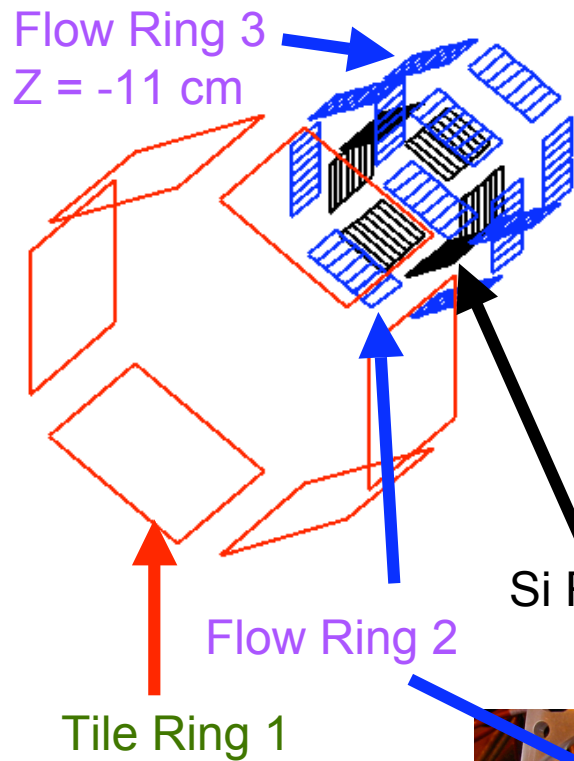


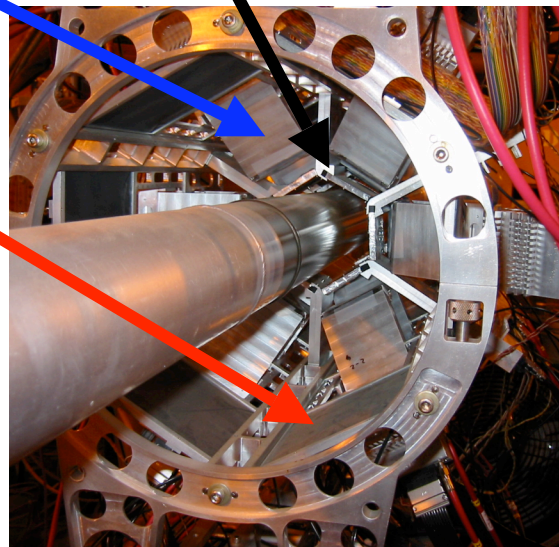
Forward-Rapidity Azimuthal and Radial Flow of Identified Particles for $\sqrt{s_{NN}} = 200$ GeV Au+Au and Cu+Cu Collisions

S.J. Sanders (U. Kansas)
for the BRAHMS Collaboration

I. Experimental Method

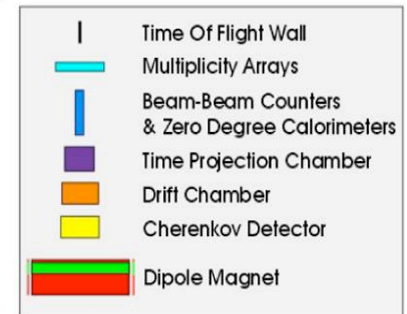
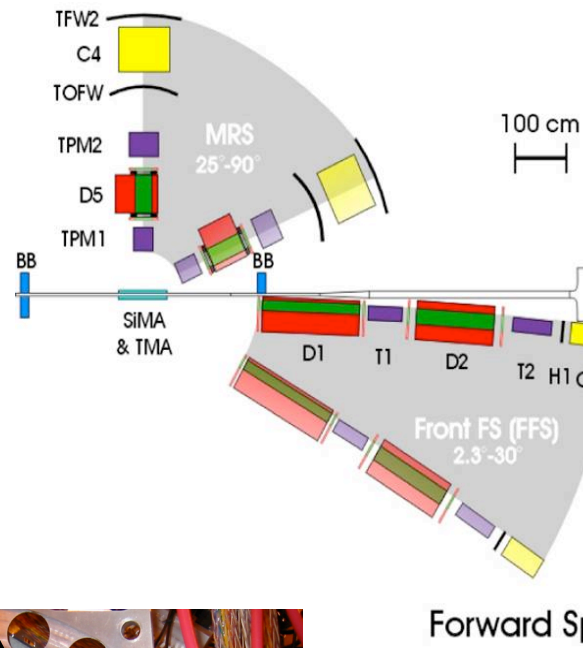


Si Ring 1



BRAHMS Experimental Setup

Mid Rapidity Spectrometer

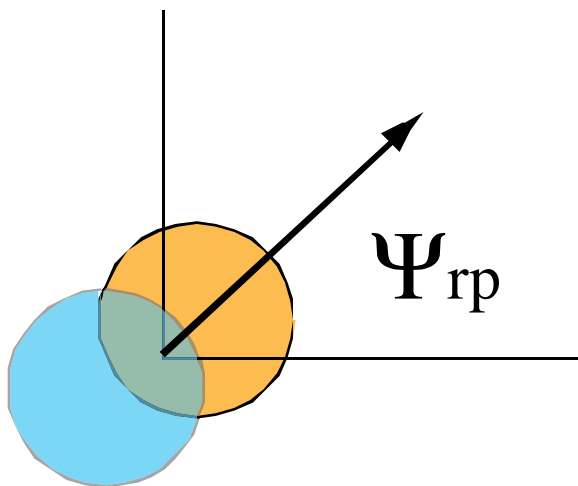


Forward Spectrometer (FS)

Determine v_2 by reaction plane method

$$\frac{dN}{d\phi} \propto 1 + 2v_2 \cos[2(\phi - \Psi_{rp}^{true})]$$

$$\Psi_{rp} = \frac{1}{2} \tan^{-1} \left(\frac{\sum w_i \sin(2\phi_i)}{\sum w_i \cos(2\phi_i)} \right)$$

