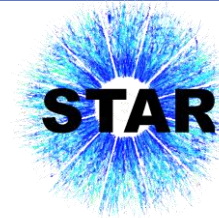
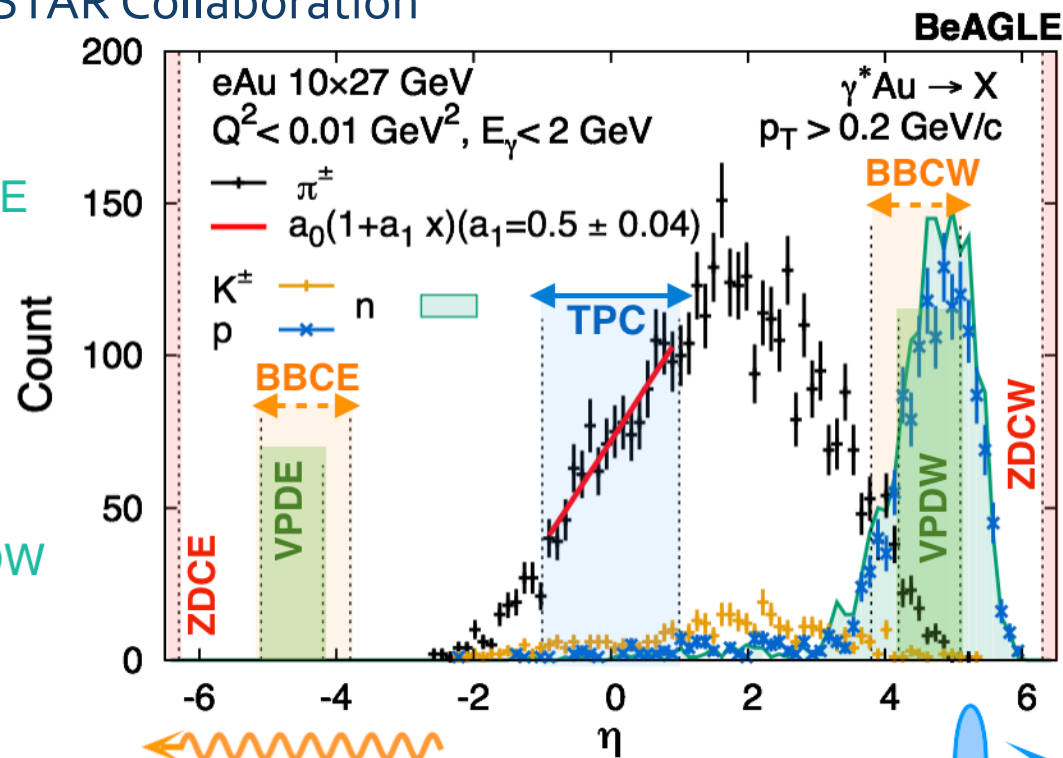
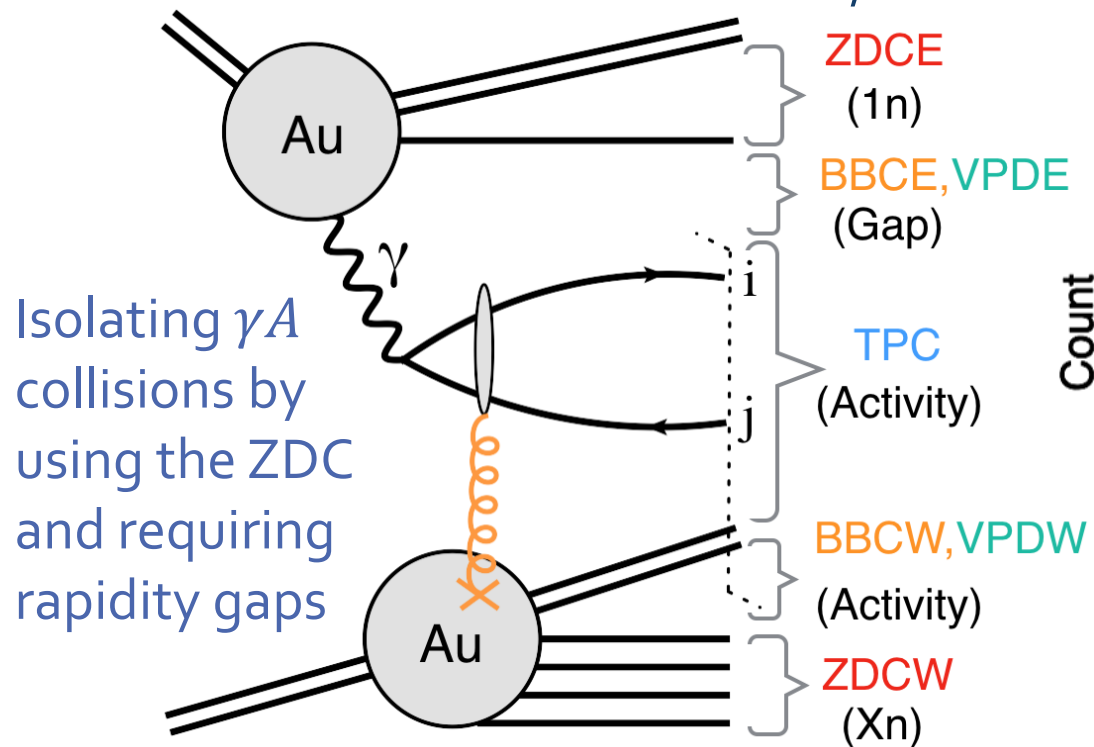


