Identified hadron production in d+Au and p+p collisions at RHIC

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Outline

- Experimental overview
- Preliminary results
  - particle spectra
  - particle yields and ratios
  - nuclear modification factor
  - net-protons
- Summary

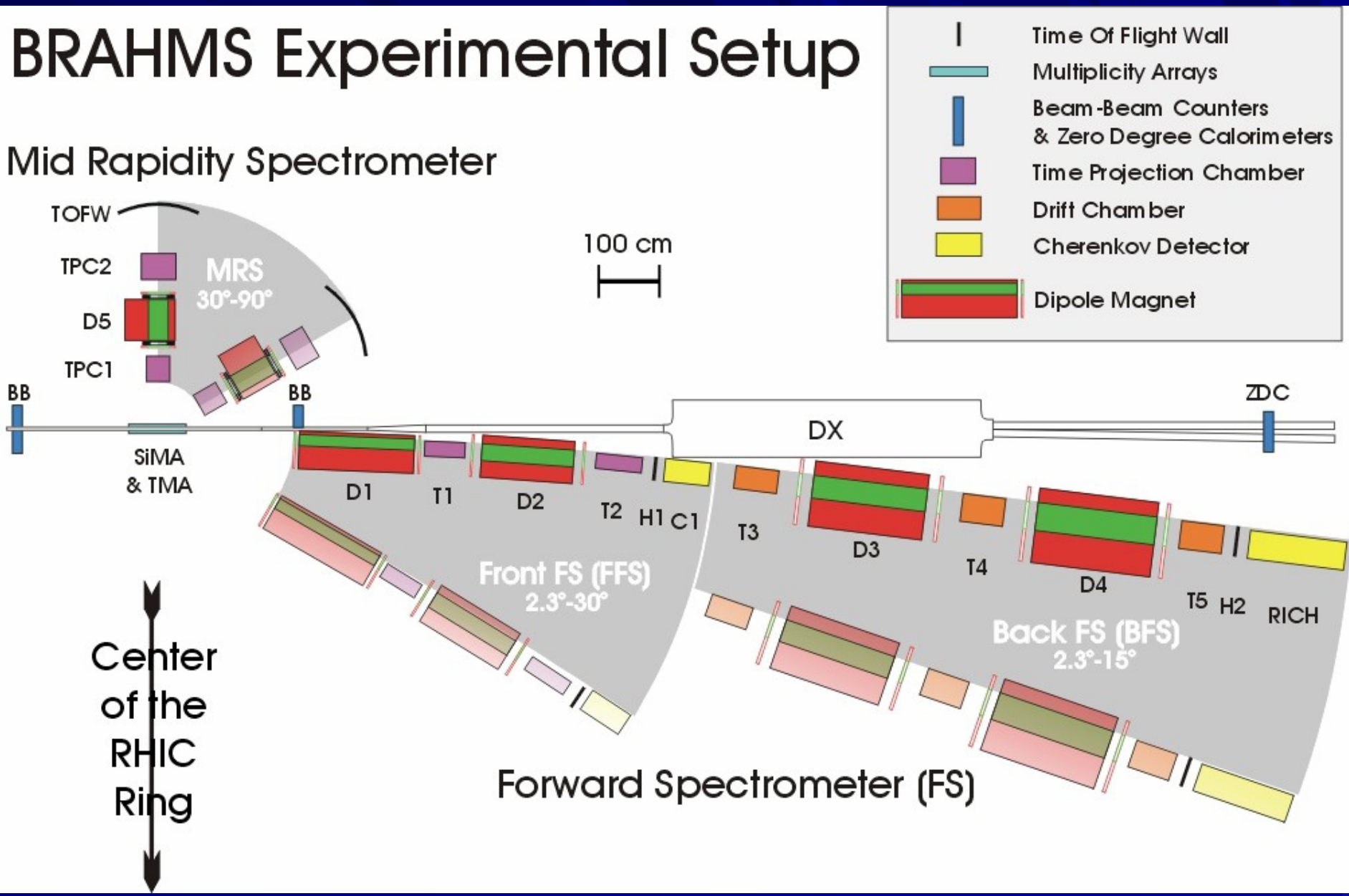
Motivations

- rapidity dependence of particle spectra in p+p and d+Au: a reference for heavy ion collisions
- particle spectra in p+p collisions: a test of pQCD
- nuclear modification factor for nuclear effect, initial state effect?

