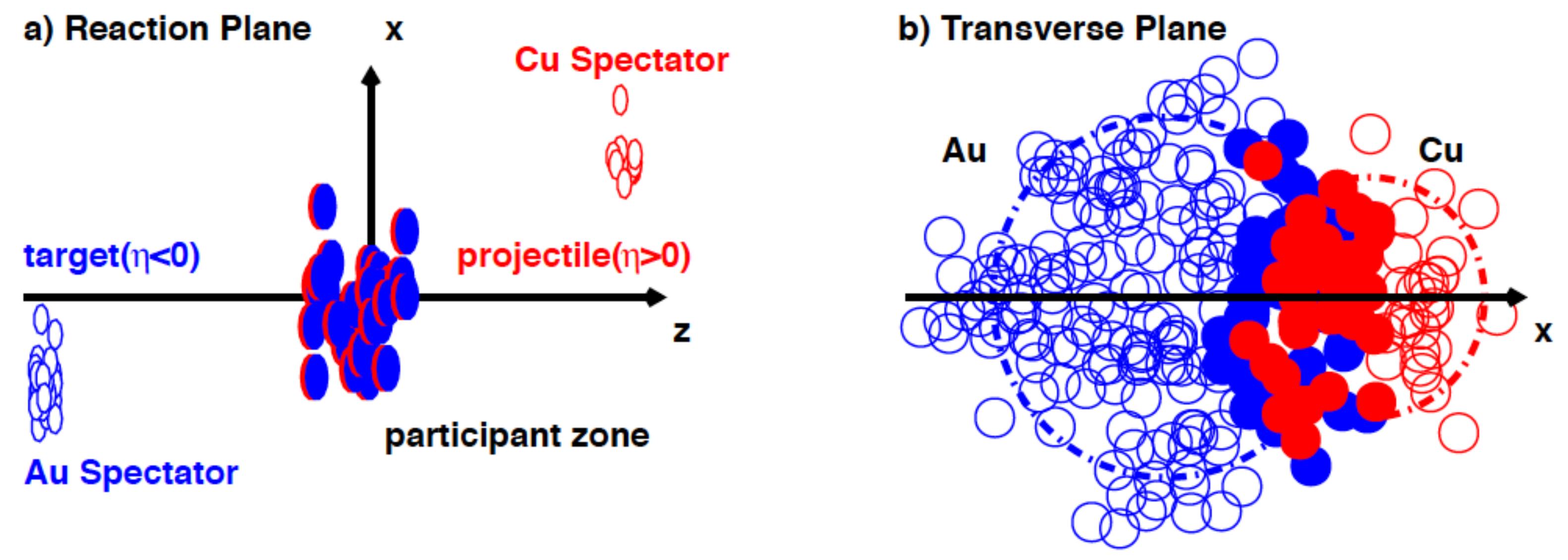
Measurements of charged hadron anisotropic flow in Cu+Au collisions at $\sqrt{s_{NN}}$=200GeV at RHIC - PHENIX