IDENTIFIED HADRON SPECTRA AND BARYON STOPPING IN $\gamma + Au$ COLLISIONS AT STAR



Nicole Lewis, for the STAR Collaboration

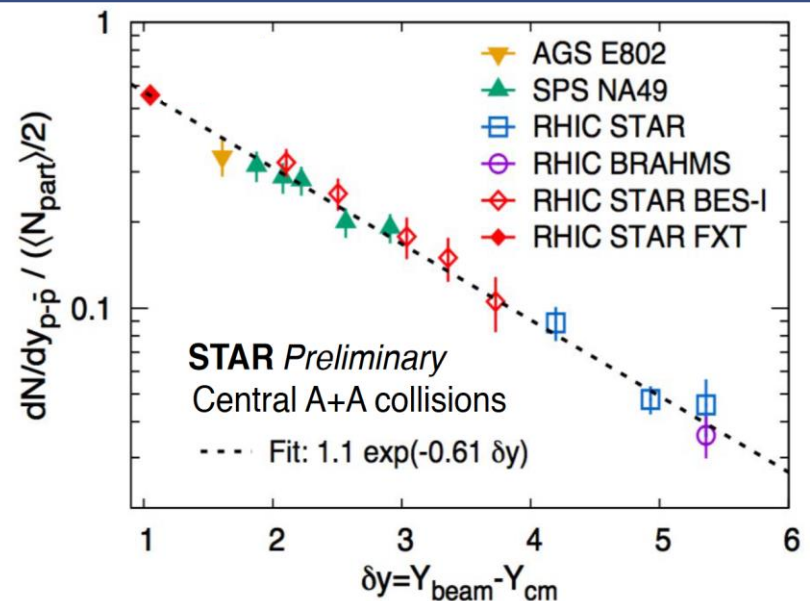


Baryon Stopping

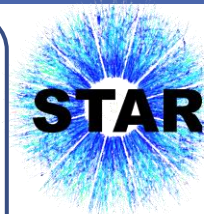
Energy needed to produce particles in heavy-ion collisions comes from kinetic energy lost by baryons in the colliding nuclei

- Larger effect in collisions with higher multiplicity (smaller impact parameter)
- Net-baryon yield can be estimated from the net-proton yield: difference in number of protons and antiprotons
- Cannot be fully explained by pure string fragmentations

See Ben Kimelman's Talk:
QCD matter at finite
temperature and density |
Tuesday 6:10 pm



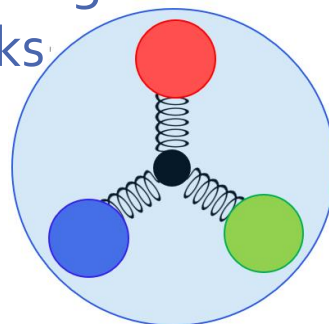
STAR Collaboration, Phys. Rev. C **79**, 034909 (2009)
STAR Collaboration, Phys. Rev. C **96**, 044904 (2017)



