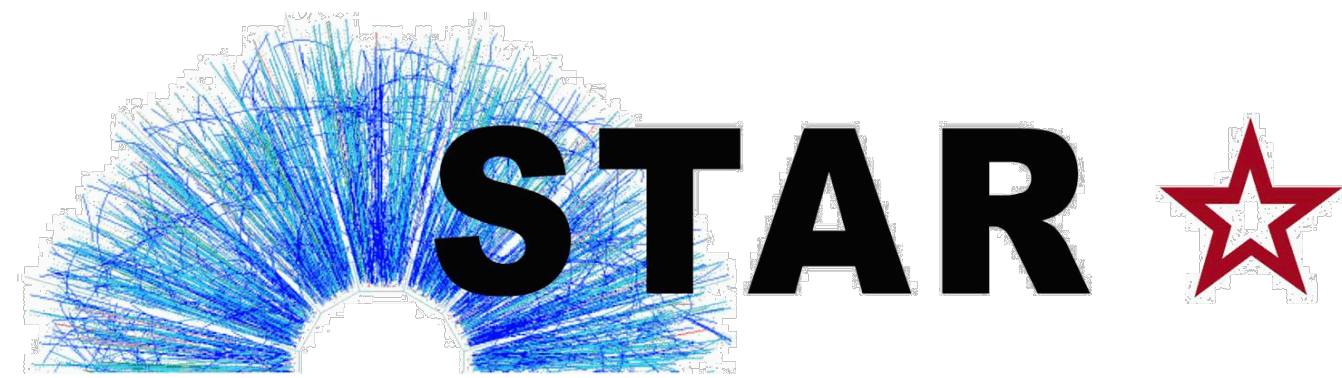


Measurement of the Sixth-Order Cumulant of Net-Particle Distributions in Au+Au Collisions from the STAR Experiment

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Central China Normal University
Quark Matter 2019, Wuhan, China