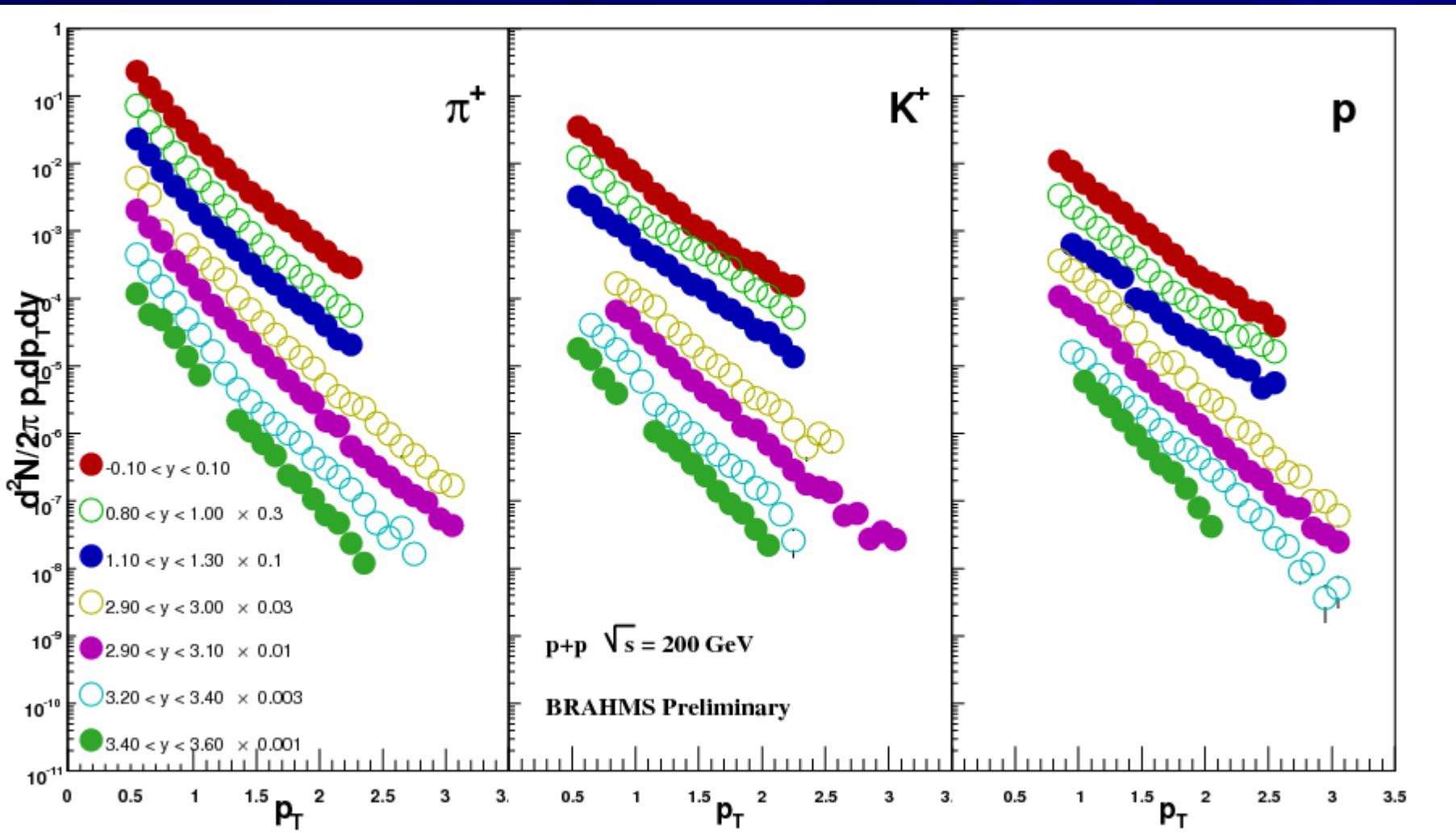
$$R_{dAu} = \frac{d^2N^{d+Au}/dp_T dy}{N_{coll}\, d^2N^{p+p}/dp_T dy}$$

