

Centrality Dependent Studies of Charged Particle Spectra at RHIC

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*2006 Division of Nuclear Physics Annual Meeting
October 25-28, 2006*

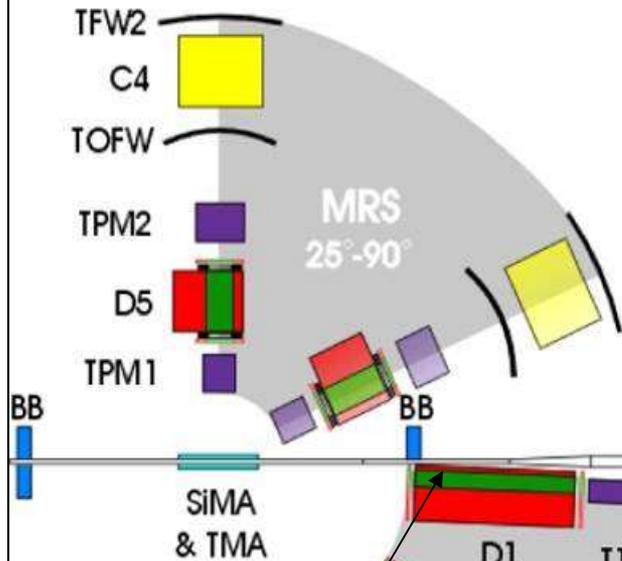
Outline

1. Introduction
2. Previous results on charged hadron suppression
3. Charged hadron suppression in CuCu @ 200 GeV
4. Particle ratios
5. Summary and Future plans