Baryon Junction

Nonperturbative configuration of gluons linked to all three valence quarks

- Carries baryon number
- Theorized to be an effective mechanism of stopping baryons in pp and AA



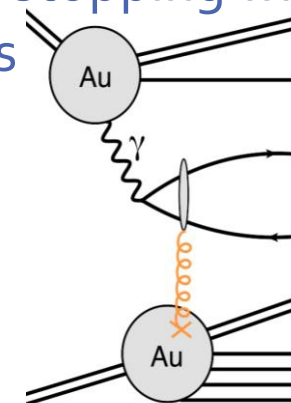
D. Kharzeev, Physics Letters B **378**, 238-246 (1996)

Nicole Lewis, QM 2022

Photonuclear Events

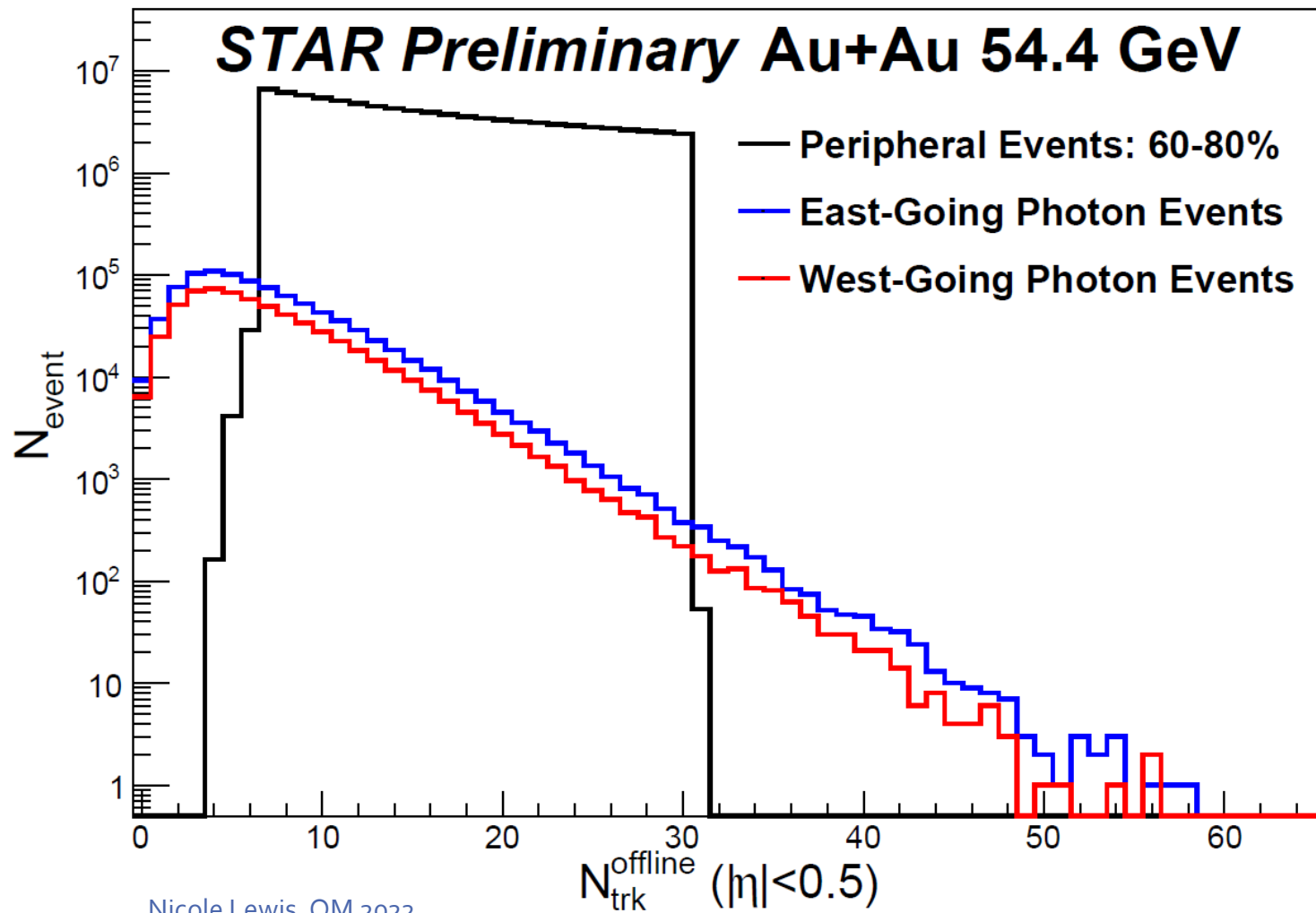
Can be used to study baryon stopping with the cleanest possible process