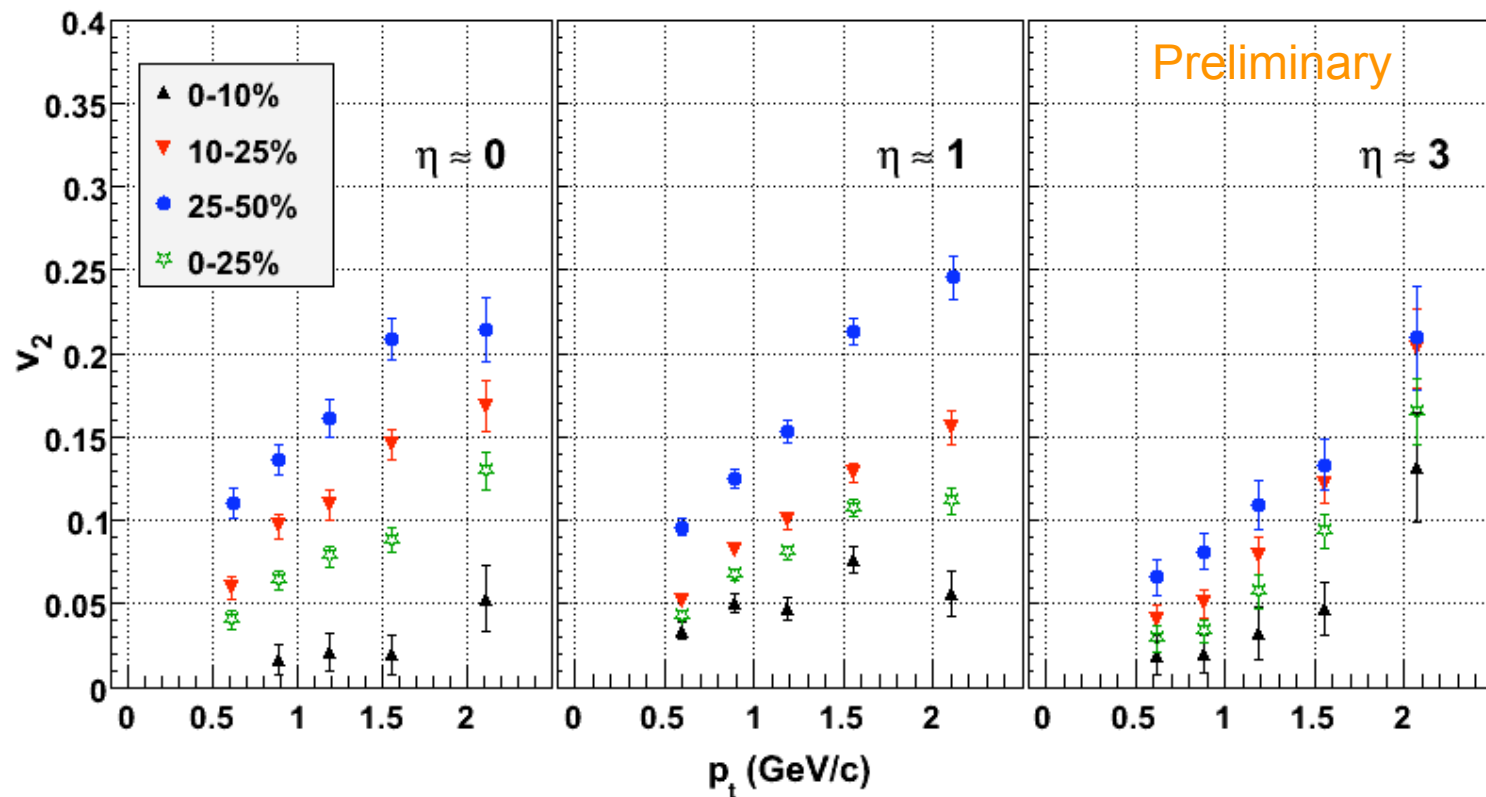


Since Ψ_{rp}^{true} is not measured

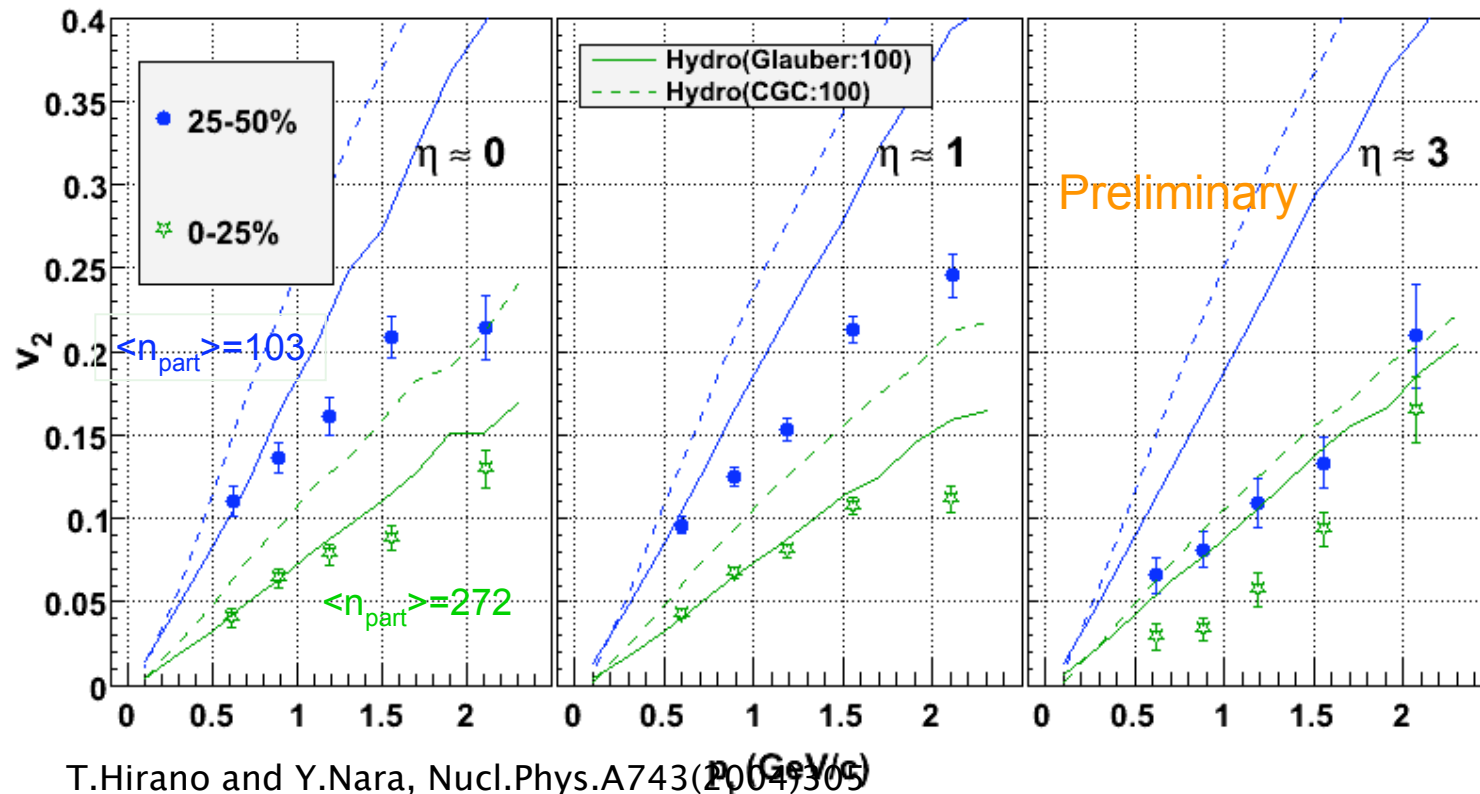
$$v_2 = (\text{resolution correction}) v_2^{obs}$$

The BRAHMS spectrometers identify particles at $\phi = 0^\circ$ (MRS) and 180° (FS) with the corresponding reaction plane angles Ψ_{rp} determined by the global detector systems.