- rapidity distribution of net-protons: stopping in elementary collisions

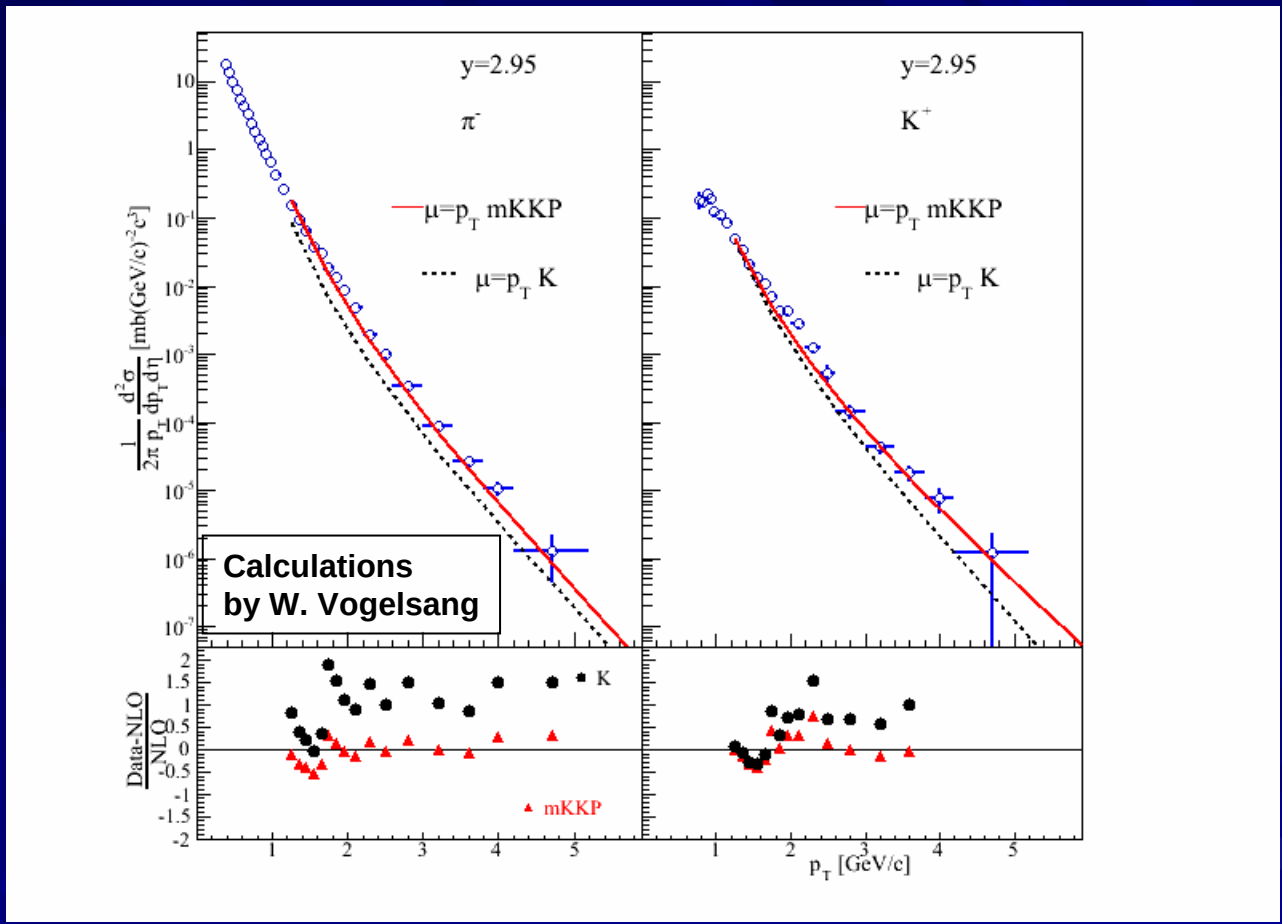
BRAHMS Experimental Setup



Identified particle spectra in p+p collisions



Spectra at forward rapidity (pp collisions) – comparison to NLO pQCD



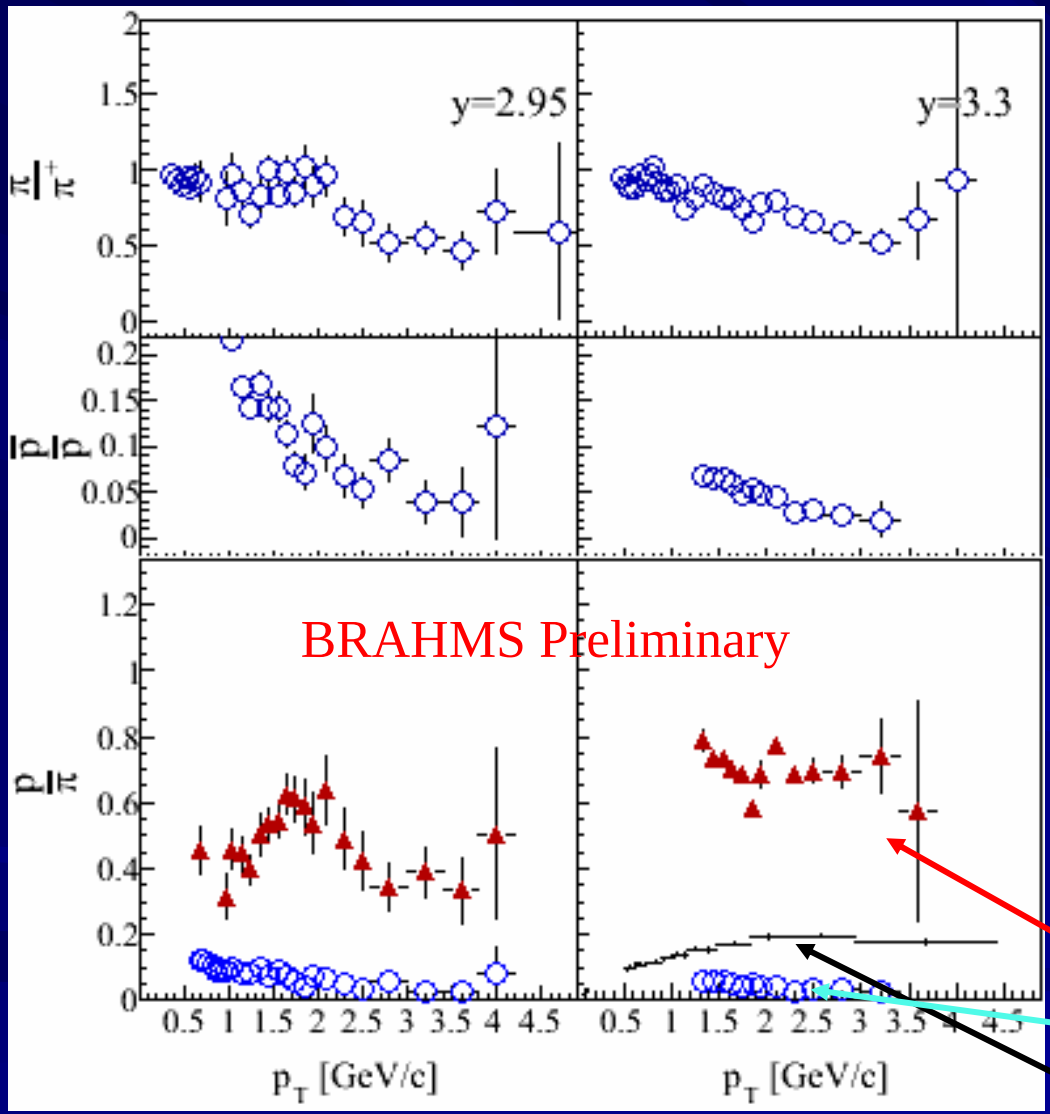
Same fragmentation functions as used for the PHENIX comparison at mid-rapidity.

mKKP: KKP has only π^0 fragmentation. Modifications were needed to calculate charged pions.

K: fragmentation function by Kretzer

- **NLO pQCD describes data also at forward rapidities**

Spectra at forward rapidity (p+p collisions)
p_T-dependence of ratios



Ratios y=3.0 and 3.3

- **Excess of positive pions: ratio ->1/2 (valence quark counting)**
- **Small $\bar{p}/p$ ratio eliminates possible strong g -> p or $\bar{p}$ fragmentation**
- **The difference between protons and anti-protons indicates another mechanism besides fragmentation that puts so many protons at high pT.**

