

Identified charged hadron spectra in Au+Au and Cu+Cu collisions in PHENIX

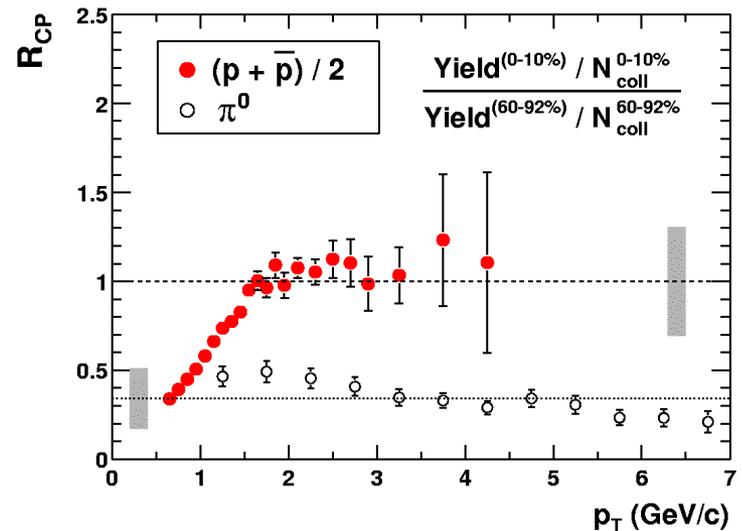
Masaya Oka (Univ. of Tsukuba)

for the PHENIX collaboration

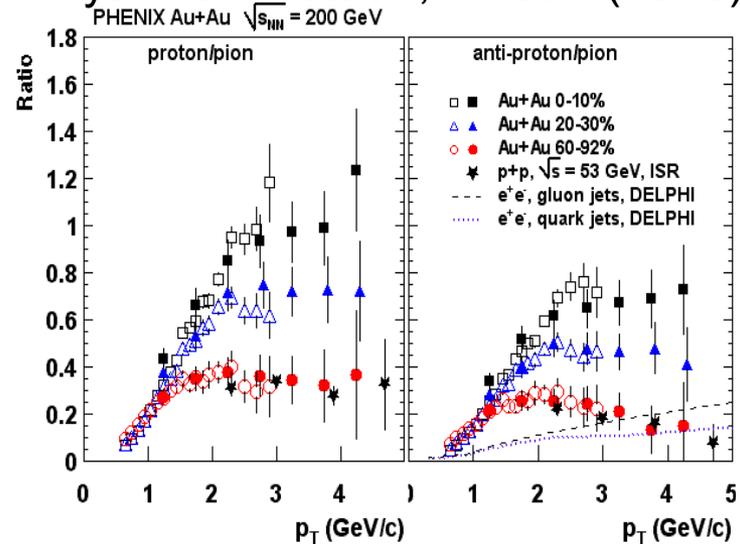


Physics motivation PHENIX

- How different between pion and proton? "baryon anomaly" or "quark recombination"?
- In order to understand Baryon/Meson effect, the systematic studies of PID hadron spectra at the intermediate p_T (2~5 [GeV/c]) region for pi/K/p are necessary, e.g., system size and beam energy dependences.
- New result: p_T extended pi/K/p spectra in Au+Au 62.4 GeV measured by PHENIX Time-of-Flight (TOF) with respect to multi-gaussian fit method.