II. Pseudorapidity dependence of charge hadrons

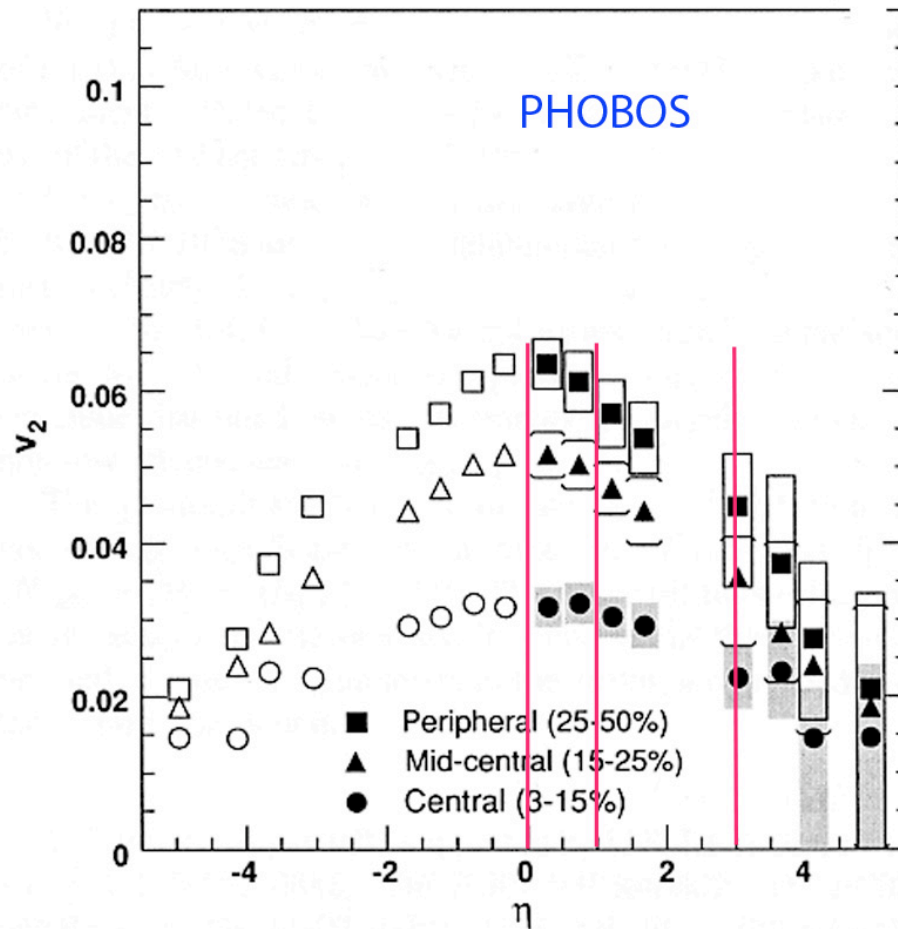


...there is a reduction in the v_2 values at forward rapidities that is most pronounced for the more peripheral events.



T.Hirano and Y.Nara, Nucl.Phys.A743(2004)305

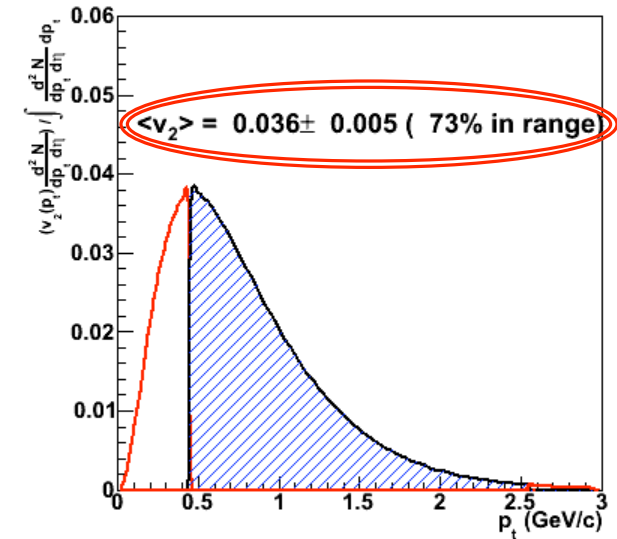
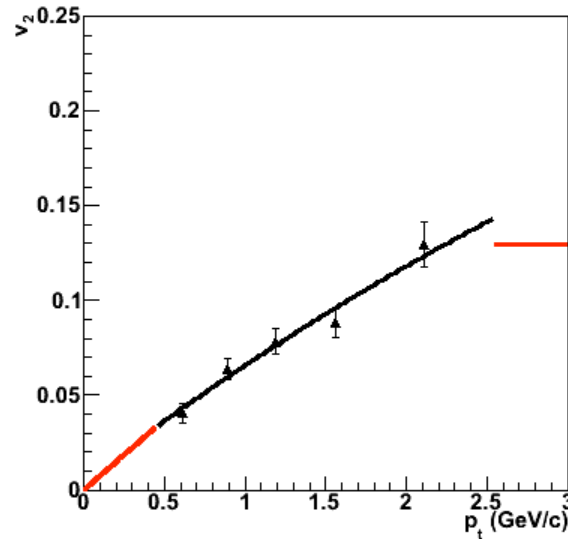
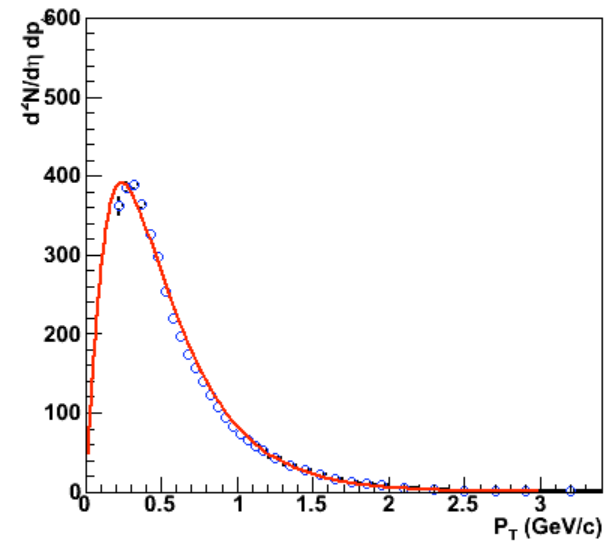
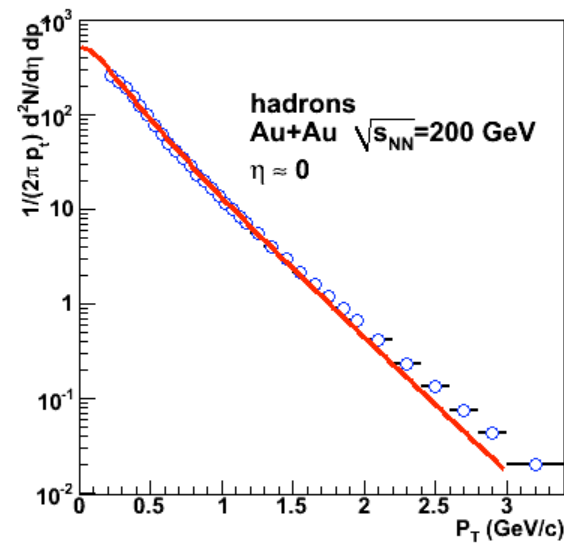
...3D Hydro (T.Hirano and Y.Nara, Nucl.Phys.A743(2004)305) with Glauber IC has good agreement with experiment at mid-rapidity but predicts larger values than observed at forward rapidity values.