Red: p/π^+

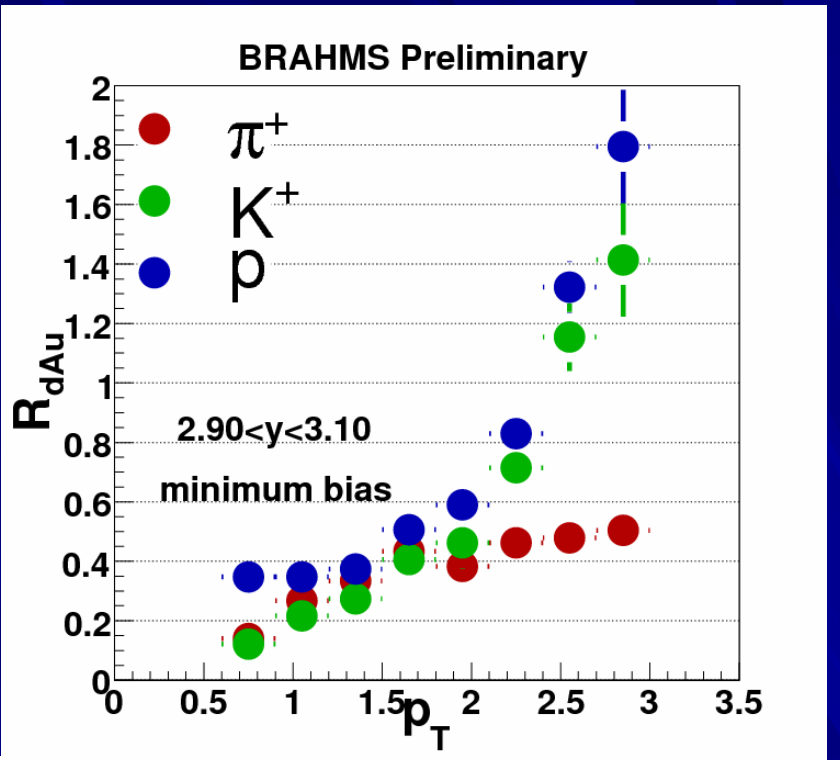
Blue: p-bar/ π^-

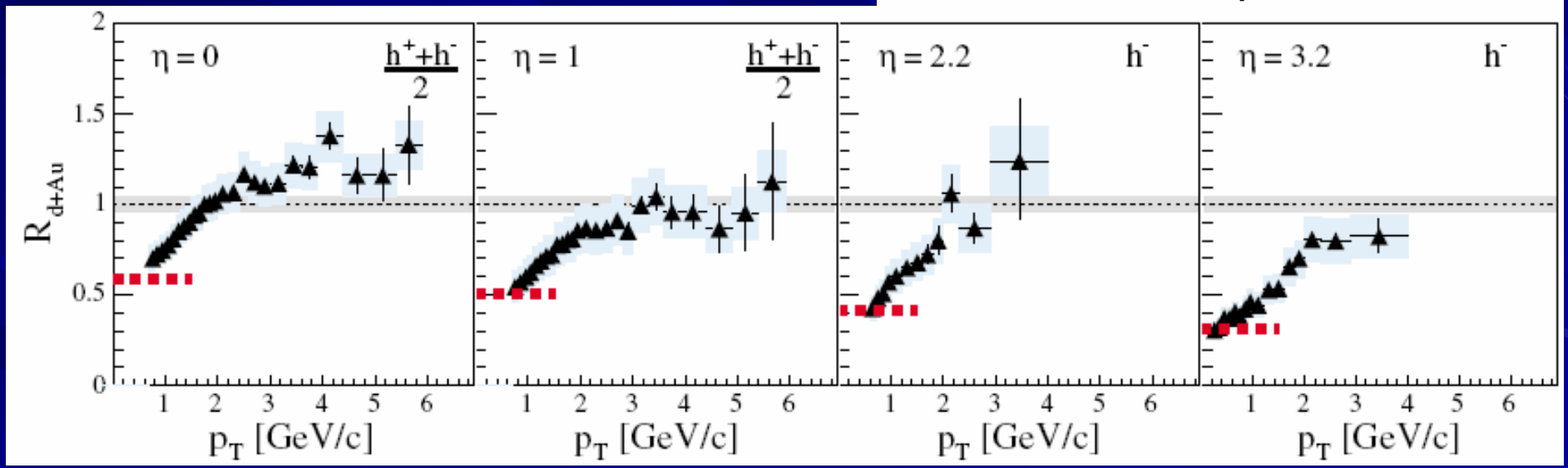
e+e-: p+p-bar/π++ π- (ALEPH)