Hiroshi Nakagomi for the PHENIX collaboration
University of Tsukuba/RIKEN

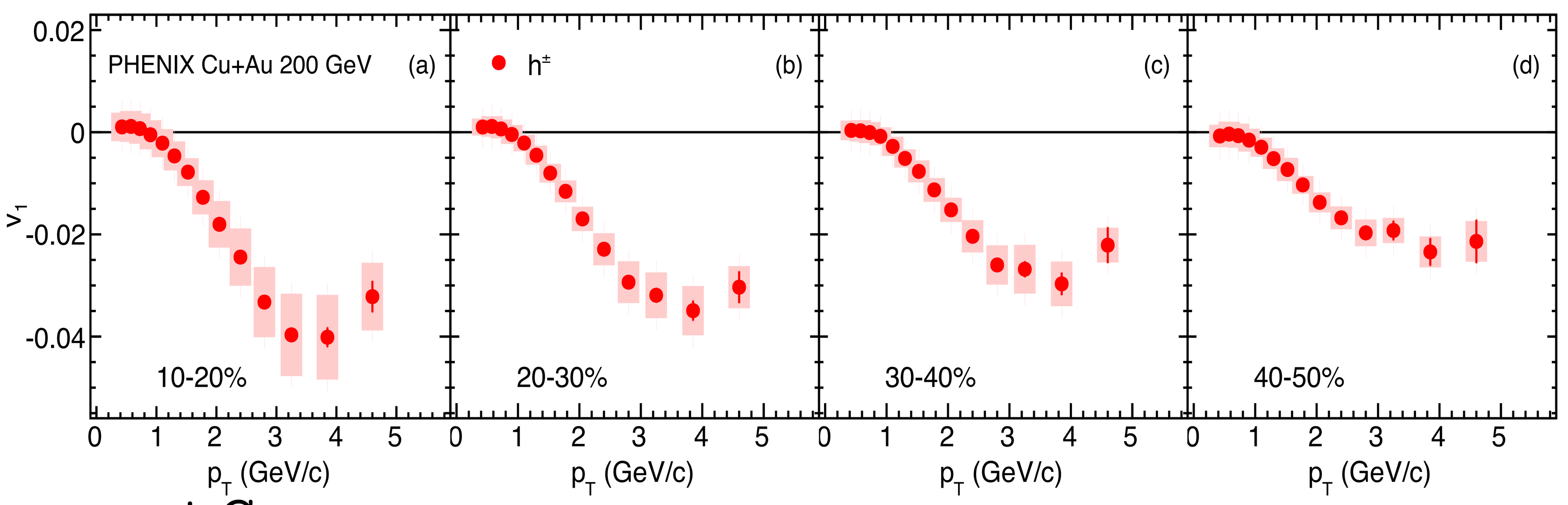
Cu+Au collisions



Measurement of anisotropic flow in Cu+Au collisions is a subject of special interest because Cu+Au collisions provide different conditions compared to symmetric collisions. Following conditions are different to symmetric collisions.

- Initial geometry
- Density profile
- Pressure gradients

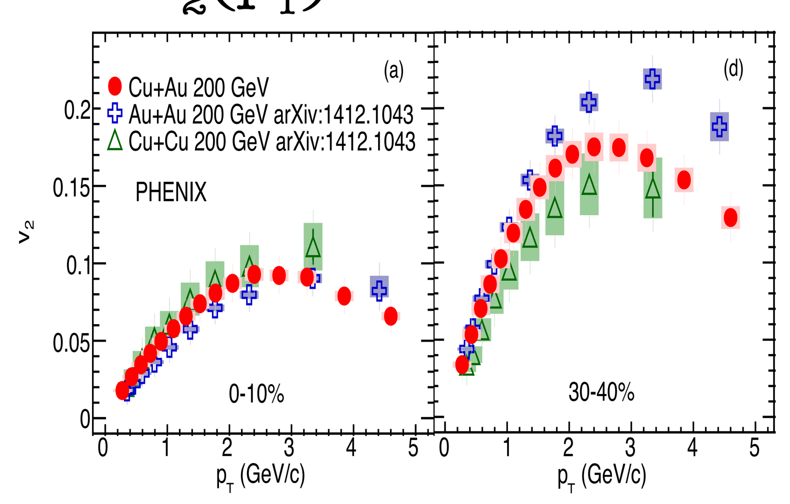
Centrality dependence of v_1



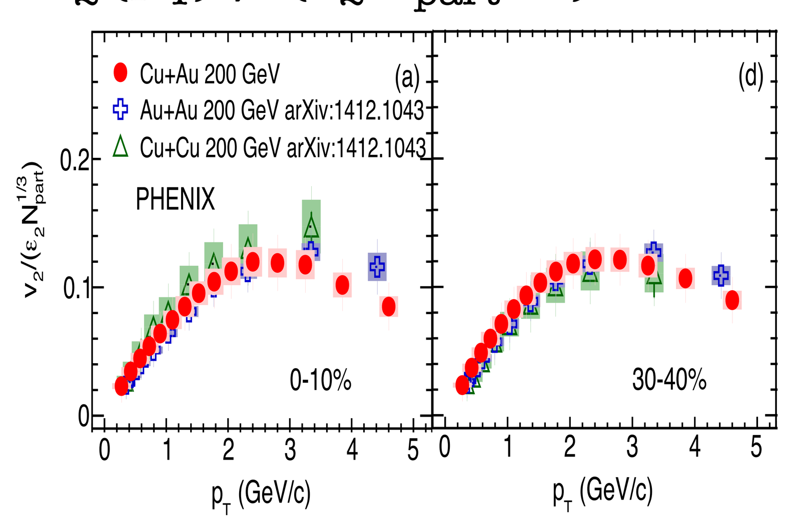
v_1 w.r.t Cu.
- In high p_T region, v_1 <0 particles are emitted to Au side. Centrality dependence of v_1 is seen.
- Magnitude of v_1 becomes smaller as centrality increase.