PHOBOS has shown that the integral v_2 values for 200-GeV AuAu fall considerably going to forward rapidity. Is this consistent with the BRAHMS results?

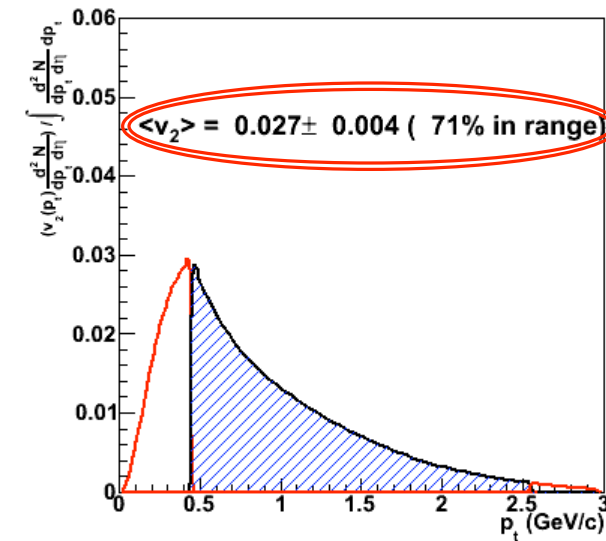
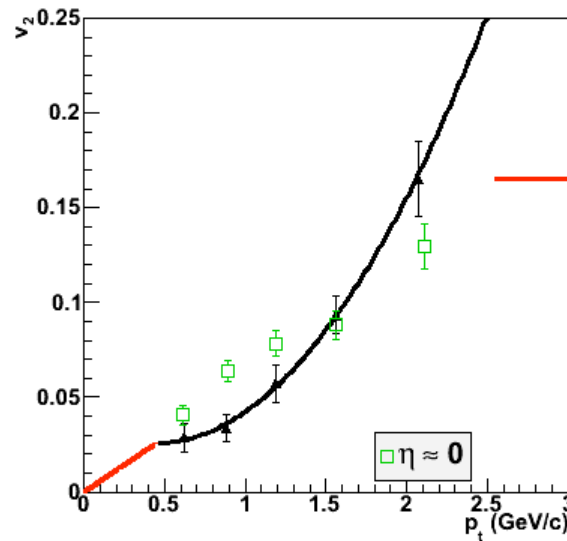
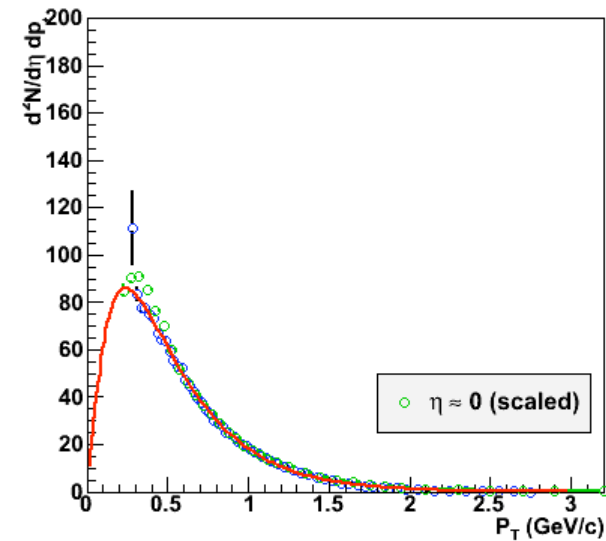
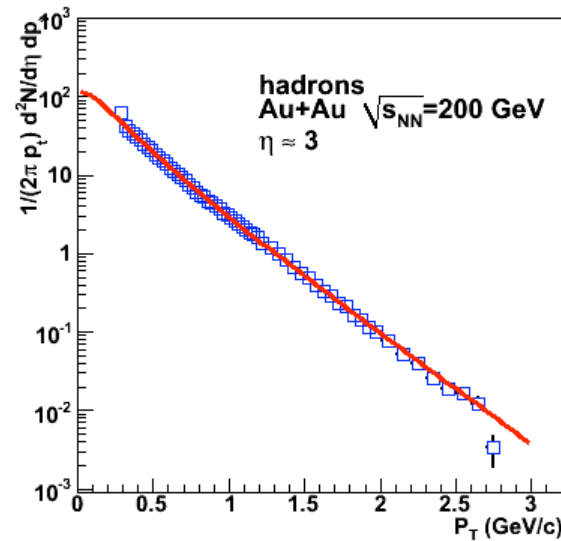
Calculating
the integral
 v_2 from the
differential...