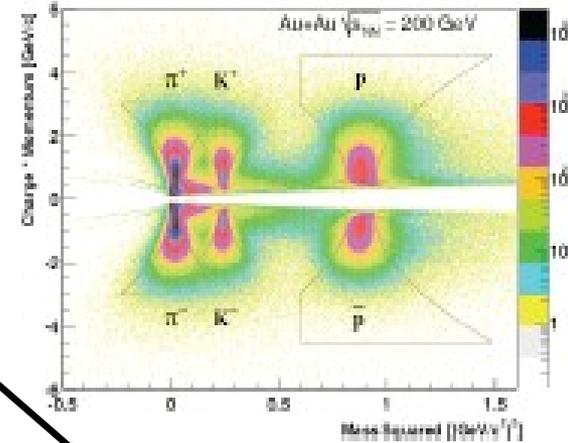
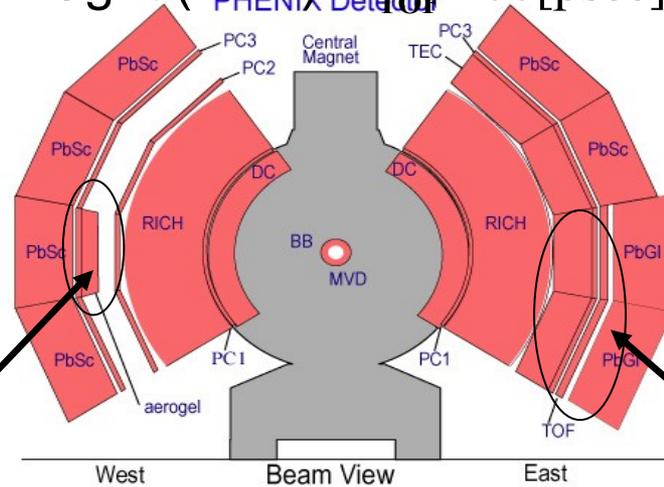
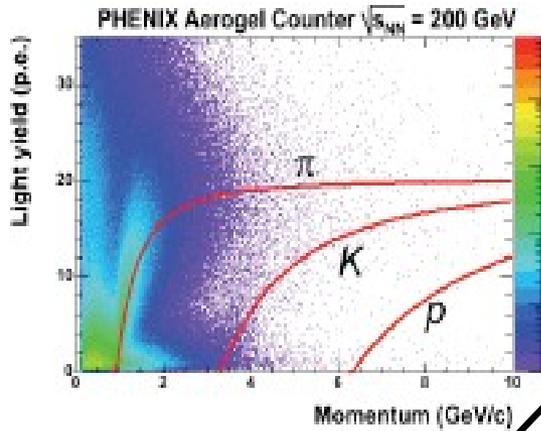


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PID in PHENIX

- High p_T charged hadron PID in PHENIX.
 - Aerogel Cherenkov Counter (threshold etc.).
 - Time-of-Flight (TOF): $\sigma_{TOF} \sim 100$ [psec]

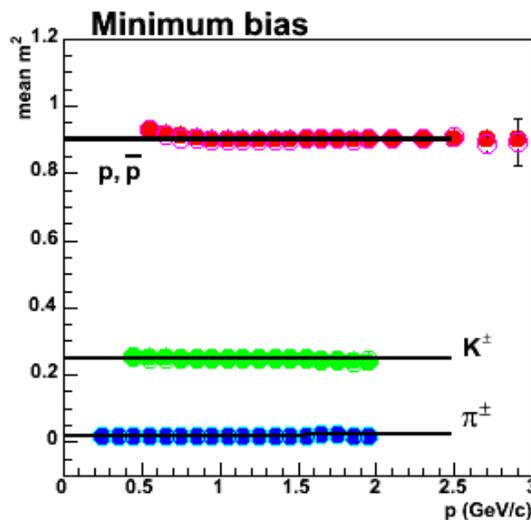
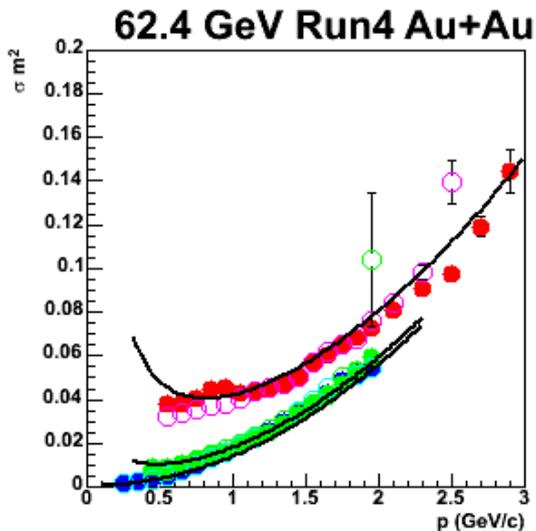


AEROGEL : (n=1.010, threshold= 10% of Max. Np.e.)