R_{dAu}

- for hadrons, suppression was seen at forward rapidity

- Pions are suppressed, while protons are not





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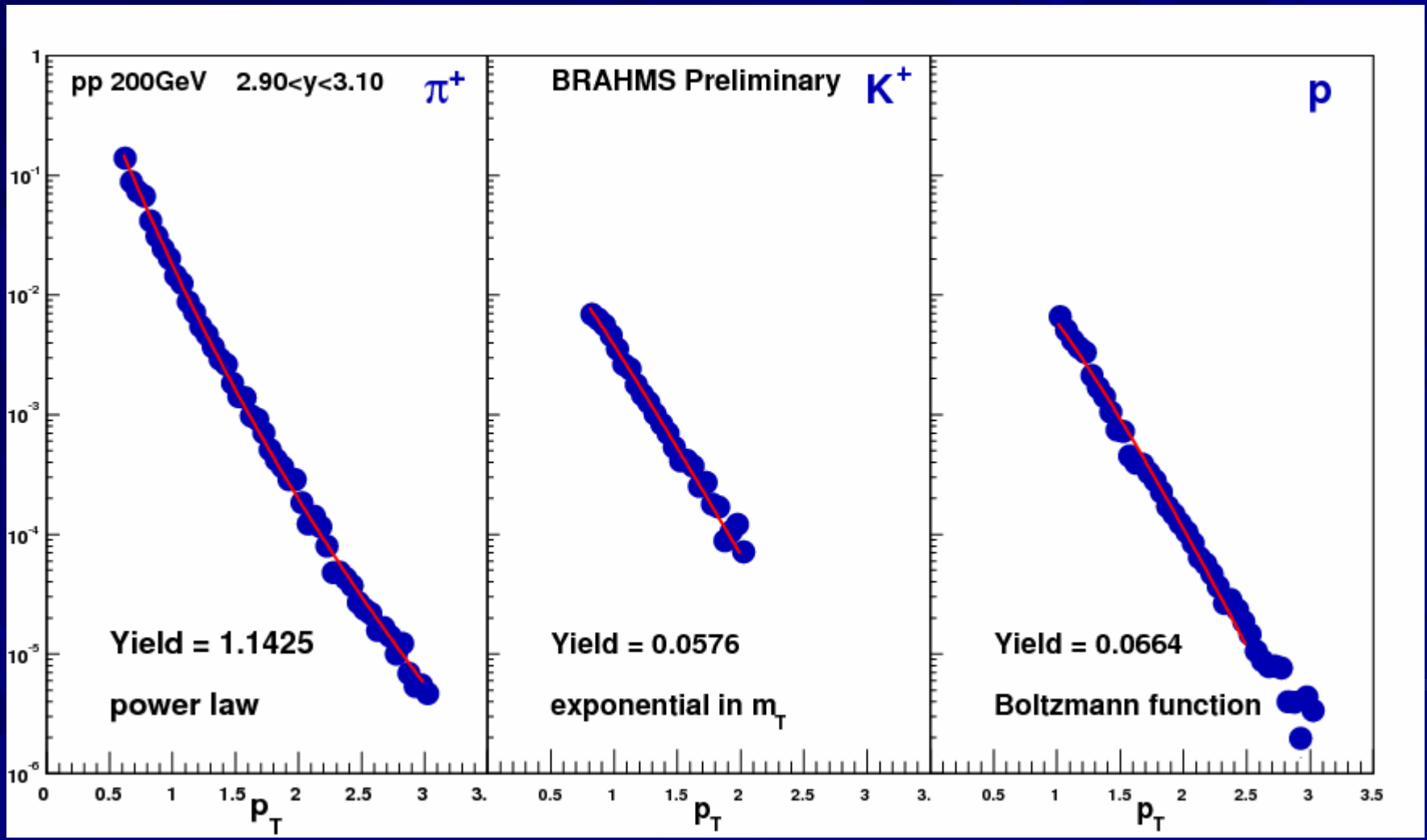
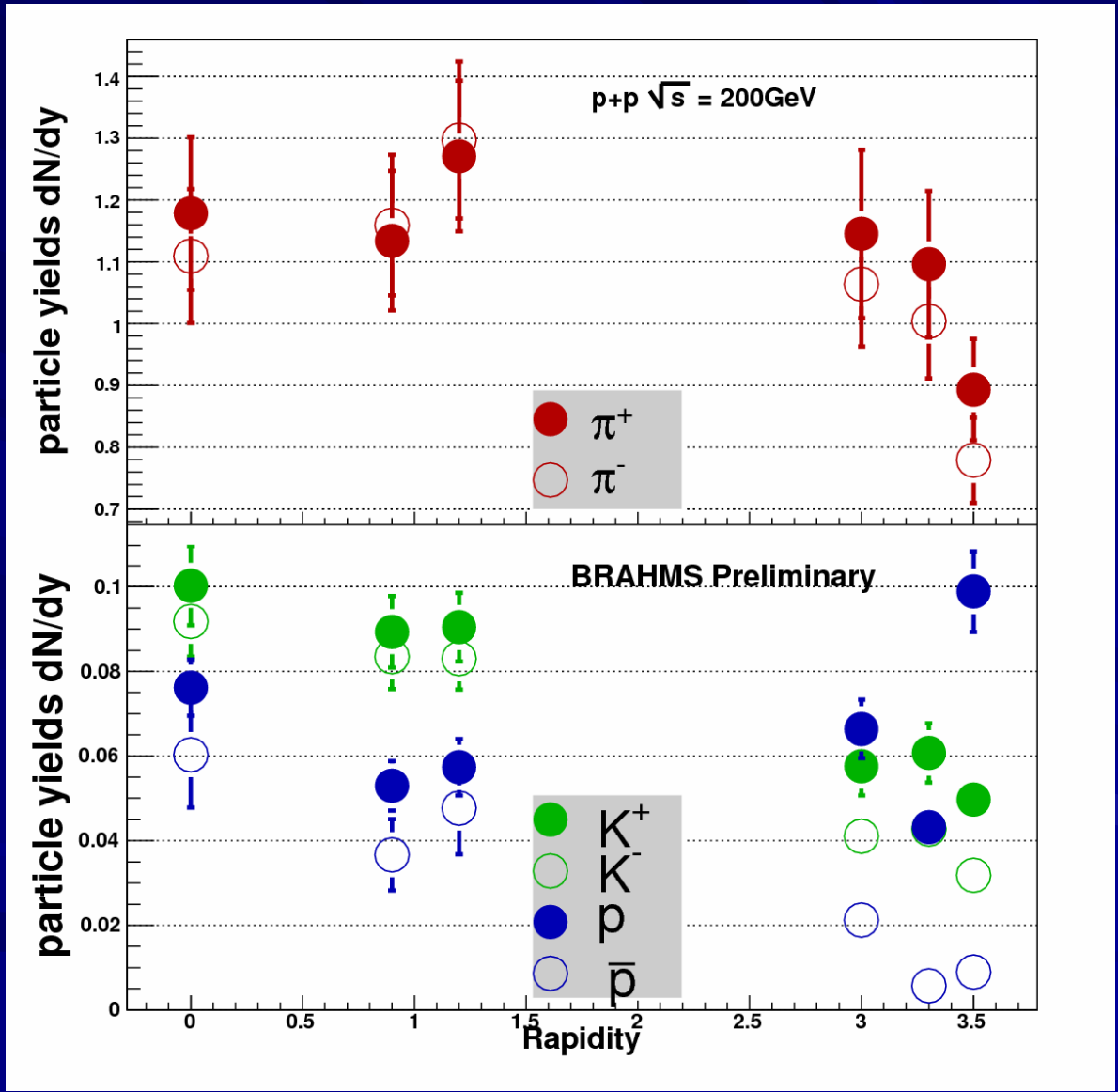
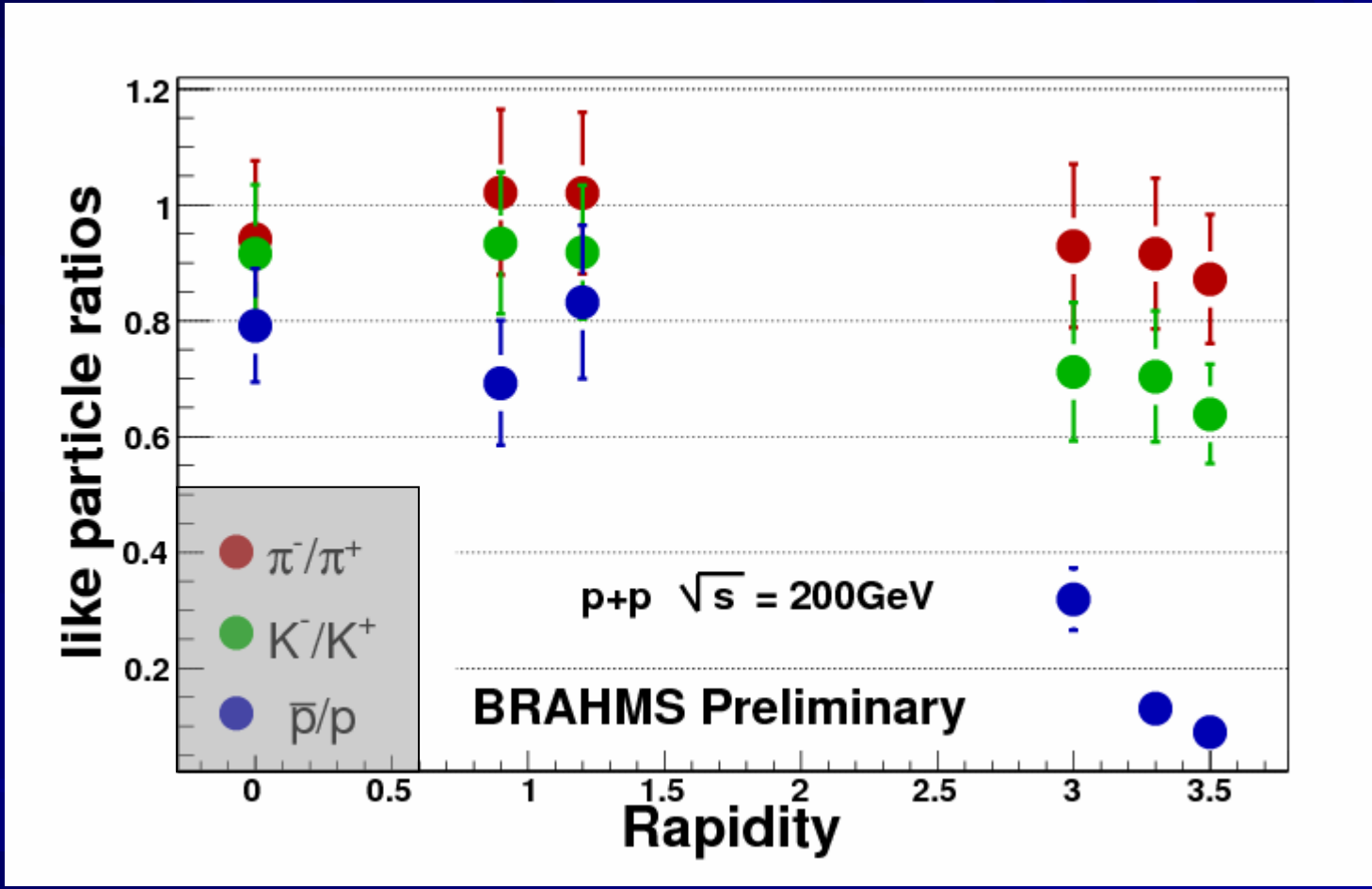
Extraction of particle yields (p+p)