$\eta=0$

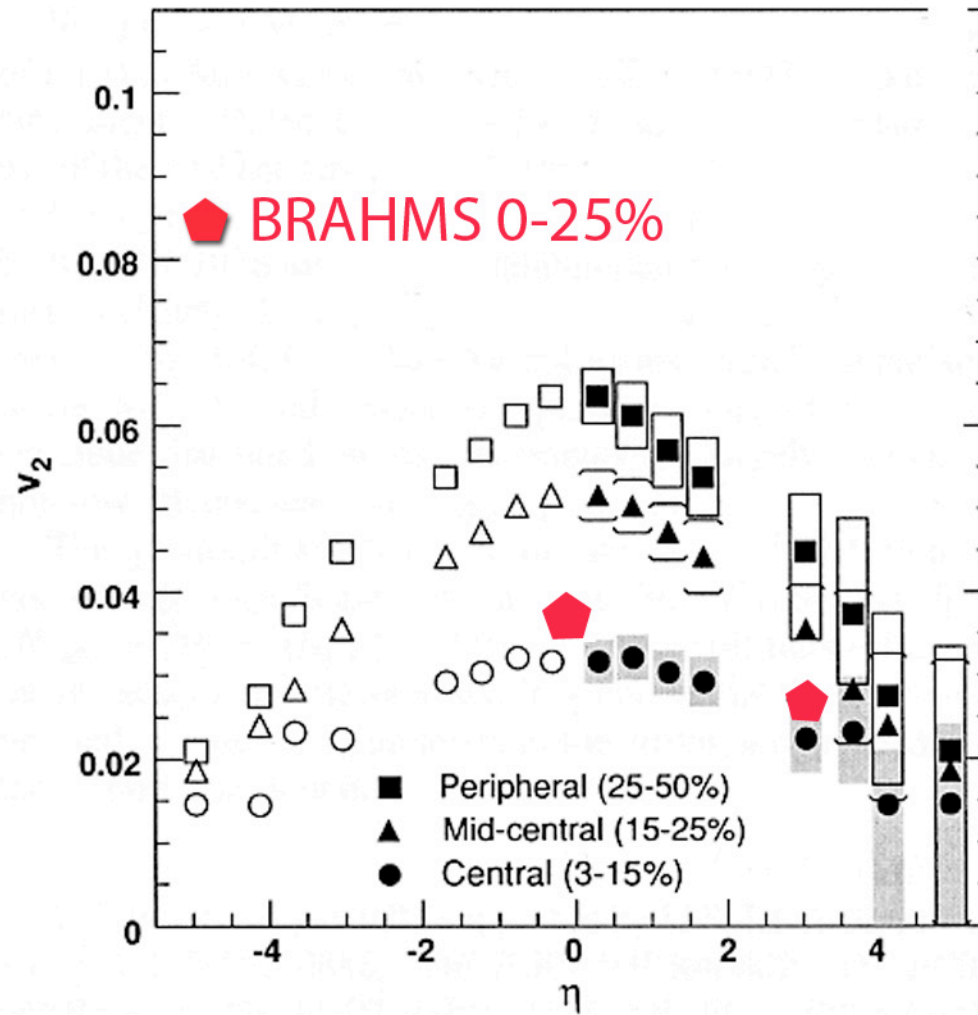


$\eta \sim 3$

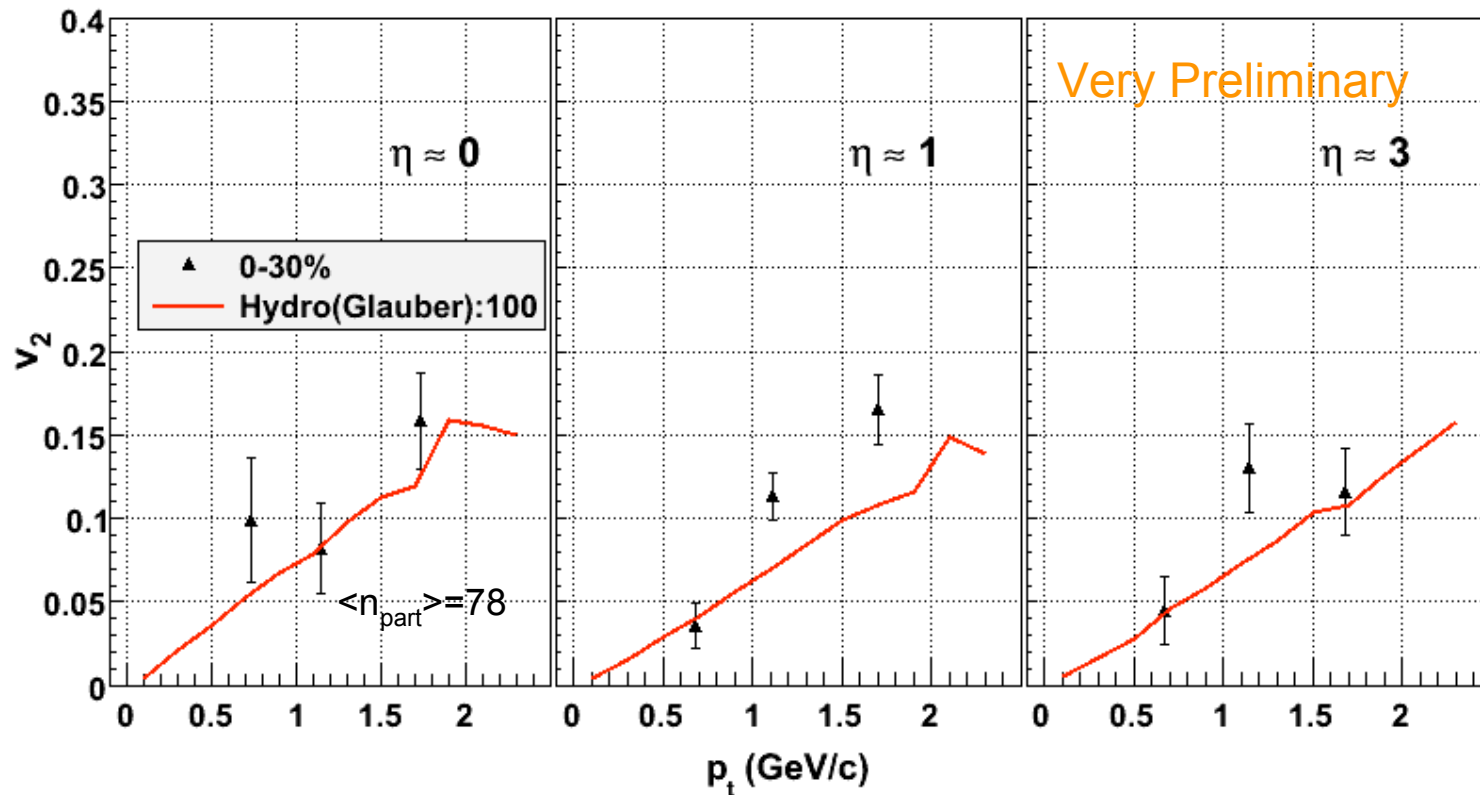
The integral v_2 values decrease at forward rapidity BOTH because of a reduction of the differential $v_2(p_T)$ values AND a smaller $\langle p_T \rangle$.



There is general agreement of the BRAHMS integral v_2 calculated from the pt distributions to the PHOBOS results...