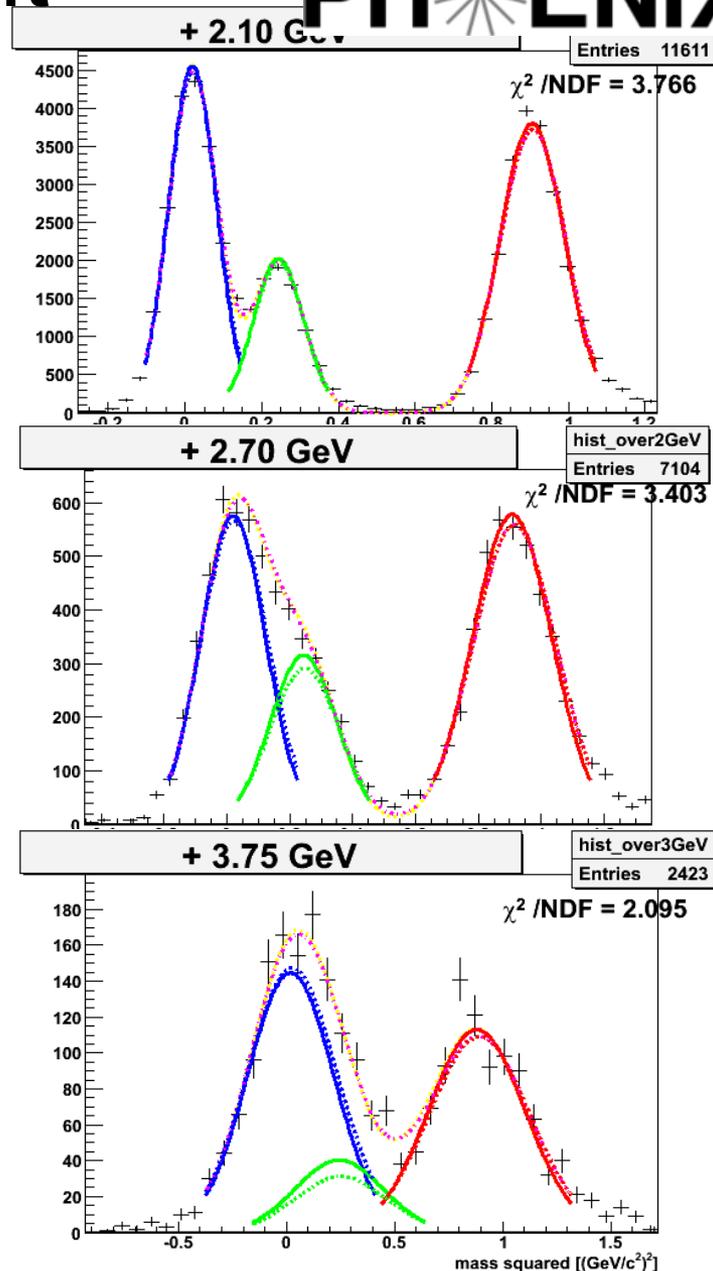
Momentum [GeV/c]	1. 0.5	2. 2.5	3. 3.7	4. 4.2	5. 5.5	6.	7.	~10. (momentum limit)
π	TOF		AEROGEL		RICH			
K	TOF		AEROGEL \cap RICH		TOF (proton) \cap AEROGEL			
p	TOF		AEROGEL \cap RICH					

- Yields extraction by using the multi-gaussian fit technique in mass squared distribution for each particles species up to $p_T \sim 4.5[\text{GeV}/c]$.
 - 1) Assume a gaussian distribution for each particle species.
 - 2) “mean” and “width” of gauss function are fixed, and fitting is carried out with the gauss function which has one free parameter “height” for each particle.
 - 3) Yields are extracted form the “height” obtained by the “multi-gaussian fitting function”.