System size dependence of v_2, v_3

✓ $v_2(p_T)$



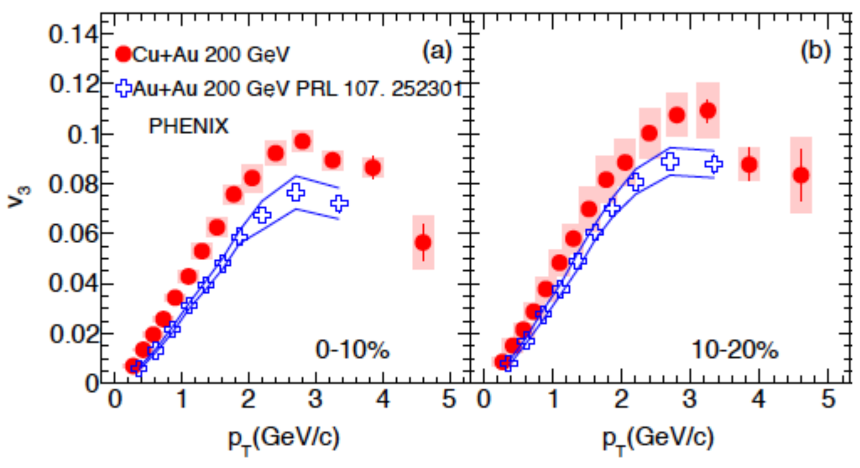
✓ $v_2(p_T) / (\varepsilon_2 N_{part}^{1/3})$



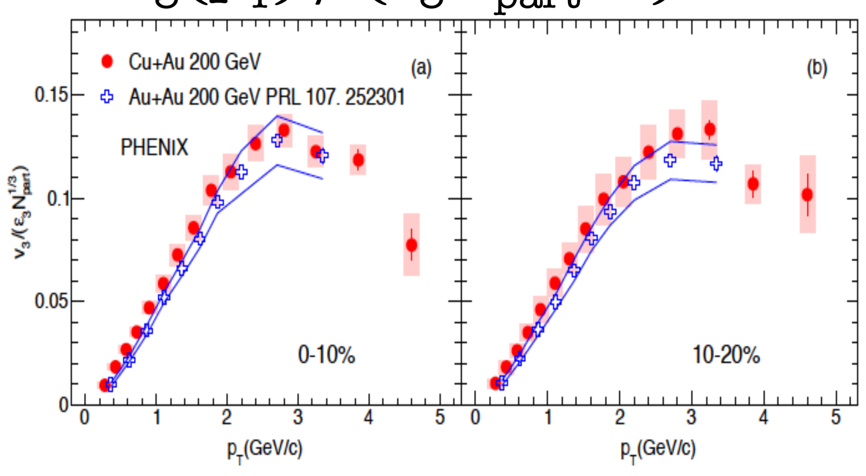
v_2 in Cu+Au is between those in Au+Au and Cu+Cu.
The magnitude of v_2 : 0-10% Cu+Cu>Cu+Au>Au+Au
30-40% Au+Au>Cu+Au>Cu+Cu

The measured v_2 are not ordered according to ε_2 in different systems. For further investigation, v_2 is scaled with $\varepsilon_2 N_{part}^{1/3}$. Under the assumption, $N_{part}^{1/3}$ is proportional to a lengh scale. Thus $\varepsilon_2 N_{part}^{1/3}$ may account for system size.