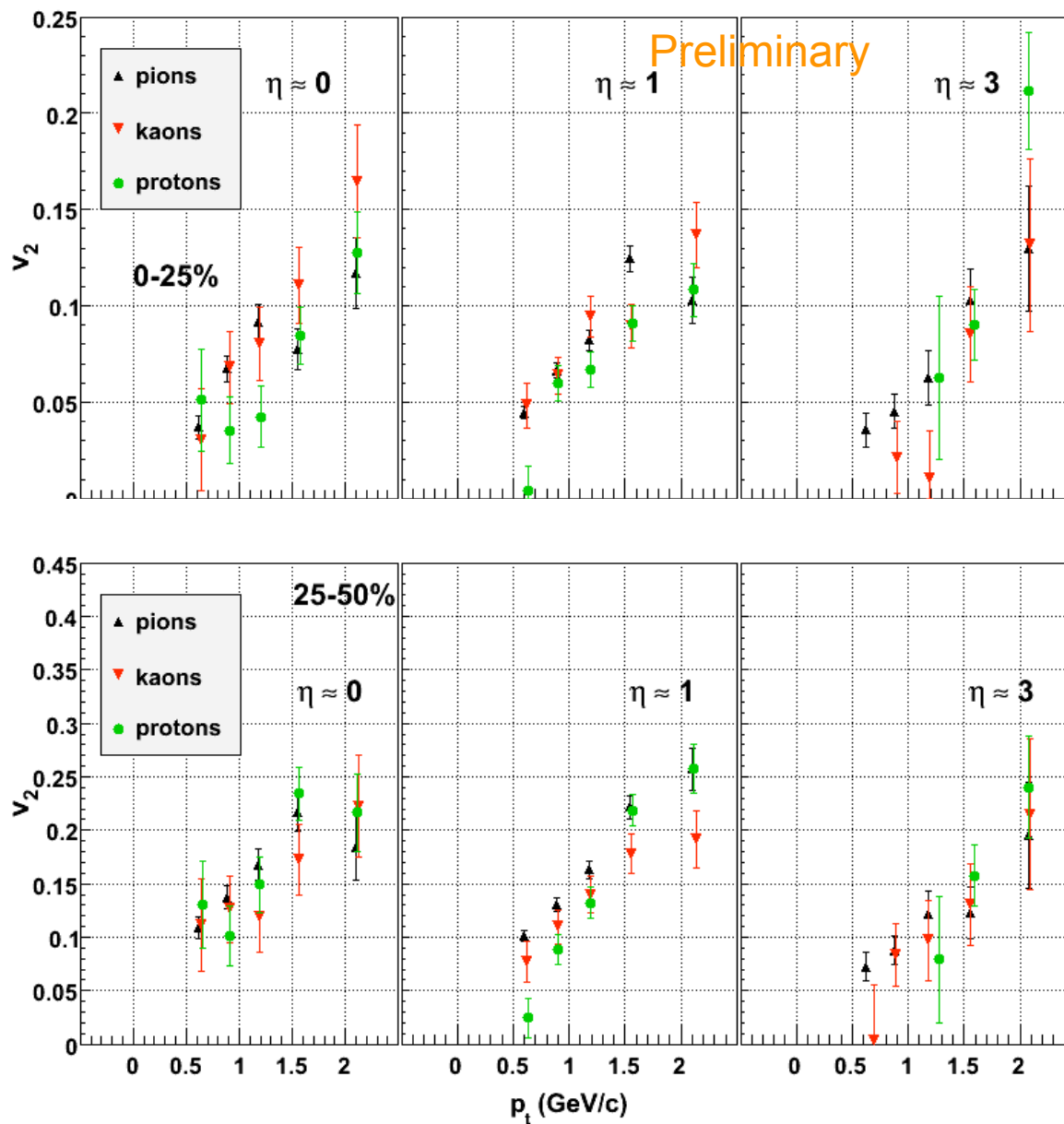
200-GeV CuCu



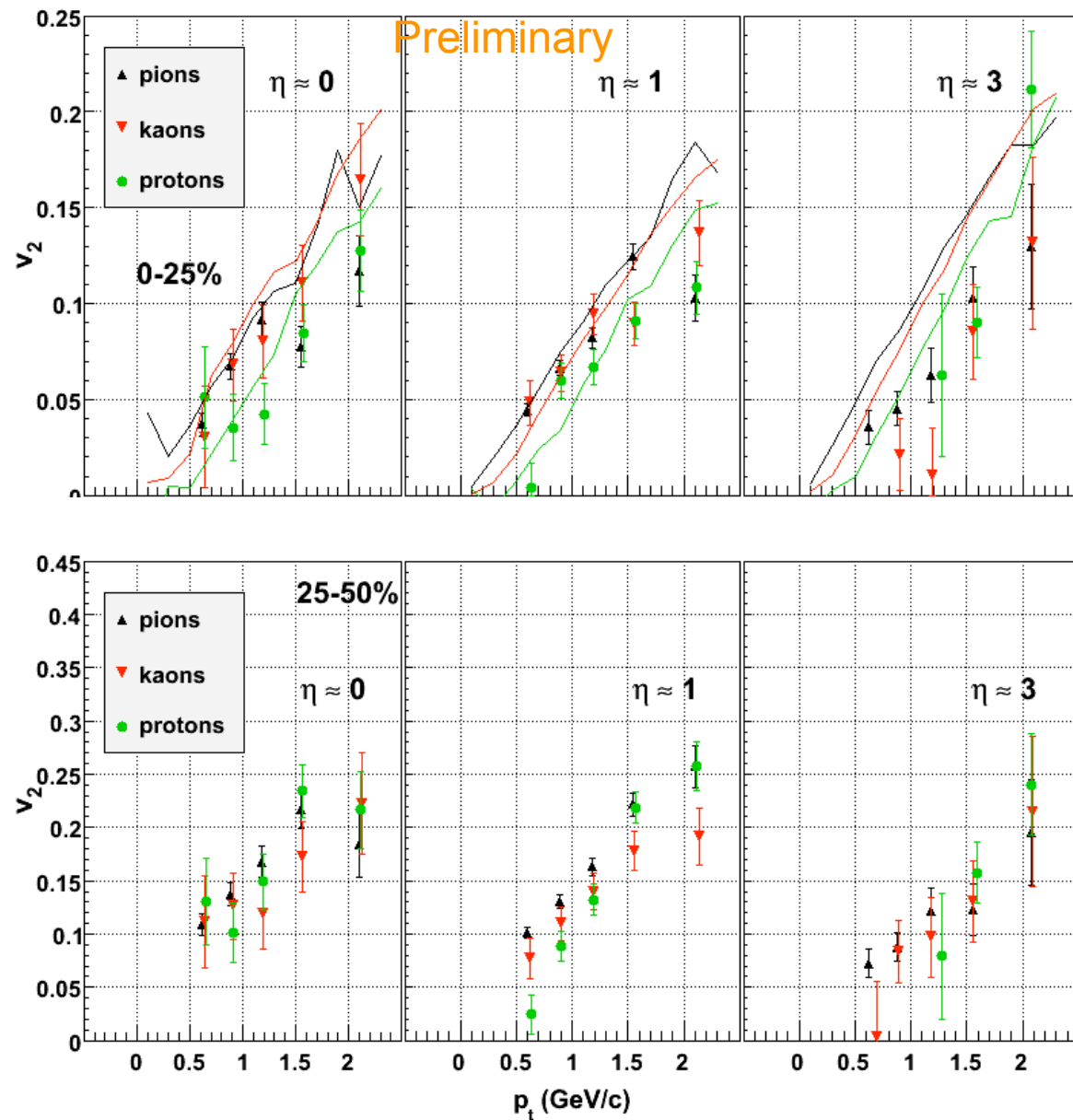
...3D Hydro with Glauber IC does good job in describing data.