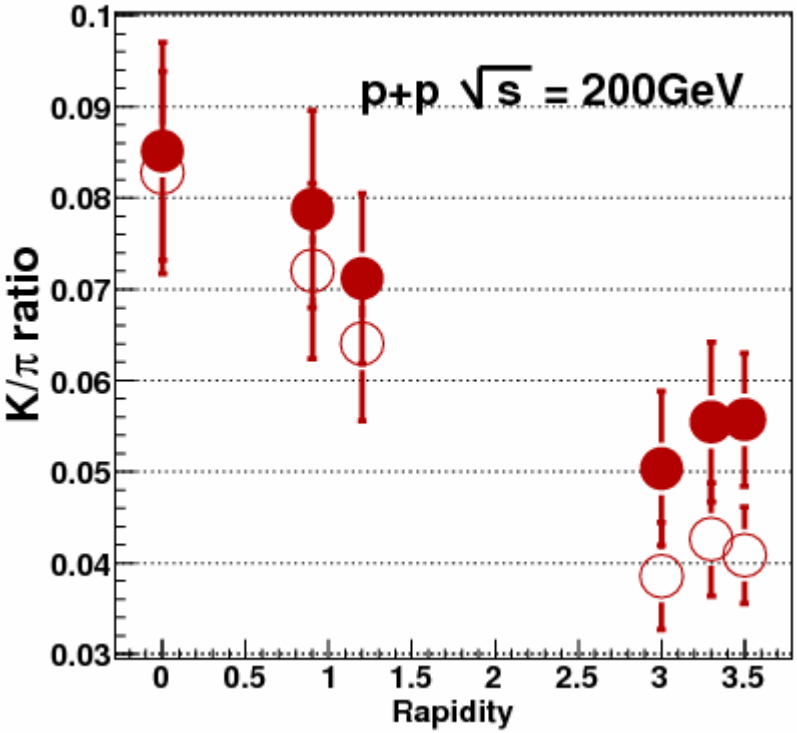
Rapidity distributions

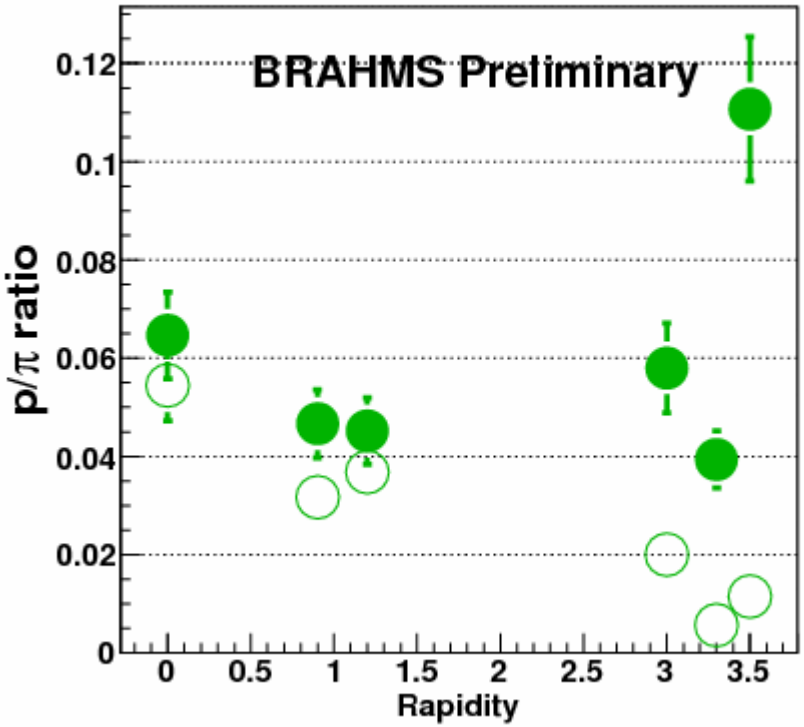


like-particle ratios (p+p)