✓ $v_3(p_T)$



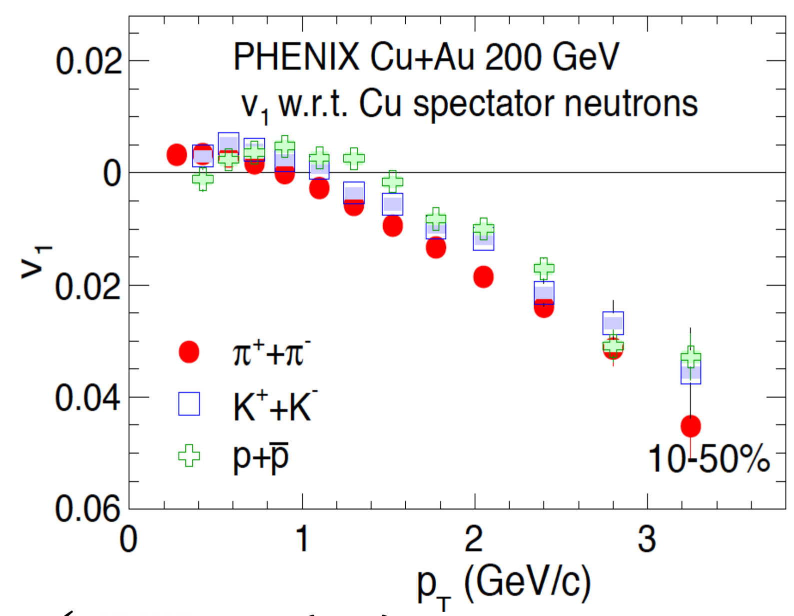
✓ $v_3(p_T) / (\varepsilon_3 N_{part}^{1/3})$



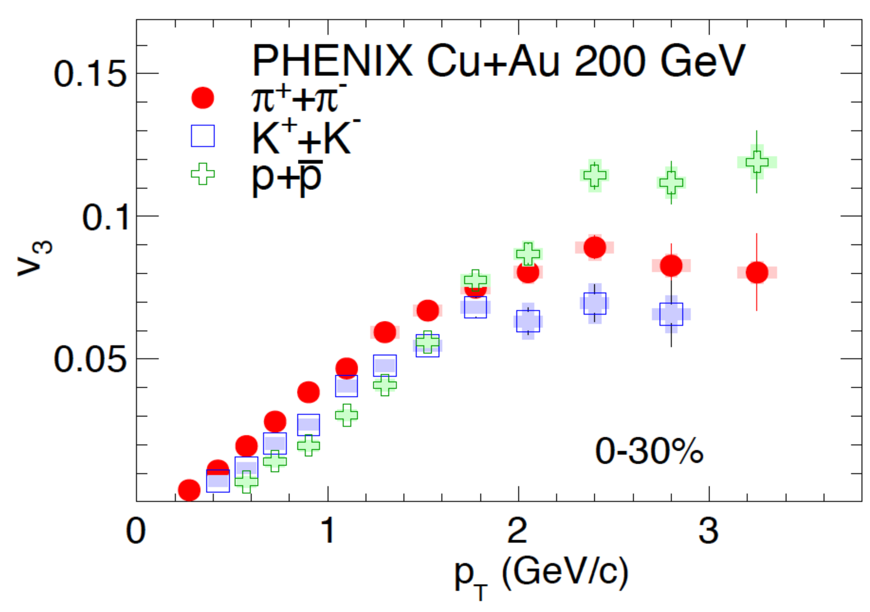
Unlike v_2 measurement, the values of v_3 are ordered according to the triangularities ε_3. $\varepsilon_3 N_{part}^{1/3}$ is perofmed as was done for the v_2. Scaled v_3 in Cu+Au and Au+Au show better agreement.