III. Identified Particle Results

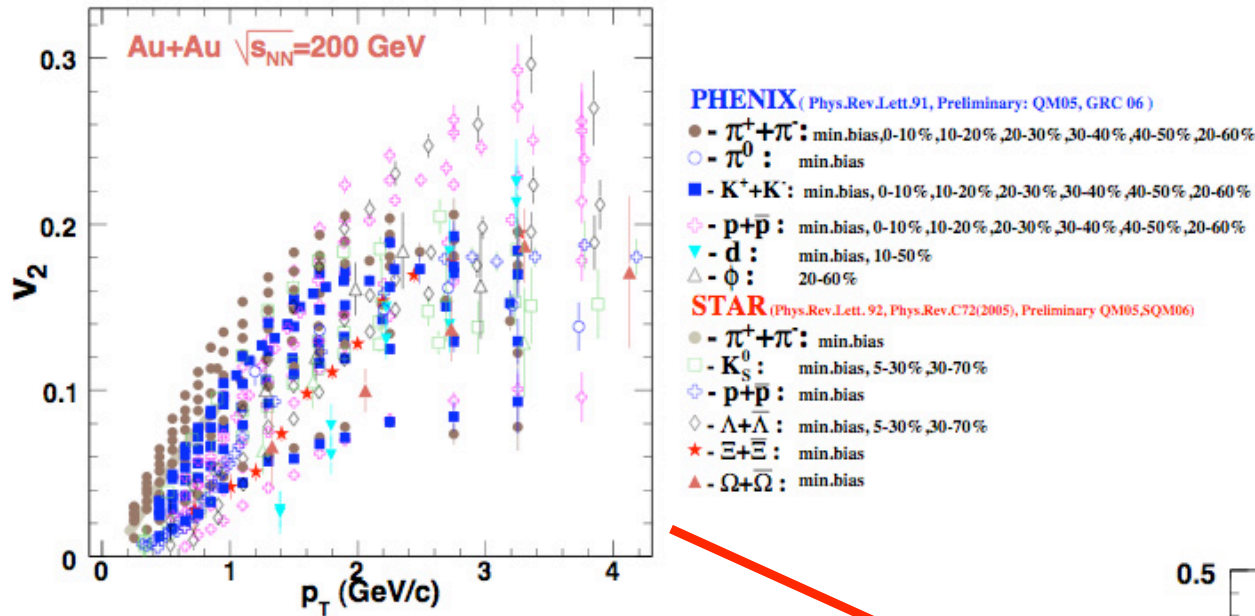
200-GeV AuAu



...again, 3D Hydro does good job describing more central, mid-rapidity results, including the mass ordering, but overpredicts the forward rapidity results.

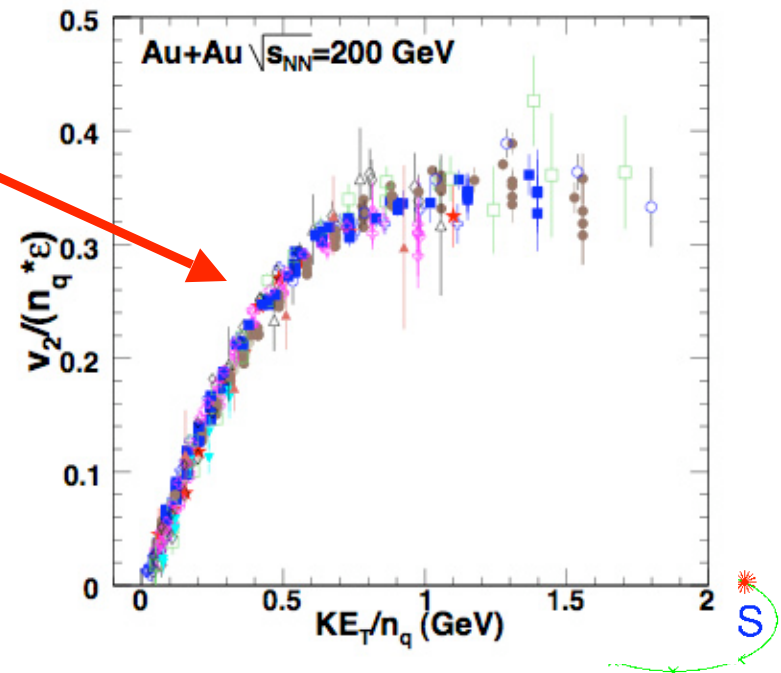


Constituent quark scaling has been found to highlight a common behavior for 200-GeV AuAu v_2 results for many particle species...