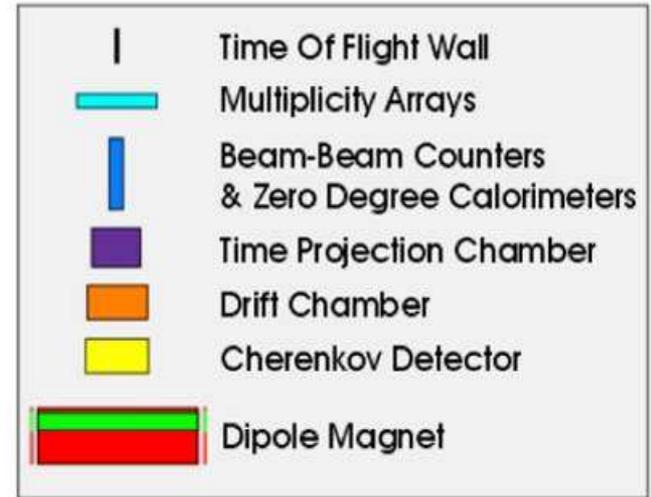
Introduction

BRAHMS Experimental Setup

Mid Rapidity Spectrometer

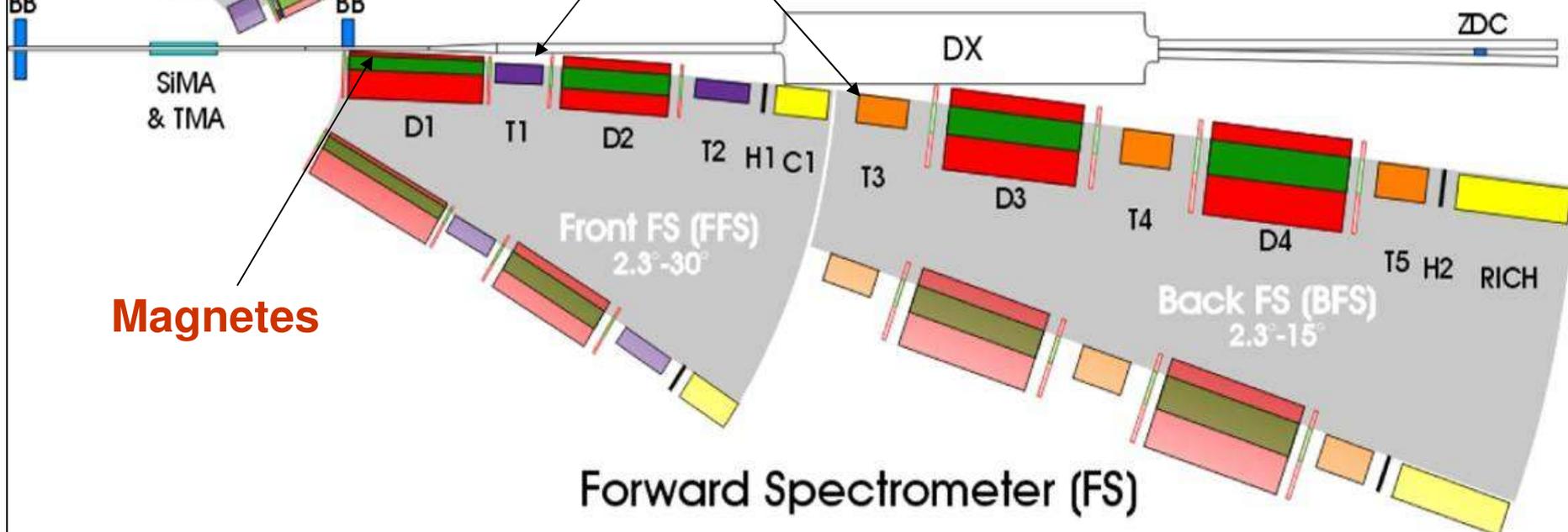


Tracking Detectors



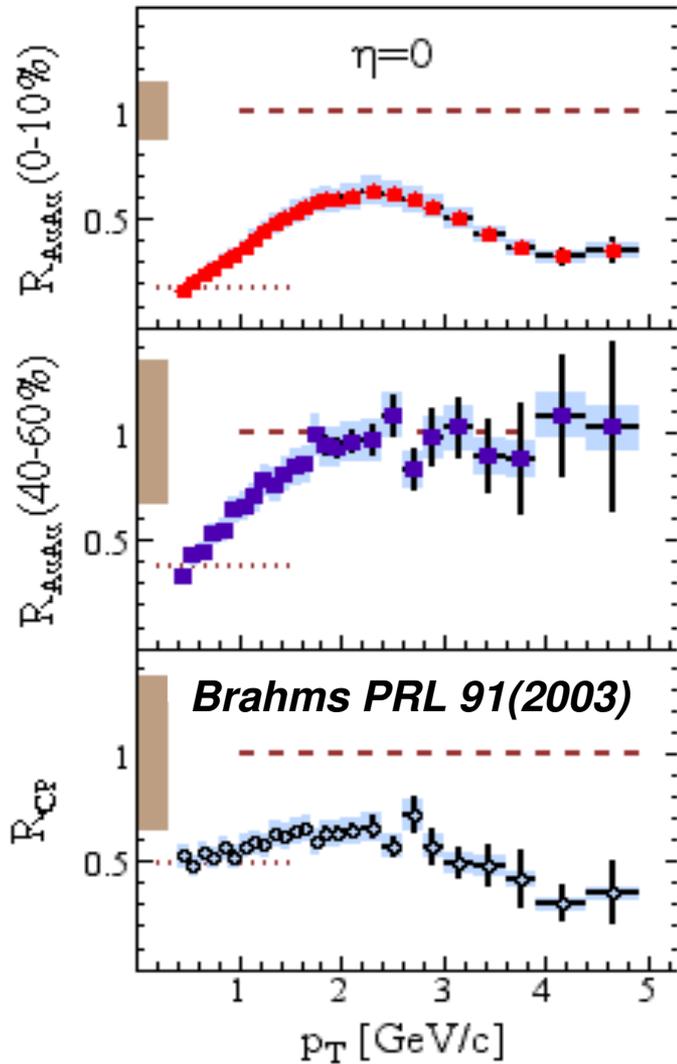
Magnetes

Forward Spectrometer (FS)



AuAu @

$$\sqrt{s_{NN}} = 200 \text{ GeV}$$



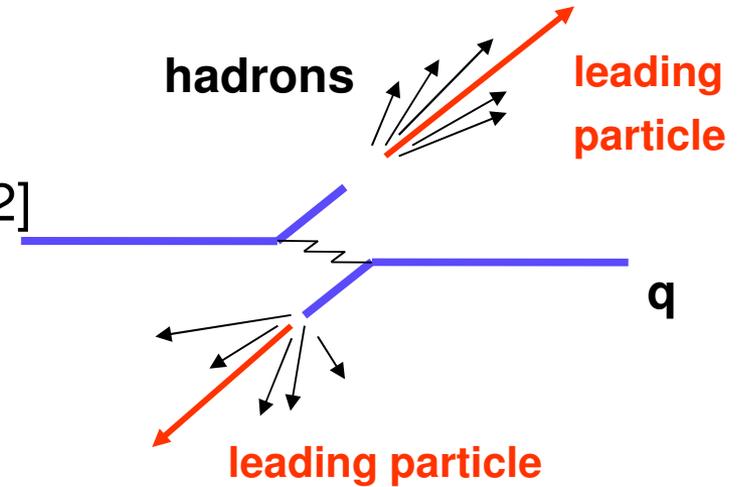
$$R_{AA} = \frac{d^2 N^{A+A} / dp_T d\eta}{N_{coll} d^2 N^{P+P} / dp_T d\eta}$$