- $q\bar{q}$ + Baryon Junction producing a midrapidity proton
- $q\bar{q}$ pair would not be able to stop baryons if the baryon number was carried by all three valence quarks



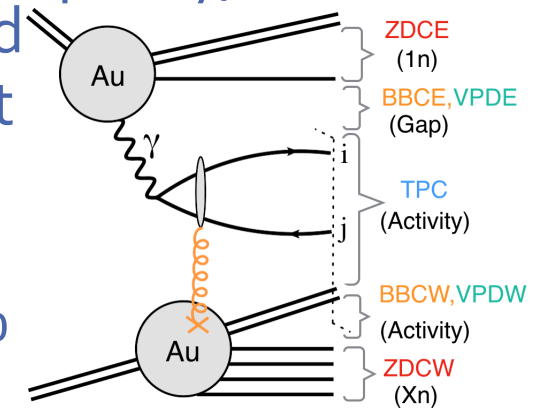


Defining γA and Peripheral AA Event Classes



Nicole Lewis, QM 2022

Most photonuclear events have low multiplicity, concentrated at equivalent Au + Au centrality of roughly 80%



Using peripheral events as a baseline comparison, multiplicity consistent with 60 – 80% Au + Au



p_T Dependence of Particle Ratios in $\gamma A/AA$

Double ratio

$K/\pi < 1$ and flat with p_T

→ less access to strangeness in γA events

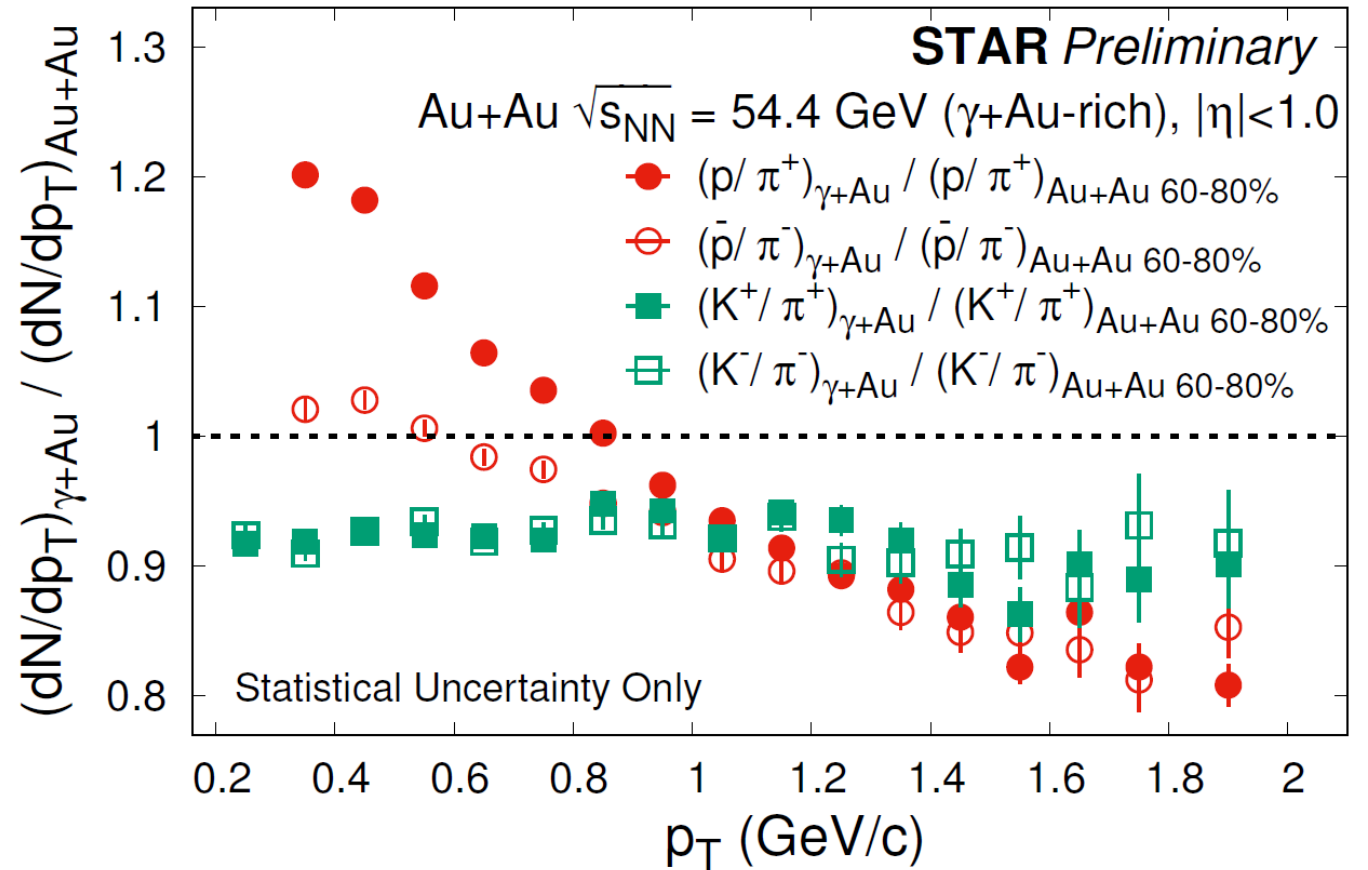
\bar{p}/π and p/π steeper than K/π

→ larger radial flow in 60 – 80% Au + Au

$\bar{p}/\pi^- < p/\pi^+$ for $p_T \lesssim 1 \text{ GeV}/c$