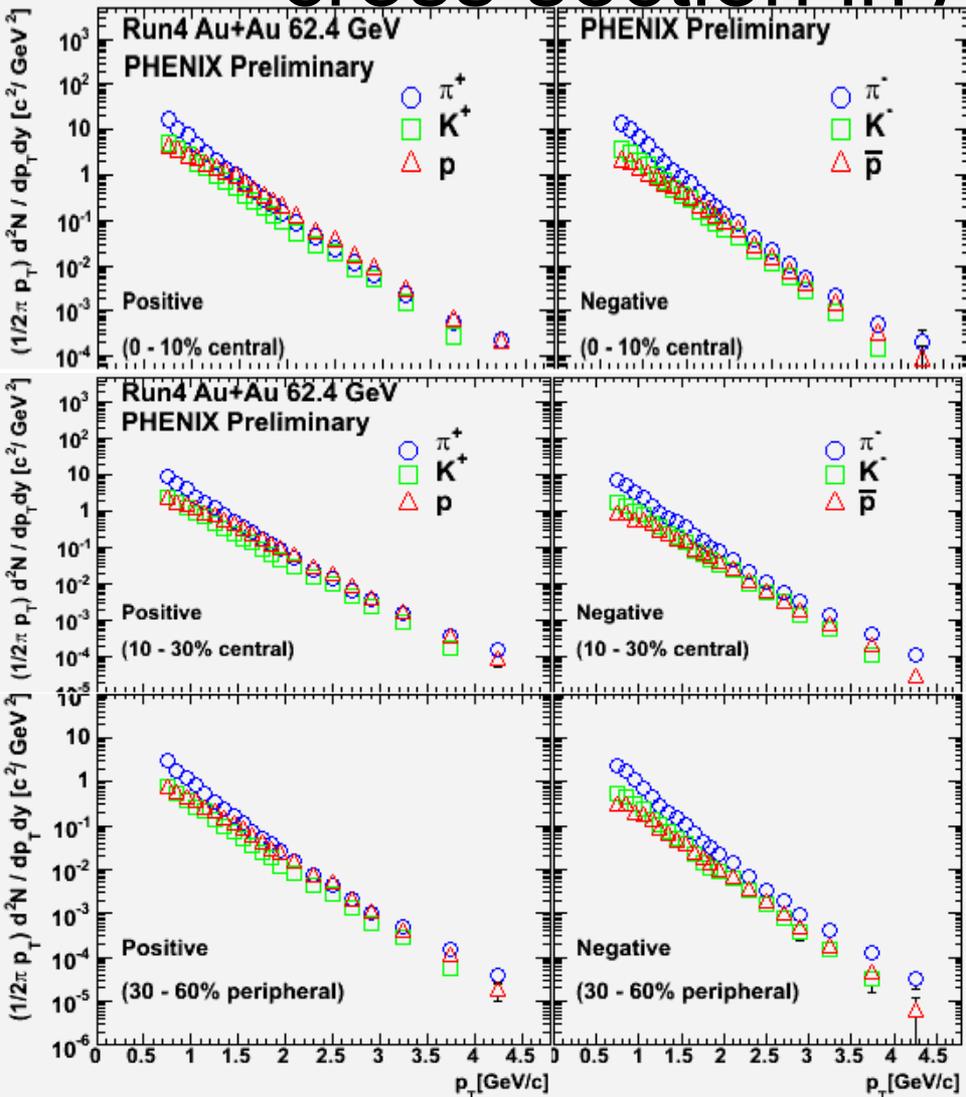
Fitting result



- We use the integral of single gauss from multi gauss fit as the raw count for each momentum sliced bin.