where $\eta = -\ln(\tan(\theta/2))$

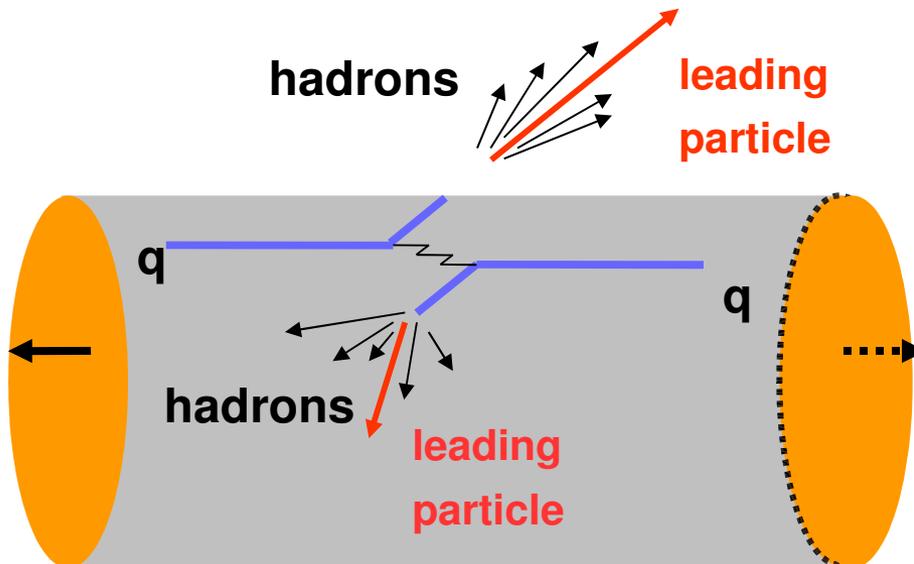
$$R_{cp} = \frac{1/N_{coll}^C d^2 N^C / dp_T d\eta}{1/N_{coll}^P d^2 N^P / dp_T d\eta}$$

Nucleon-Nucleon collision

Back to back correlation measurements at STAR indicated that the distribution of the away side jets is strongly suppressed in comparison with the near side jets at mid-rapidity [STAR PRL 90 (2003) 082302]



Heavy ion collision



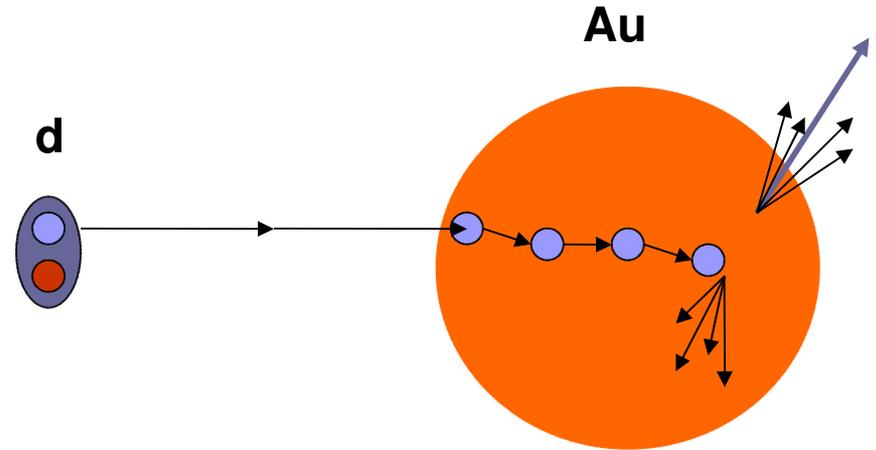
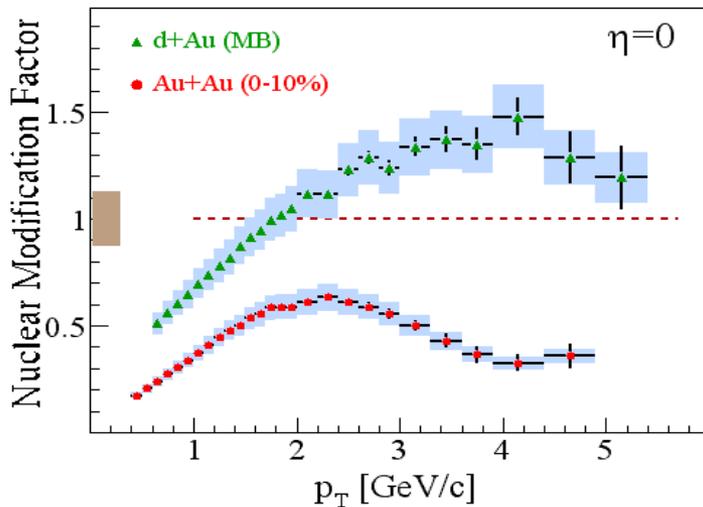
Results from AuAu at mid-rapidity are consistent with partonic energy loss in the larger interaction volume corresponding to central collisions.