PID v_1, v_2, v_3

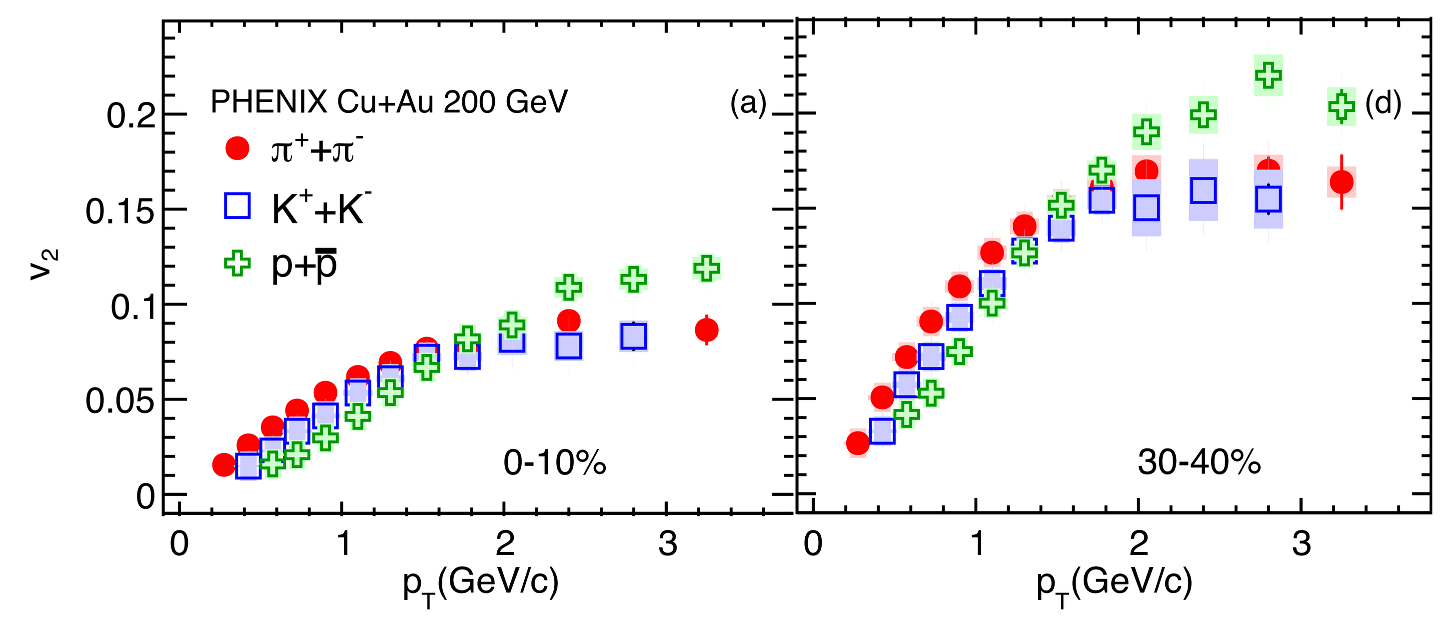
✓ PID $v_1(p_T)$



✓ PID $v_3(p_T)$



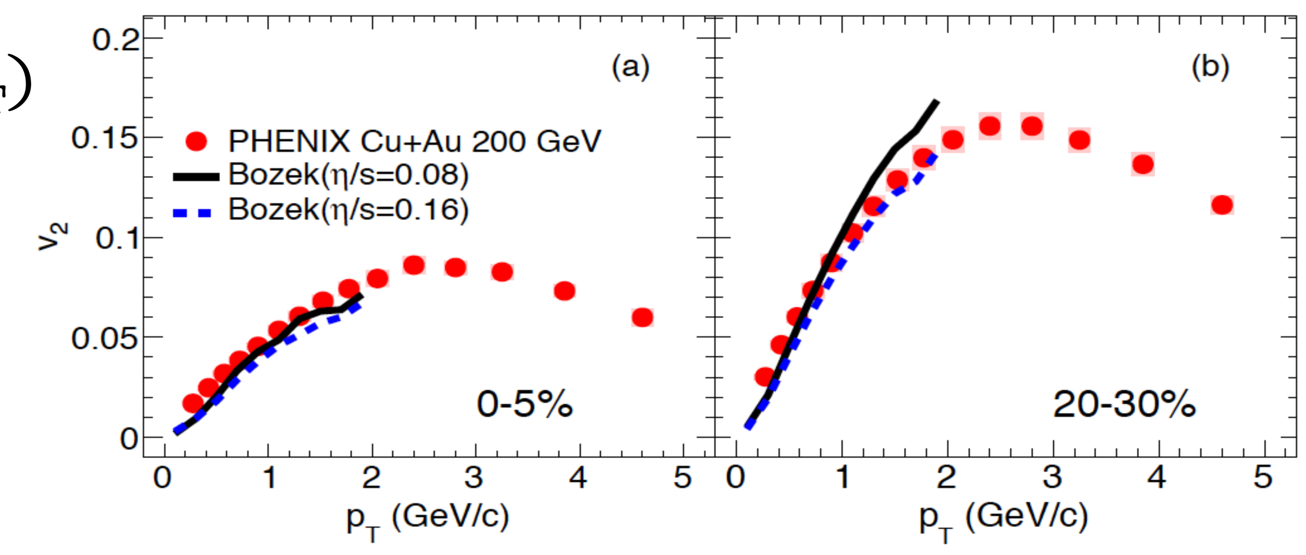
✓ PID $v_2(p_T)$



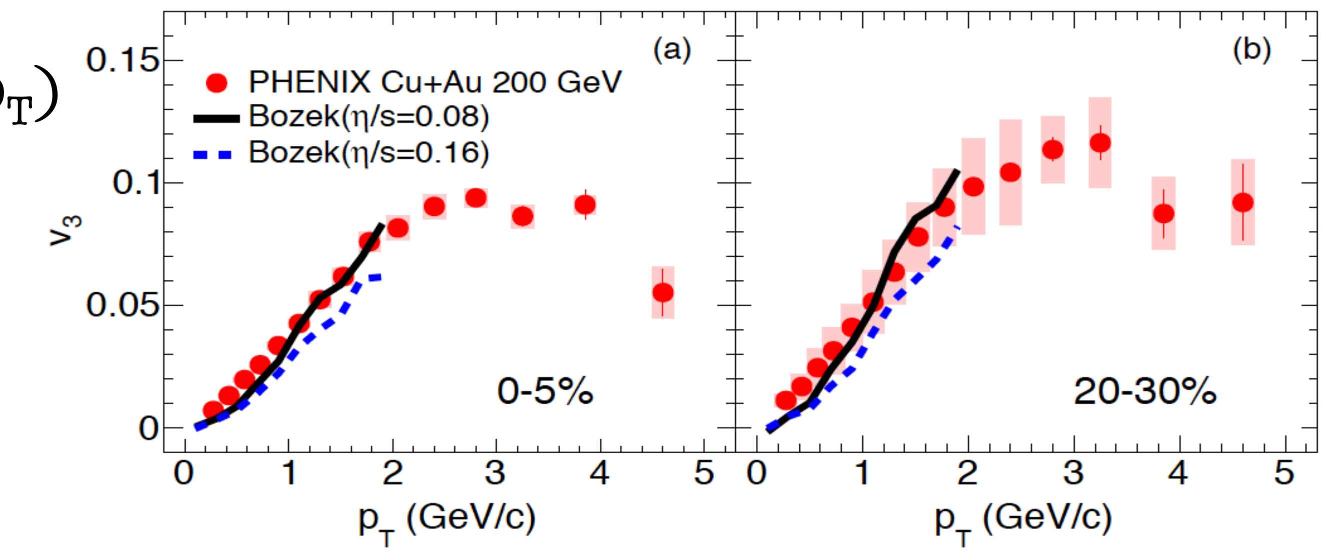
Mass ordering is seen in v_1, v_2,v_3. In low p_T region, the anisotropy is largest for lightest hadron and smallest for the heaviest hadron. This mass ordering from the common velocity field(radial flow). Above p_T>2GeV/c, the anisotropy is larger than it is for mesons. These patterns have been observed in Au+Au collisions.

Comparison to theoretical calculations

✓ $v_2(p_T)$



✓ $v_3(p_T)$



Glauber + even-by-event hydrodynamics calculations with η/s =0.08, 0.16 are compared to measured v_2,v_3 for 0-5%, 20-30% centrality bins. Our measurements in 20-30% are well reproduced. For the most 0-5%, a value of η/s =0.08 is preferd by data

Conclusion

✓ System size dependence of v_2,v_3
- v_2,v_3 in different systems and centrality are scaled with $\varepsilon_2 N_{part}^{1/3}$, $\varepsilon_3 N_{part}^{1/3}$

✓ PID v_n
- Mass ordering was observed in all harmonics(n=1-3)

✓ Glauber+Hydrodynamics calculations
-v_2,v_3 are reproduced with η/s =0.08-0.16 for 0-5,20-30%

Reference

arXiv:

Hiroshi Nakagomi :hiro_n@rcf.rhic.bnl.gov