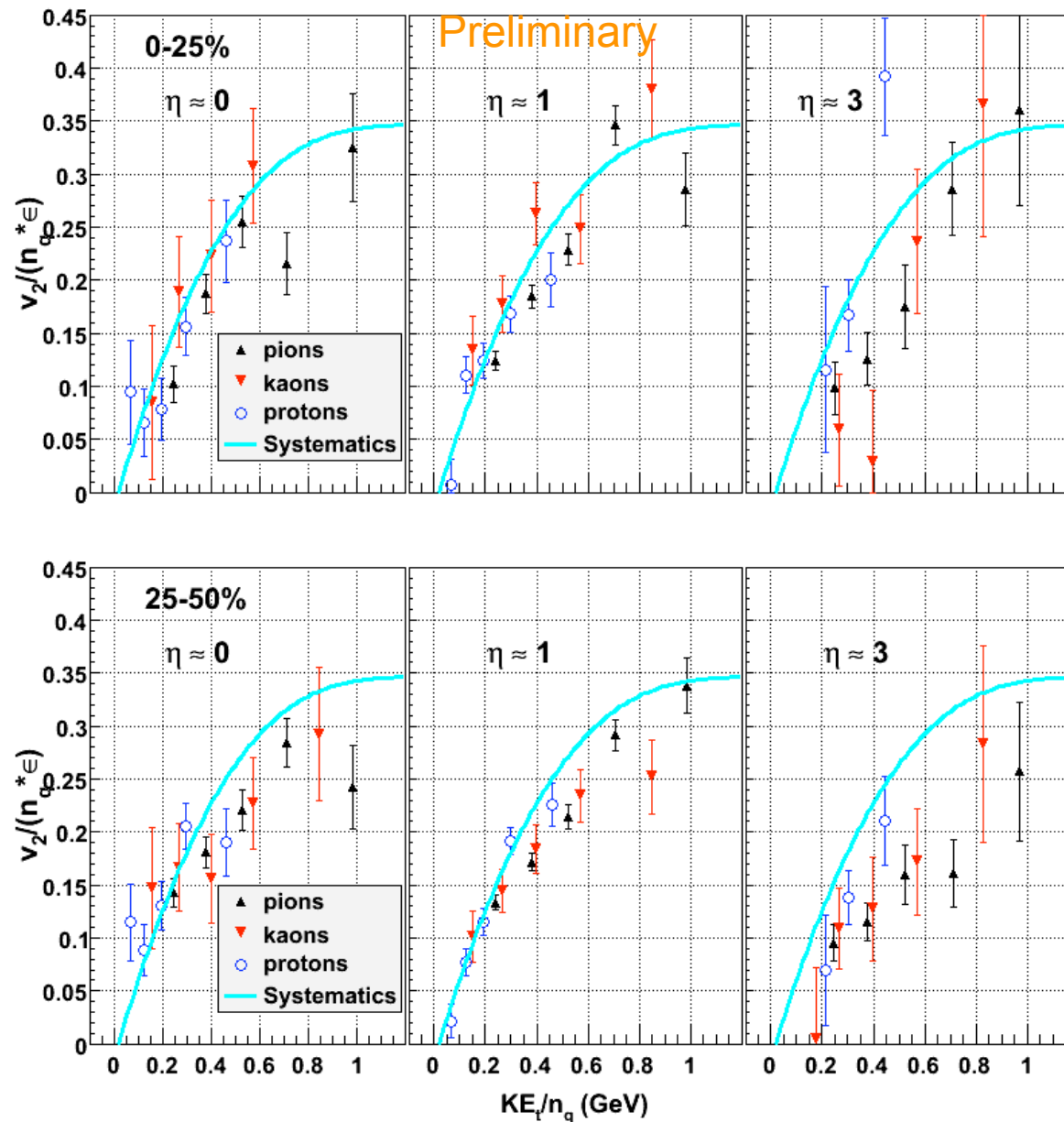


R.A. Lacey and A. Taranenko,
nucl-ex/0610029

Scaled yields consistent with
ideal hydrodynamics..

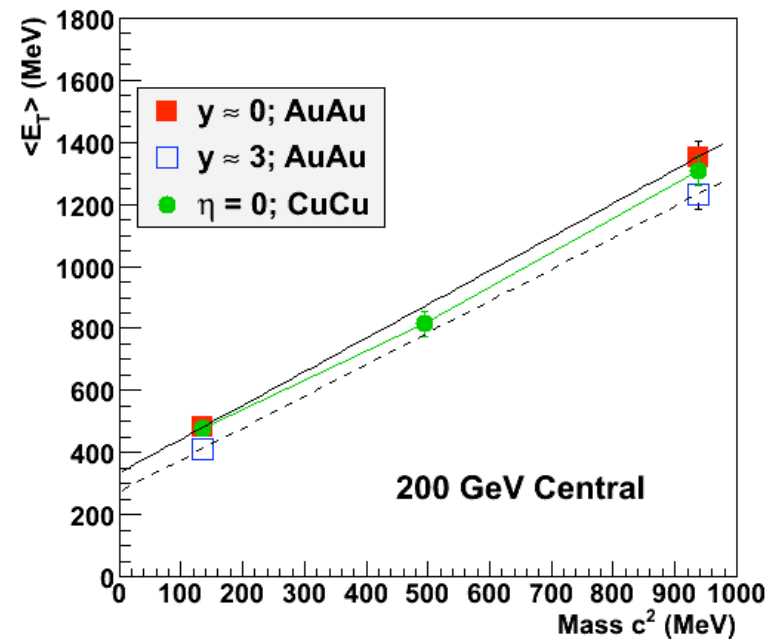
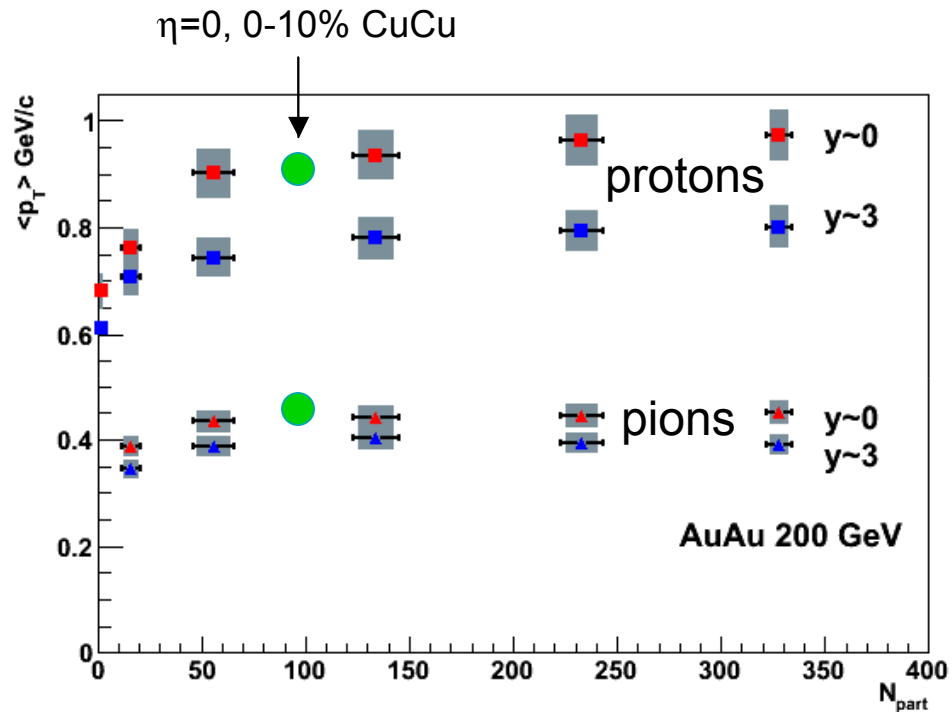


Constituent quark scaling of BRAHMS data..



The curve is based on the previously observed behavior near mid-rapidity...

The reduction in azimuthal flow at forward coincides with an apparent reduction in radial flow, as evidenced by $\langle E_T \rangle$ values...



IV. Summary

- BRAHMS has measured identified-particle $v_2(p_T)$ at $\eta=0,1$, and 3 for the Au+Au and Cu+Cu systems at $\sqrt{s_{NN}}=200$ GeV. The differential elliptic flow decreases at forward rapidity.
- Corresponding measurements of the particle spectra indicate a decrease in $\langle E_T \rangle$ at forward rapidity, suggesting a reduction in radial flow.
- The significant decrease in the integral v_2 values going to forward rapidity is found to arise from BOTH the reduction in differential elliptic flow and a reduction in radial flow.
- 3D Hydro does a good job reproducing the mid-rapidity results for both charged hadrons and identified particles, but predicts too much azimuthal flow at forward rapidities.

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