Identified hadron invariant PHENIX cross section in Au+Au 62.4 GeV



- We estimate centrality dependence of pion, Kaon and proton spectra at large p_T region (~ 4.5 [GeV/c] for π/p , ~ 4.0 [GeV/c] for K).
- Without Feed down correction for proton and Anti-proton.

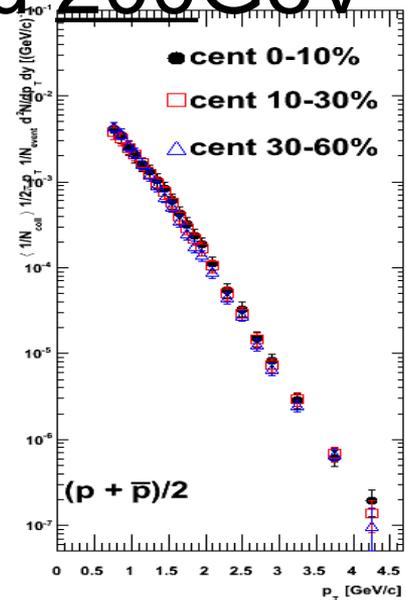
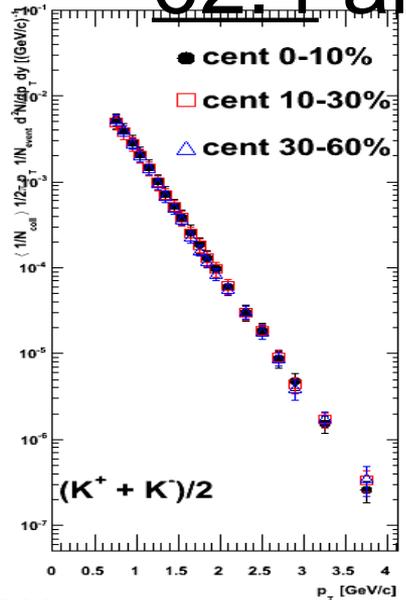
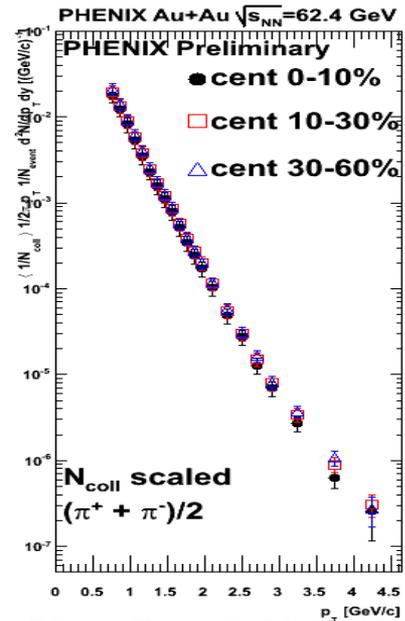
N_{coll} scaling Au+Au collision



