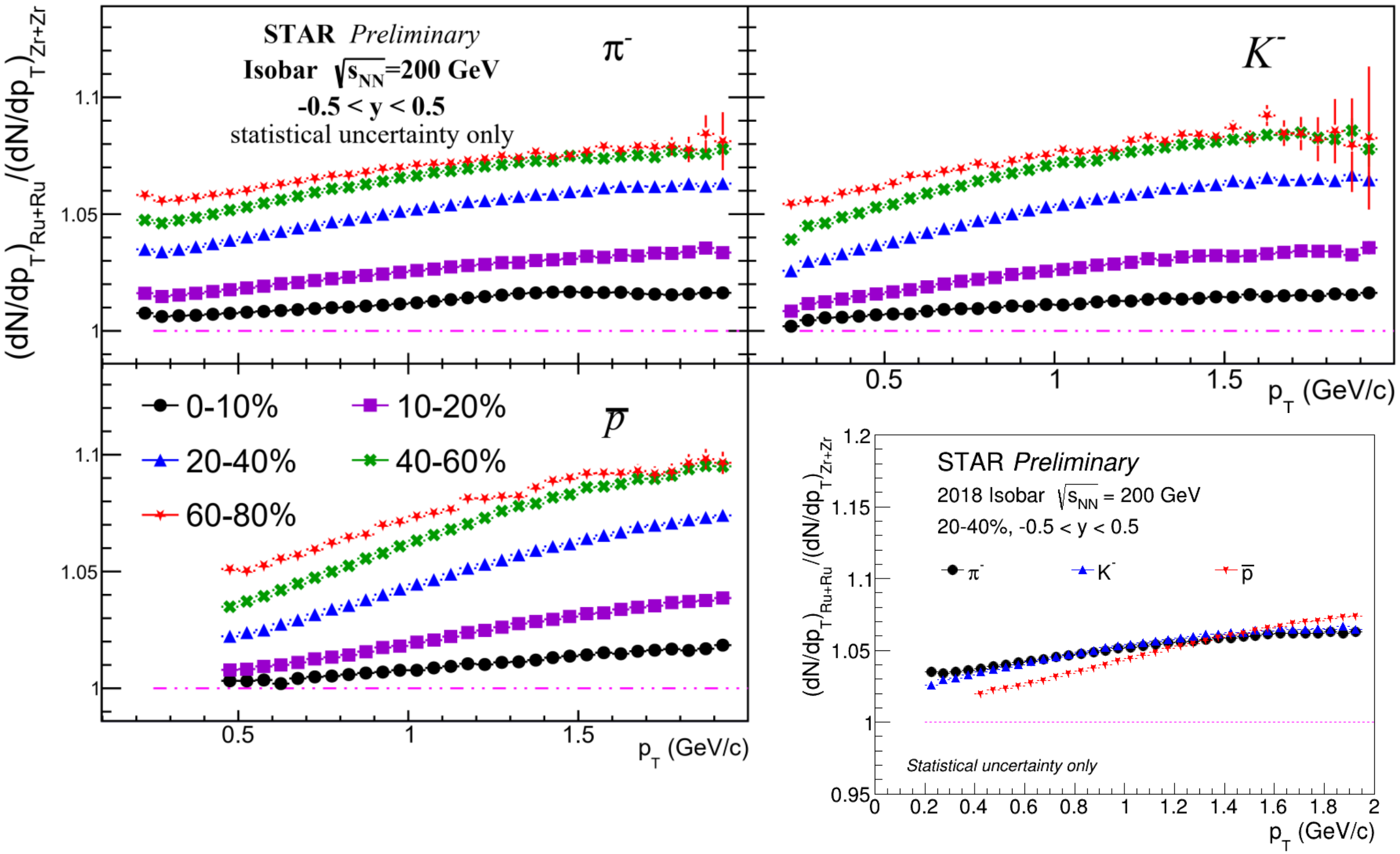
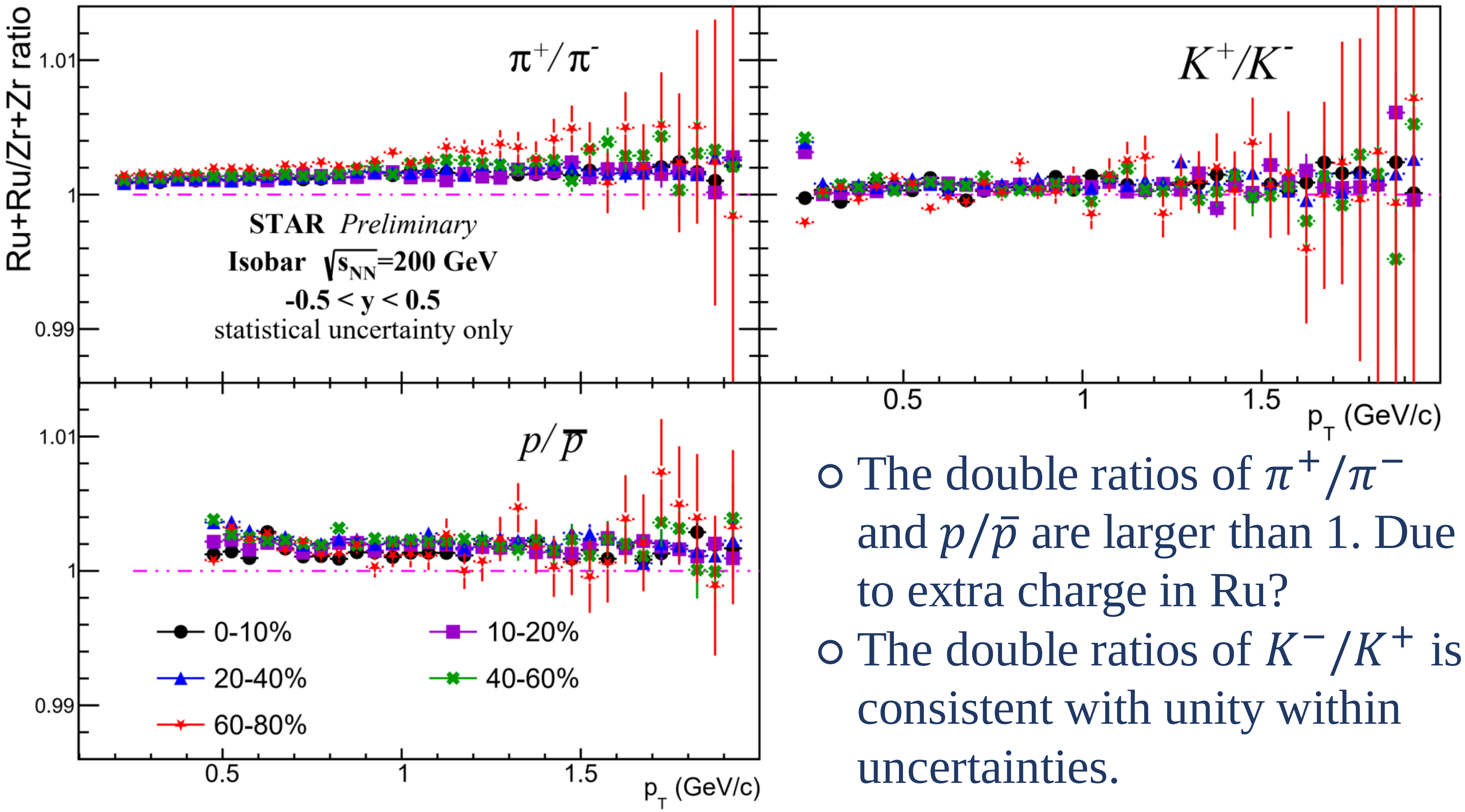
Particle ratios between Ru+Ru and Zr+Zr collisions



- More particle production in Ru+Ru than Zr+Zr at same centrality.
- Similar centrality dependence for each particle species.
- For a given centrality, the particle ratio increases more rapidly with increasing particle mass, which could be driven by different radial flows in the two collision systems.

Double ratios between Ru+Ru and Zr+Zr collisions



- The double ratios of π^+/π^- and $p/\bar{p}$ are larger than 1. Due to extra charge in Ru?
- The double ratios of K^-/K^+ is consistent with unity within uncertainties.

Outlook:

- Extract freeze-out parameters from fully corrected spectra.
- Study connections between charge stopping and baryon stopping.