→ soft baryon stopping

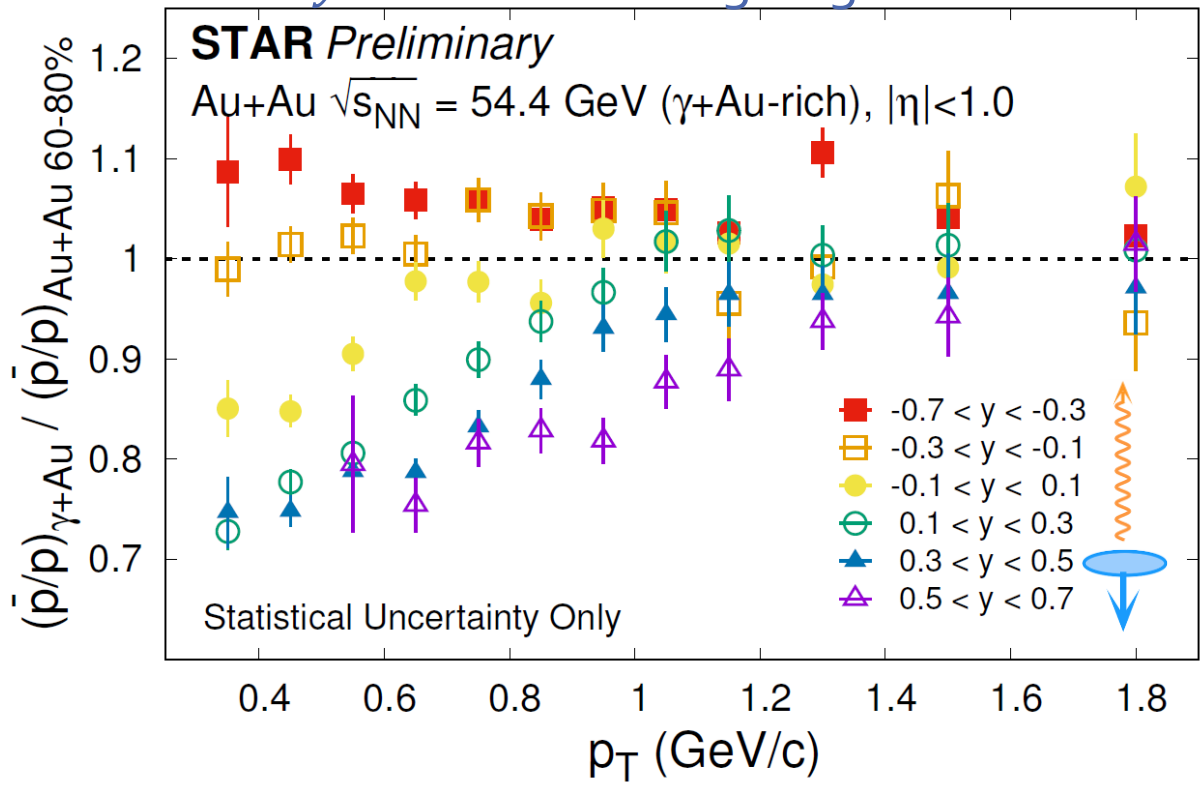
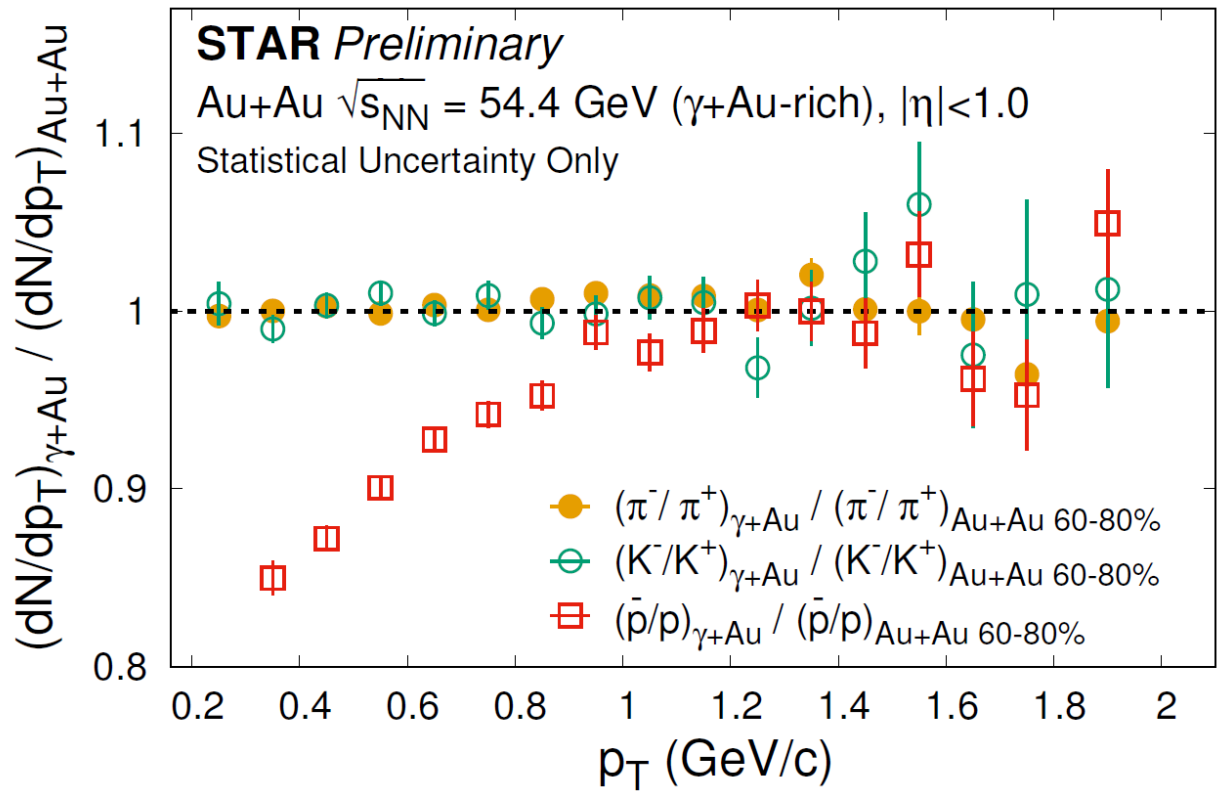
Not corrected for efficiency, but largely canceled in the ratio





Low p_T Baryon Enhancement in γA

$y > 0$ is in the A -going direction



Double ratio: $\bar{p}/p < 1$ at lower p_T

- Soft baryon stopping that is **stronger** in γA compared to peripheral AA
- Ratio is smaller at higher rapidity (A -going side)