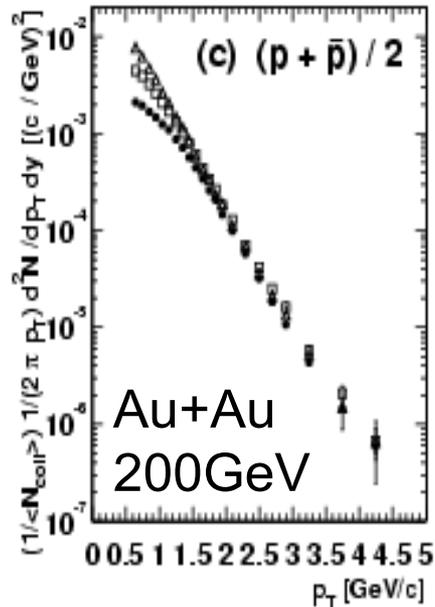
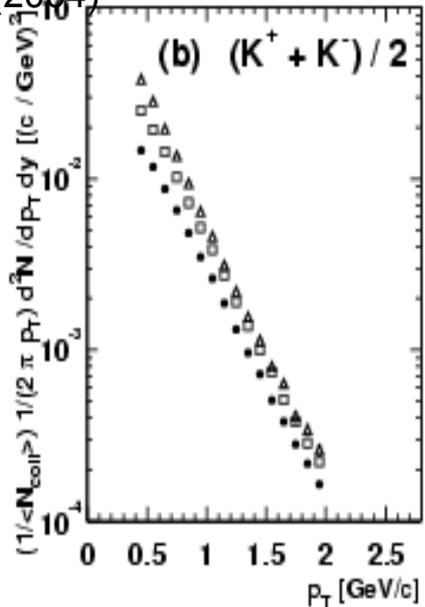
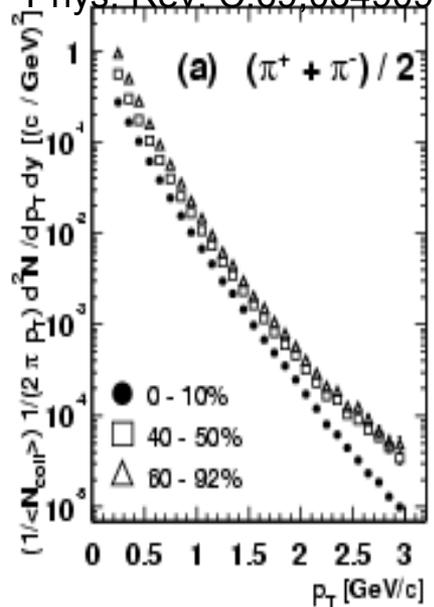
62.4 and 200GeV

Radial Flow effect in 200GeV Collision. But, 62.4GeV??

- Need to study the most peripheral centrality bin(60-83%) for the comparison.
- And, need more study with other particles, and “Blast wave fitting”.