→ the suppression might be due to final state interactions

How can one be sure?

Look at situations where final state interactions are expected to be less important such as dAu collisions. The expected result was $R_{dAu} \sim 1$ if the suppression is a final state effect or $R_{dAu} < 1$ if the suppression is an initial effect

The data from RHIC at mid-rapidity seem to favor the scenario with final state



**How about forward rapidities?
Will the situation at mid-rapidity
persist?**

dAu @ 200 GeV

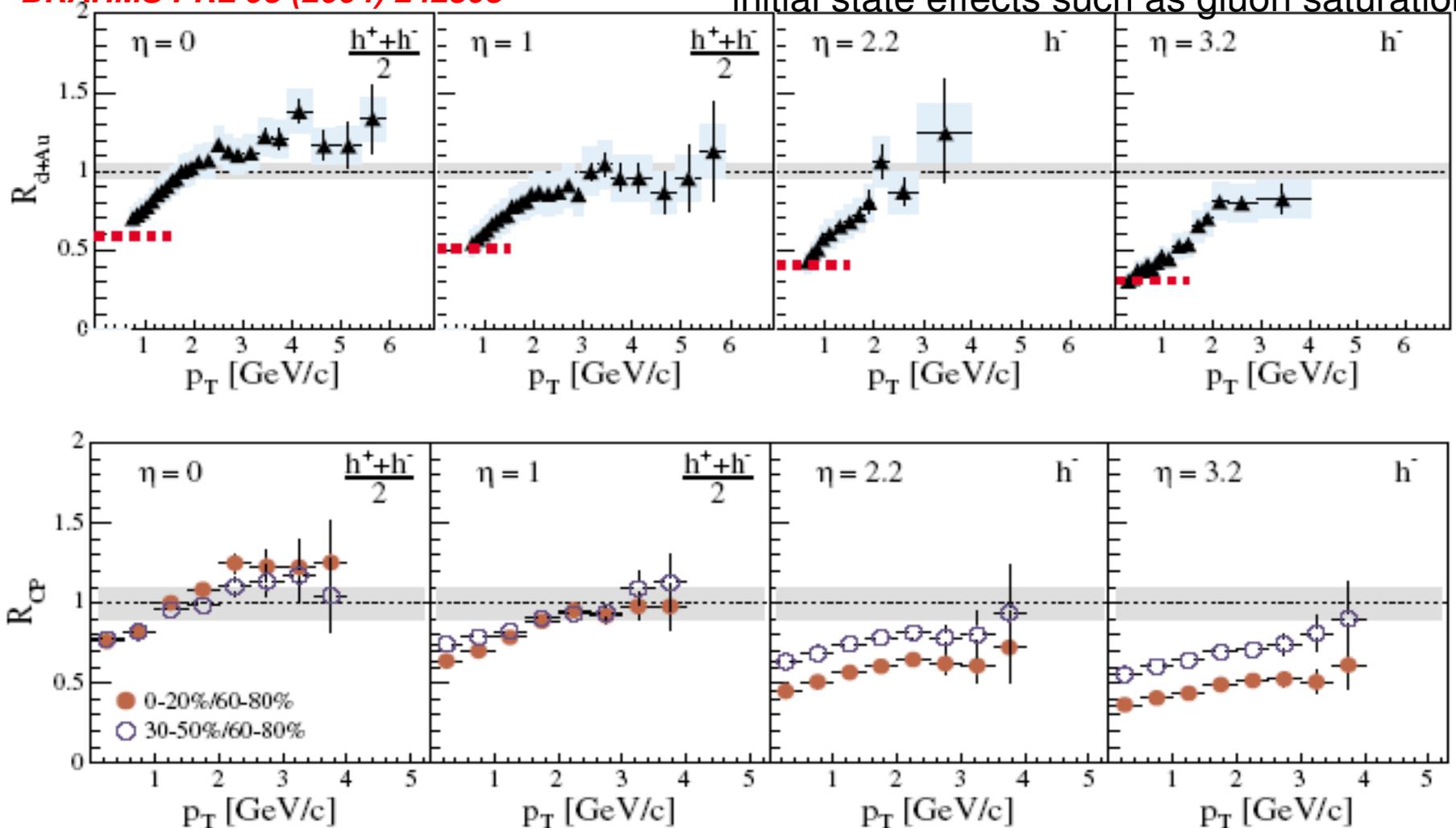
10% most central collisions

BRAHMS PRL 93 (2004) 242303

- Cronin like enhancement at $\eta = 0$

- Clear suppression as η changes from 0 to 3.2

- Suggest suppression may also be due to initial state effects such as gluon saturation

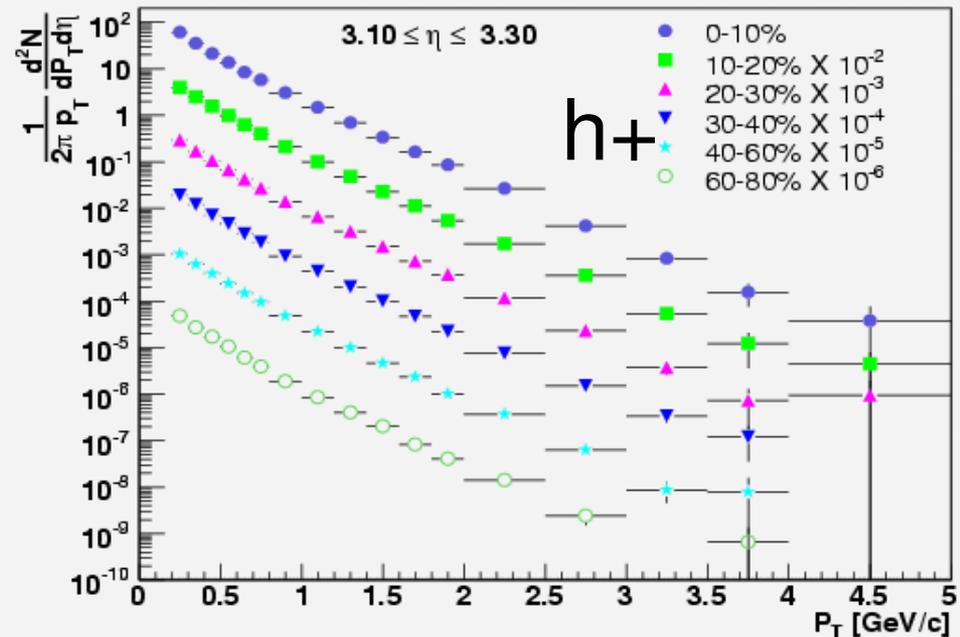
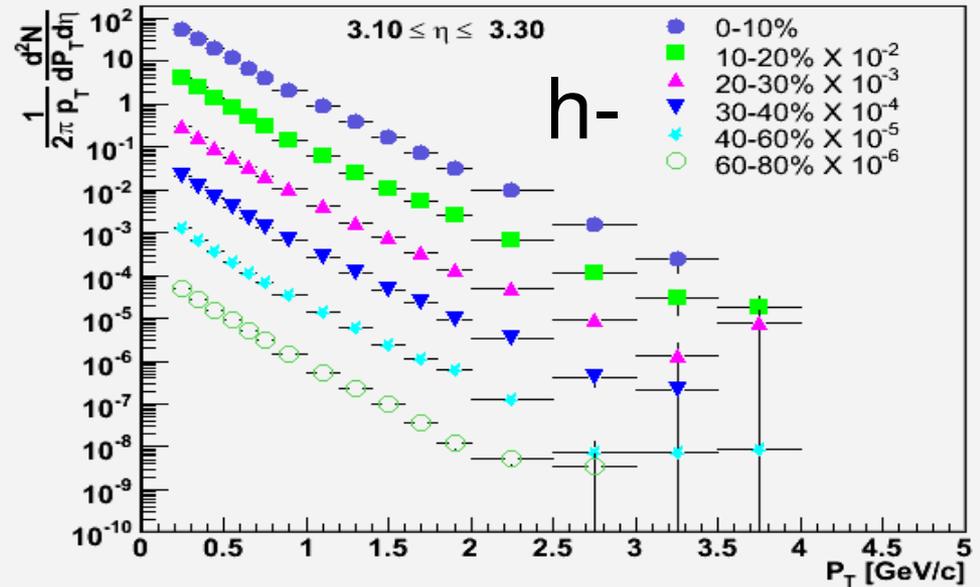