K/π, p/π ratios (p+p)



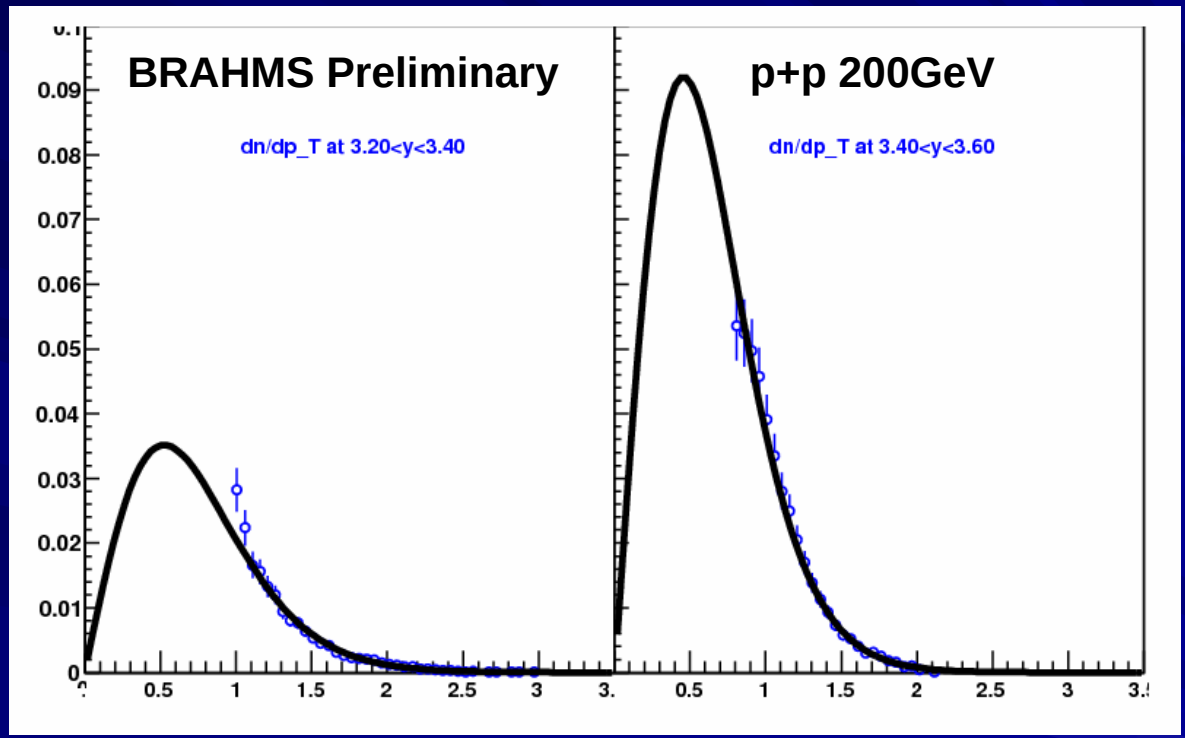


Open symbols: positive particles

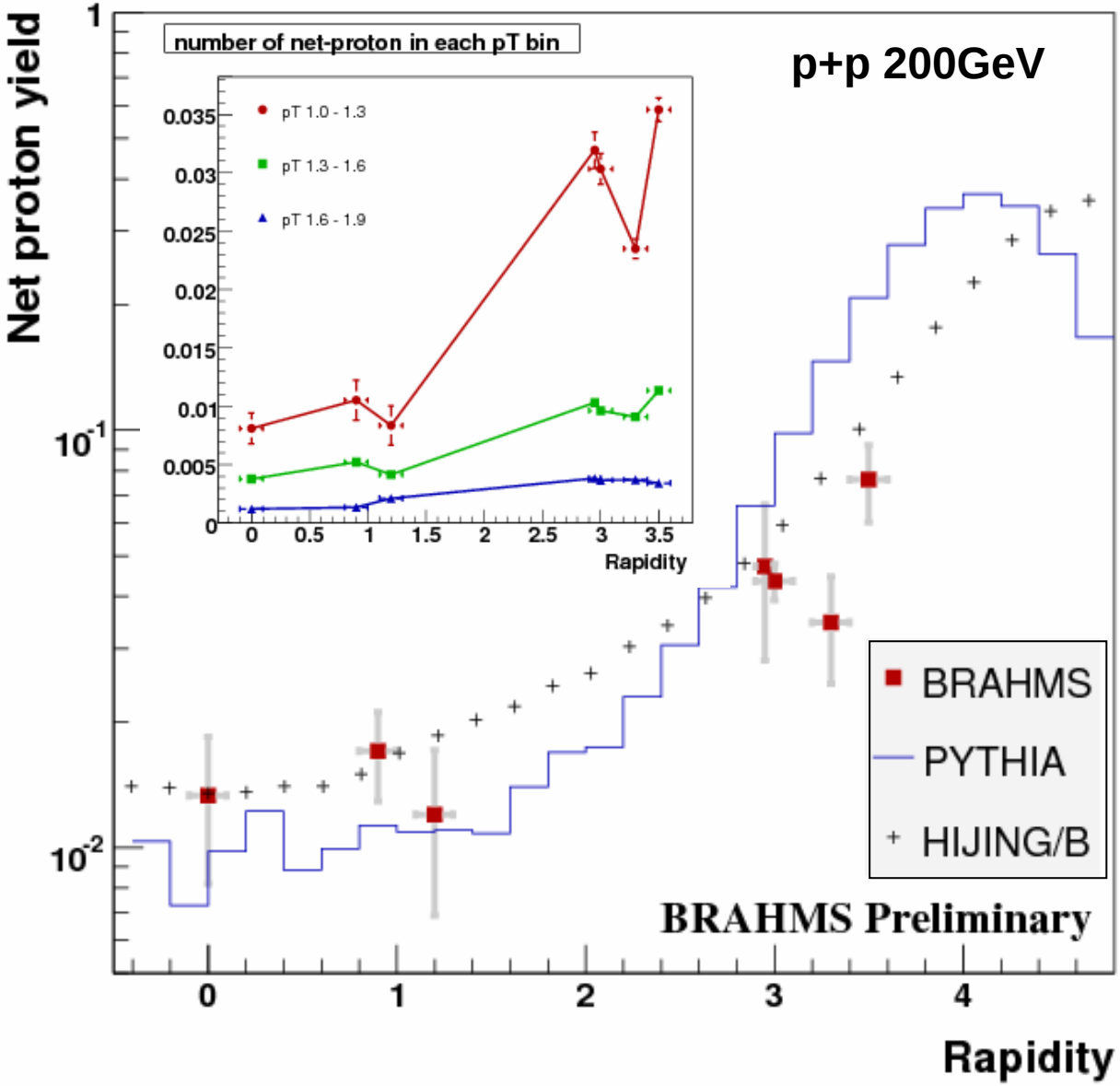
Closed symbols: negative particles

All ratios decrease with increasing rapidity , except p/π+

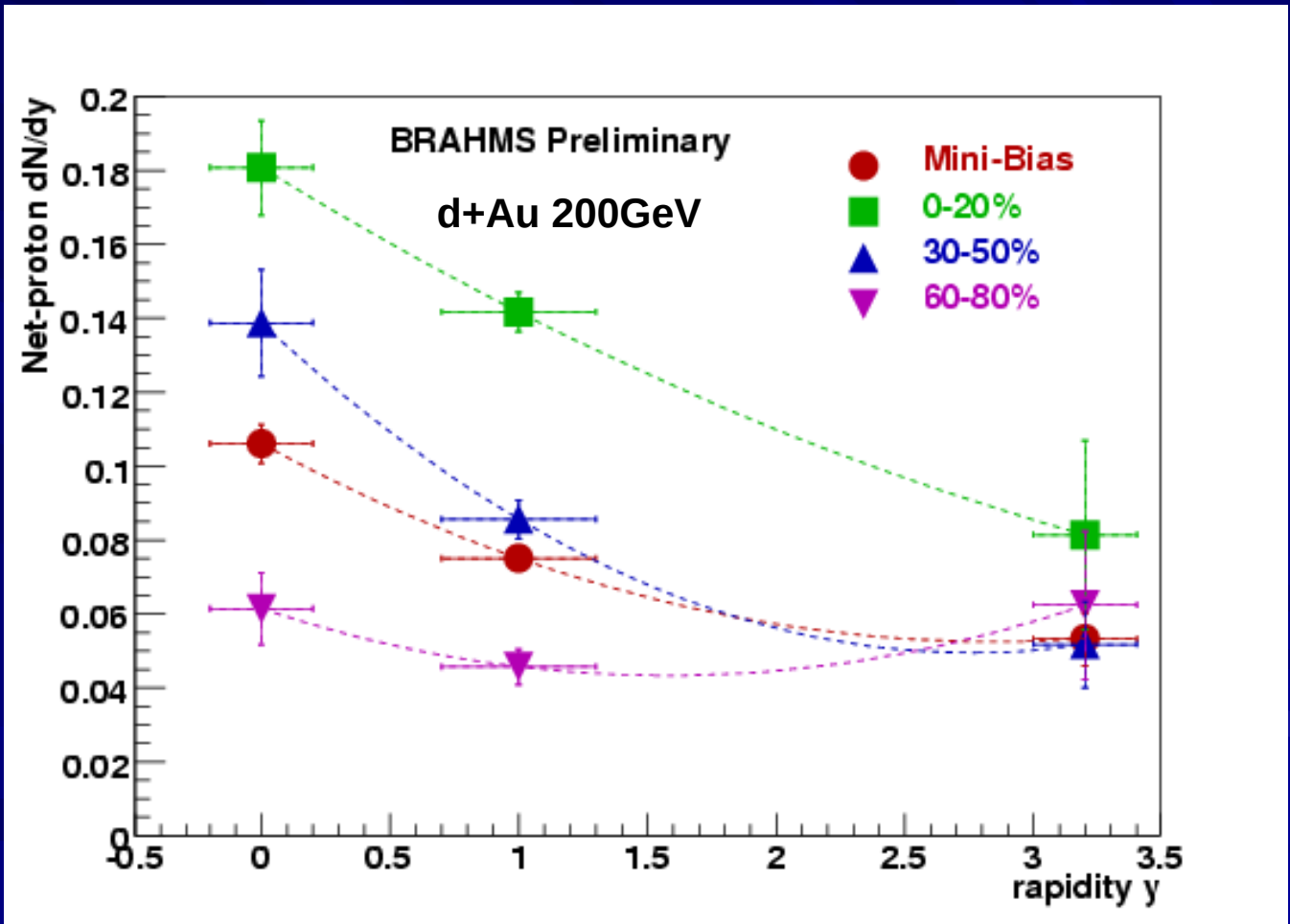
Net-proton distribution



- Subtraction of p-bar yield from proton yield for each p_T bin
- A Boltzmann function is used to fit the data


p+p 200GeV
Net proton yield
number of net-proton in each pT bin
pT 1.0 - 1.3
pT 1.3 - 1.6
pT 1.6 - 1.9
Rapidity
BRAHMS
PYTHIA
HIJING/B
BRAHMS Preliminary
Rapidity

Net-proton distribution (d+Au)



Summary

- NLO pQCD describes p_T spectra at forward rapidities in p+p collisions
- R_{dAu}: suppression of h^- yields at forward rapidities confirmed by identified hadrons spectra
  - Strong suppression of pions
  - No suppression of protons
- HIJING/B describes the net-protons in p+p better than PYTHIA
- Net-protons are piled up at mid-rapidity in central d+Au collisions

BRAHMS Collaboration

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