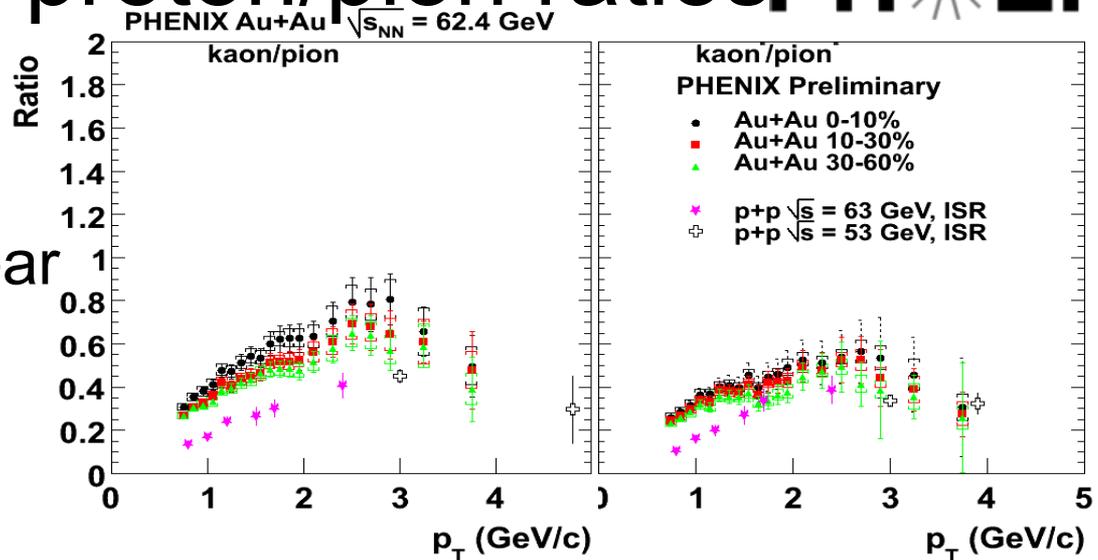


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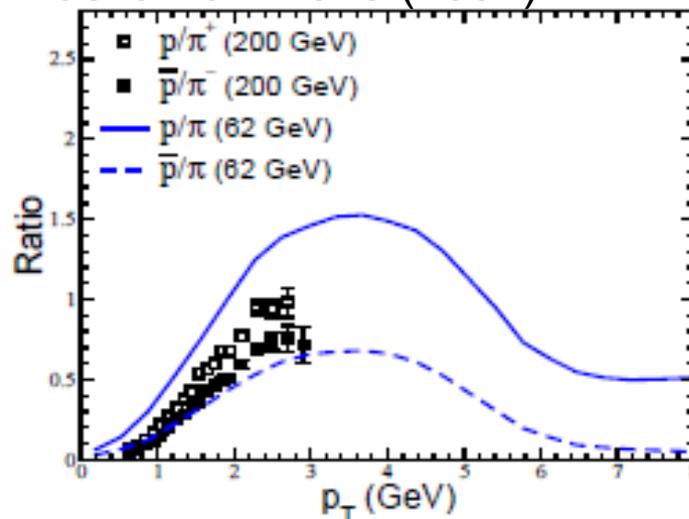


Kaon/pion and proton/pion ratios PHENIX

- K^+/π^+ and K^-/π^- are almost same.
- P/π^+ and anti- p/π^- clear difference.
 - stopping effect larger in 62.4 GeV
 - recombination and fragmentation ??

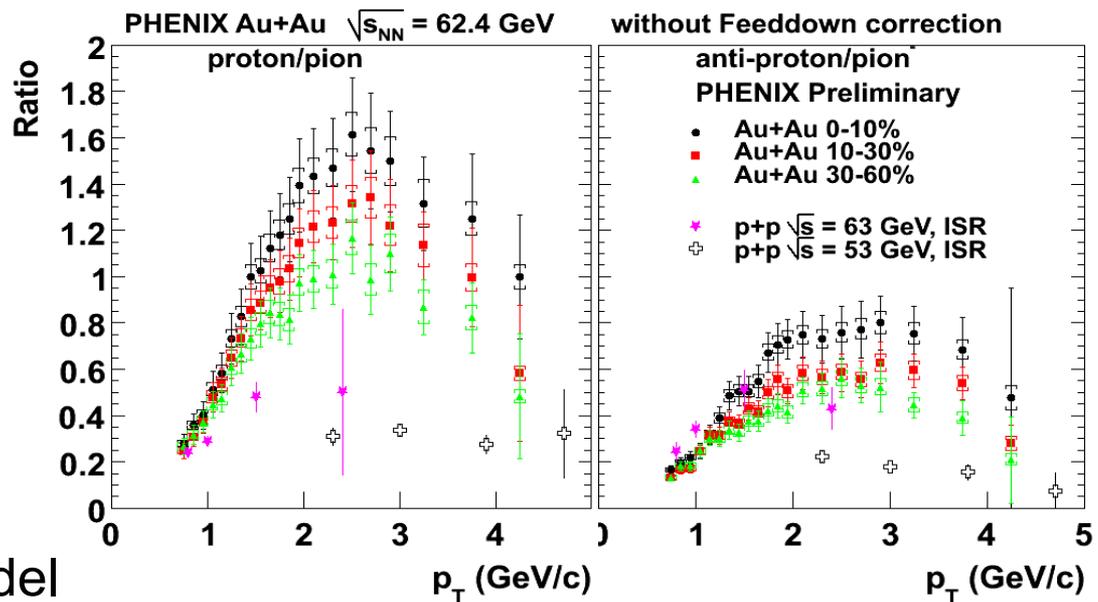


Nucl-th. 0412043 (2004)