CuCu @200 GeV

-CuCu serves as bridge between

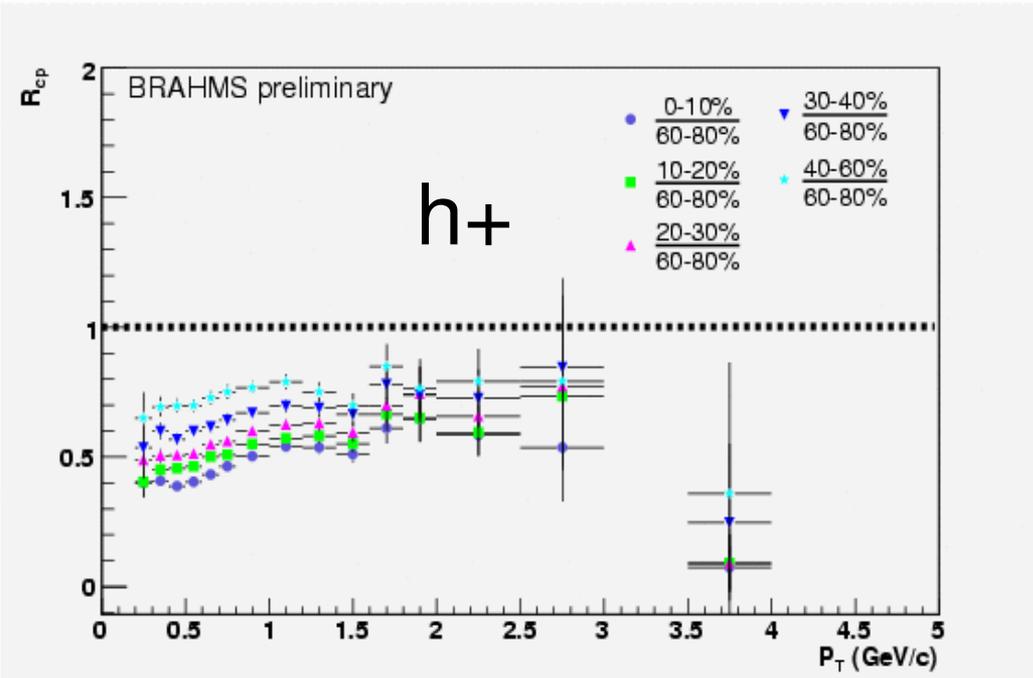
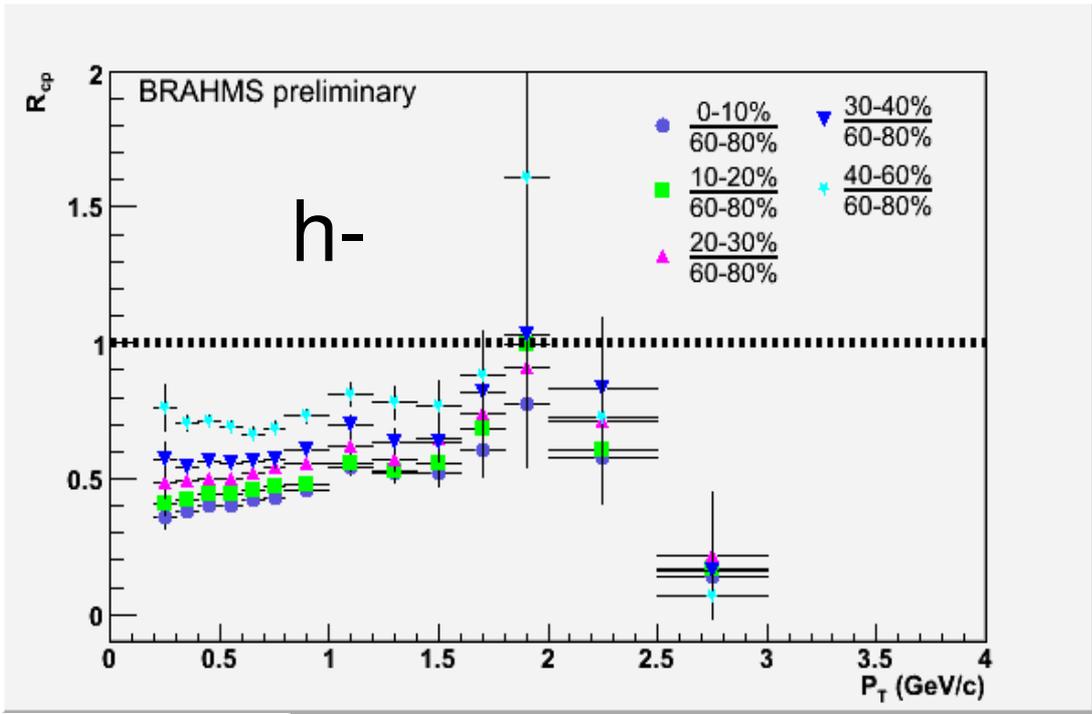
dAu and AuAu