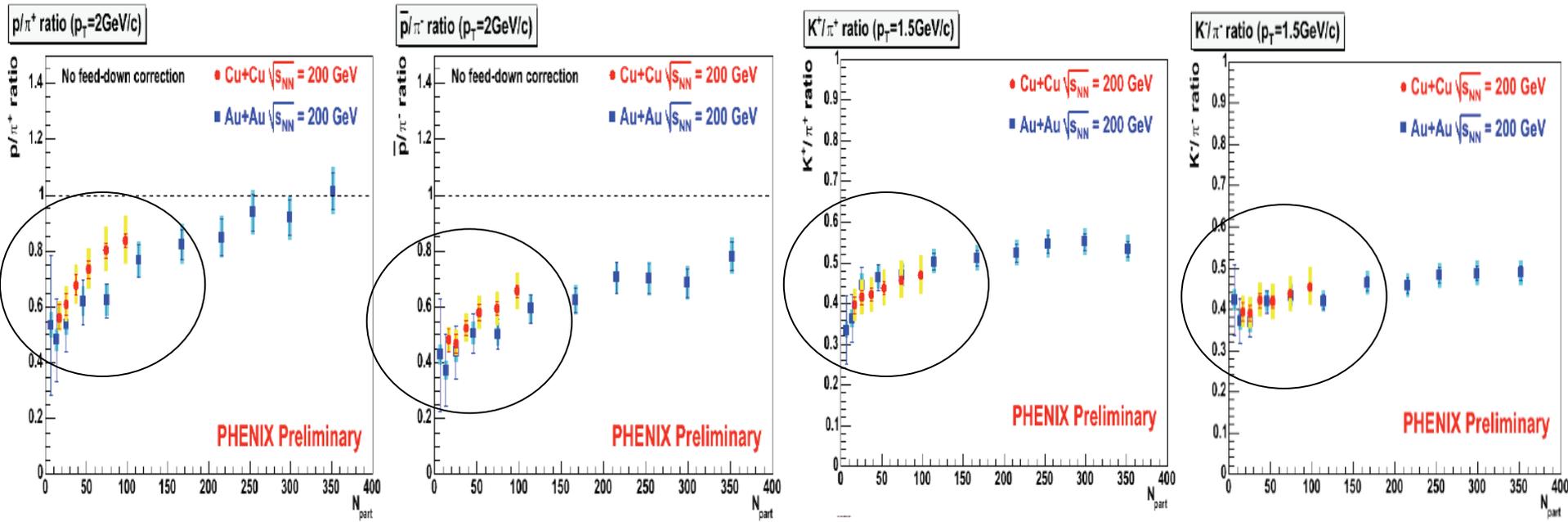


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Coalescence model

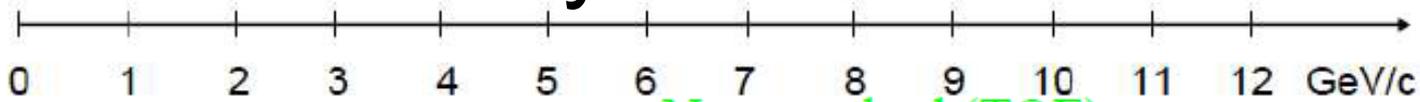


p/pi and K/pi in Cu+Cu vs. Au+Au at 200GeV



- Meson production is not dependent collision system ?
But, Baryon production is dependent collision system ???
- Need more study in other energies and other system sizes.

Summary & Conclusions PHENIX



- We measured PIDed hadron spectra.
 - Pion and proton ~ 4.5 [GeV/c], Kaon ~ 4.0 [GeV/c]
 - Conclusions,
 - Difference between p/π^+ and $\text{anti-}p/\pi^-$, due to a less baryon and Anti-baryon pair production and a larger baryon transport at 62.4 GeV Au+Au than those in Au+Au 200GeV.
 - Au+Au vs. Cu+Cu @ 200 GeV: N_{part} scaling worked in K/pi and p/K ratios.
- Next,
 - We study (more systematic study) hadron production at large p_T region for other collision condition,
 - Au+Au 200GeV, 62.4GeV, p+p 200GeV
 - Cu+Cu 200GeV, 62.4GeV, 22.5GeV
 - Need the new reference p+p @ 62.4 GeV and 22.5 GeV for R_{AA} , and other collision systems (Asymmetrical collision?) for Hadron production.