-Provides data to study system size dependence together with pp, dAu and AuAu



Charged hadron suppression in CuCu@200 GeV/c at $\eta = 3.2$

The suppression increases with centrality

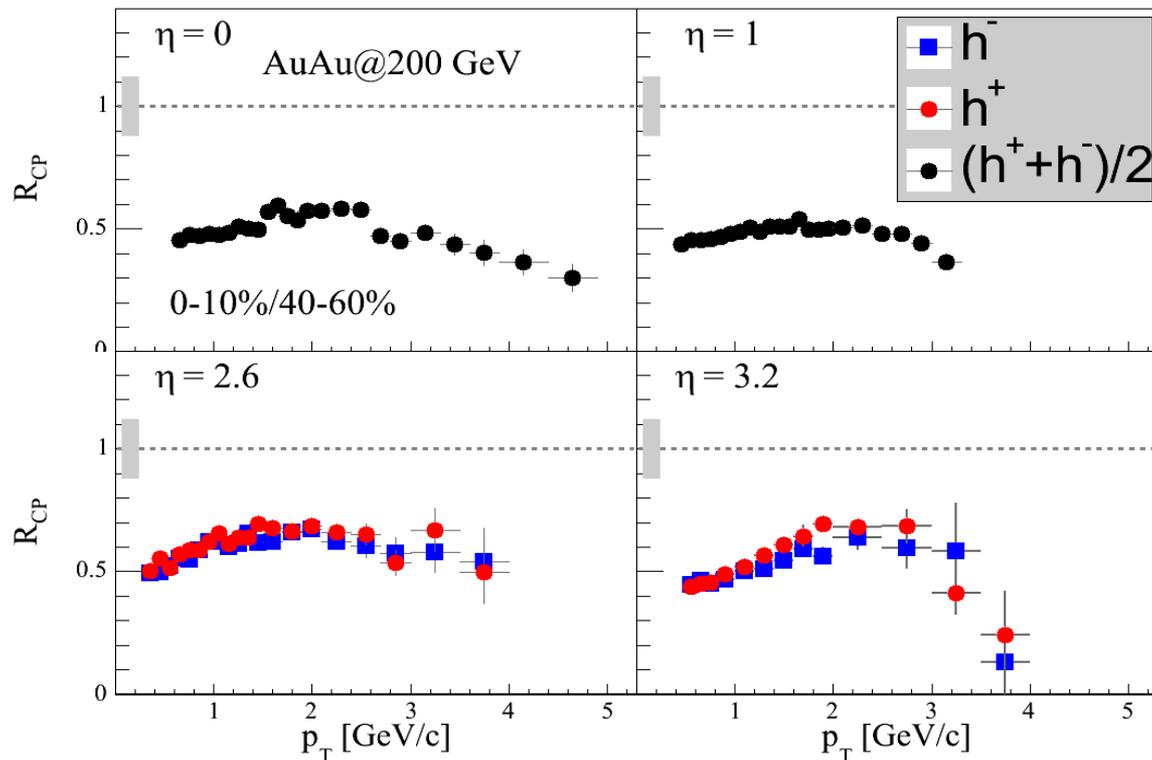


Both negative and positive hadrons show similar levels of suppression

R_{CP} in AuAu @ $\sqrt{s_{NN}} = 200$ GeV

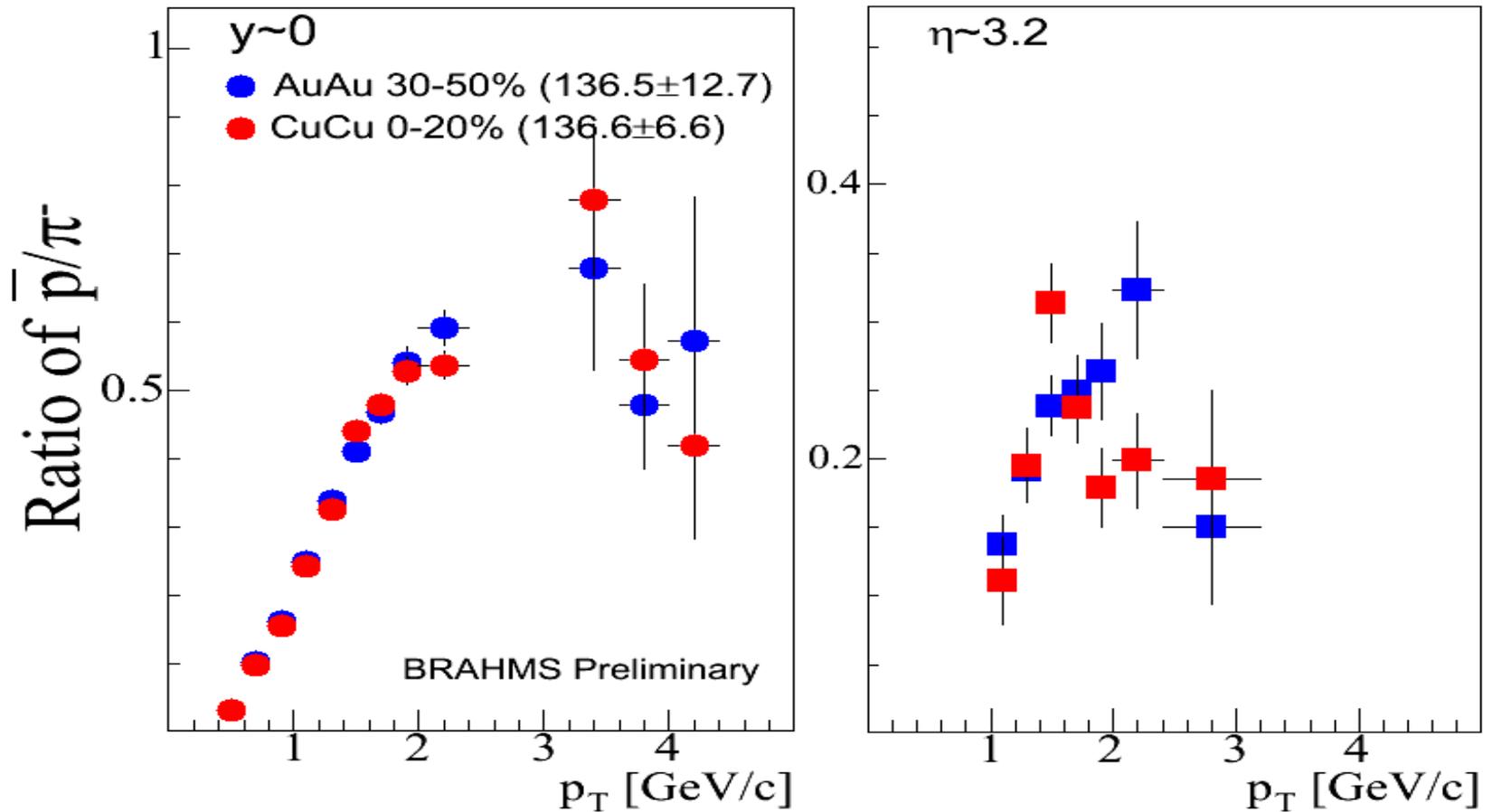
BRAHMS preliminary

Truls Martin Larsen, QM2005



One also sees a similar level of suppression in AuAu collisions at the same energy

Particle ratios



anti- p/π^- ratios in different collision systems are similar for comparable number of binary collisions

Summary

- Suppression of particle production increases with centrality
- Similarity of particle ratios between CuCu and AuAu systems for the same N_{coll} indicates only the size of the overlap region is important in particle production.

Future Plans

- ▣ Study rapidity dependence of particle production
- ▣ Compare results from dAu, AuAu and CuCu for the same N_{part}
- ▣ Study centrality and rapidity dependence of identified particle spectra
- ▣ Test model predictions