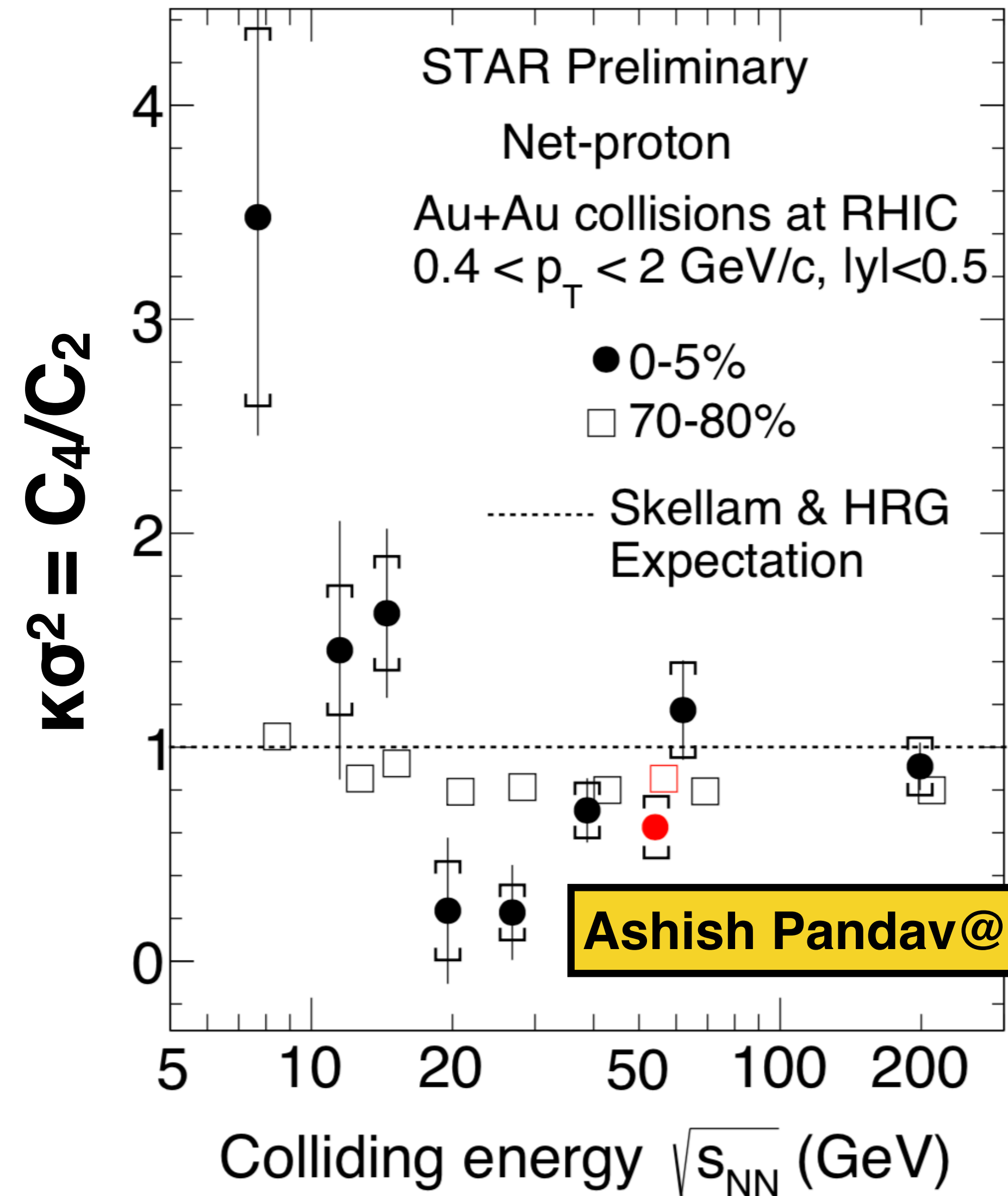


In part supported by



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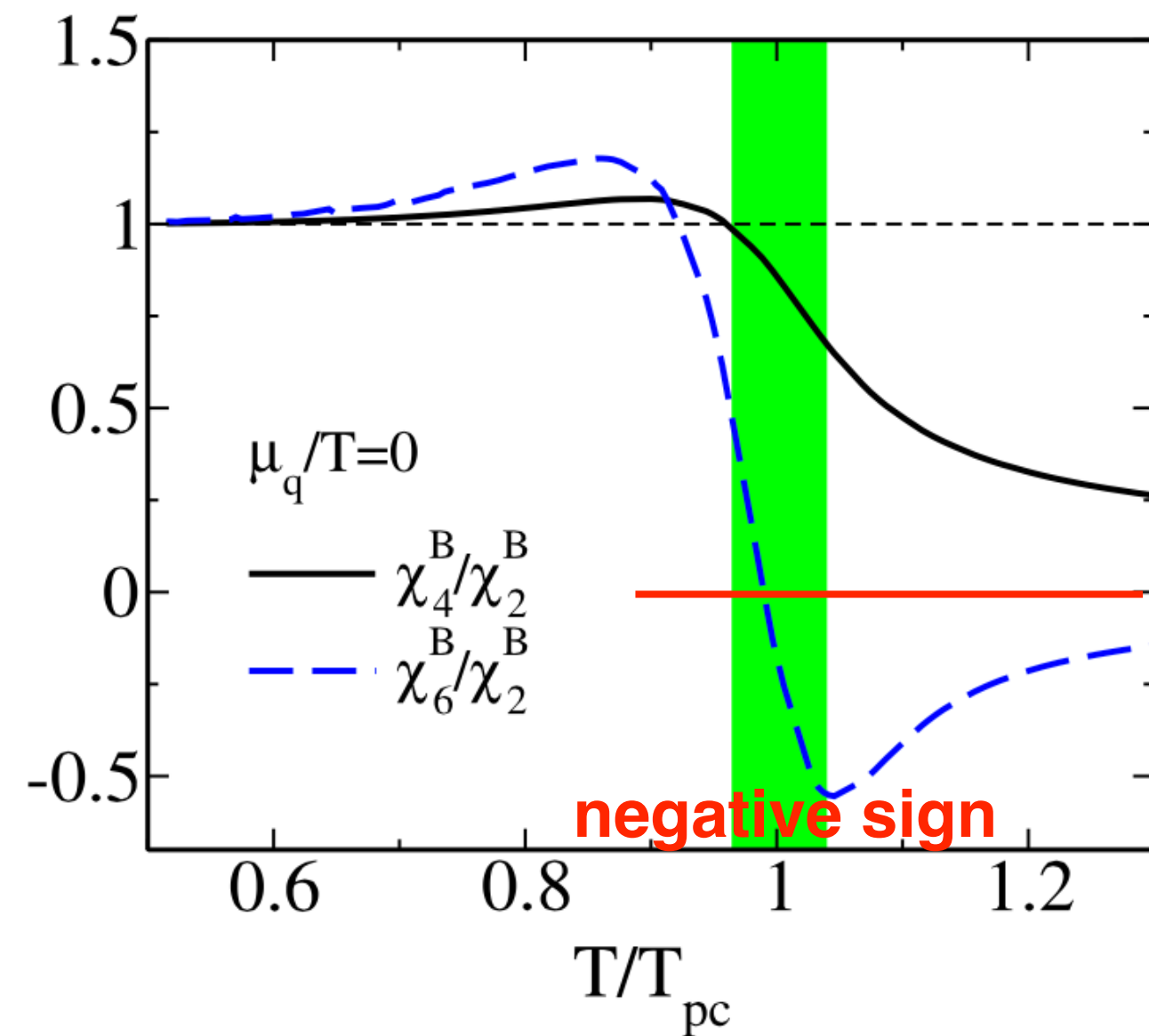




C_6/C_2 for crossover search

- ✓ There isn't yet any direct experimental evidence for the smooth crossover at $\mu_B \sim 0$.
- ✓ $C_6/C_2 < 0$ is predicted if the freeze-out is close enough to the phase transition.
- ✓ High-statistics data sets at $\sqrt{s_{NN}} = 54.4 \text{ GeV}$ and 200 GeV are analyzed to look for the **experimental signature of crossover transition**.

Friman et al, Eur. Phys. J. C (2011)
71:1694 : PQM model



C.Schmidt, Prog.Theor.Phys.Suppl.186,563–566(2010)
Cheng et al, Phys. Rev. D 79, 074505 (2009)
Friman et al, Eur. Phys. J. C (2011) 71:1694

Freeze-out conditions	χ_4^B / χ_2^B	χ_6^B / χ_2^B	χ_4^Q / χ_2^Q	χ_6^Q / χ_2^Q
HRG	1	1	~ 2	~ 10
QCD: $T^{\text{freeze}} / T_{pc} \lesssim 0.9$	$\gtrsim 1$	$\gtrsim 1$	~ 2	~ 10
QCD: $T^{\text{freeze}} / T_{pc} \simeq 1$	~ 0.5	< 0	~ 1	< 0

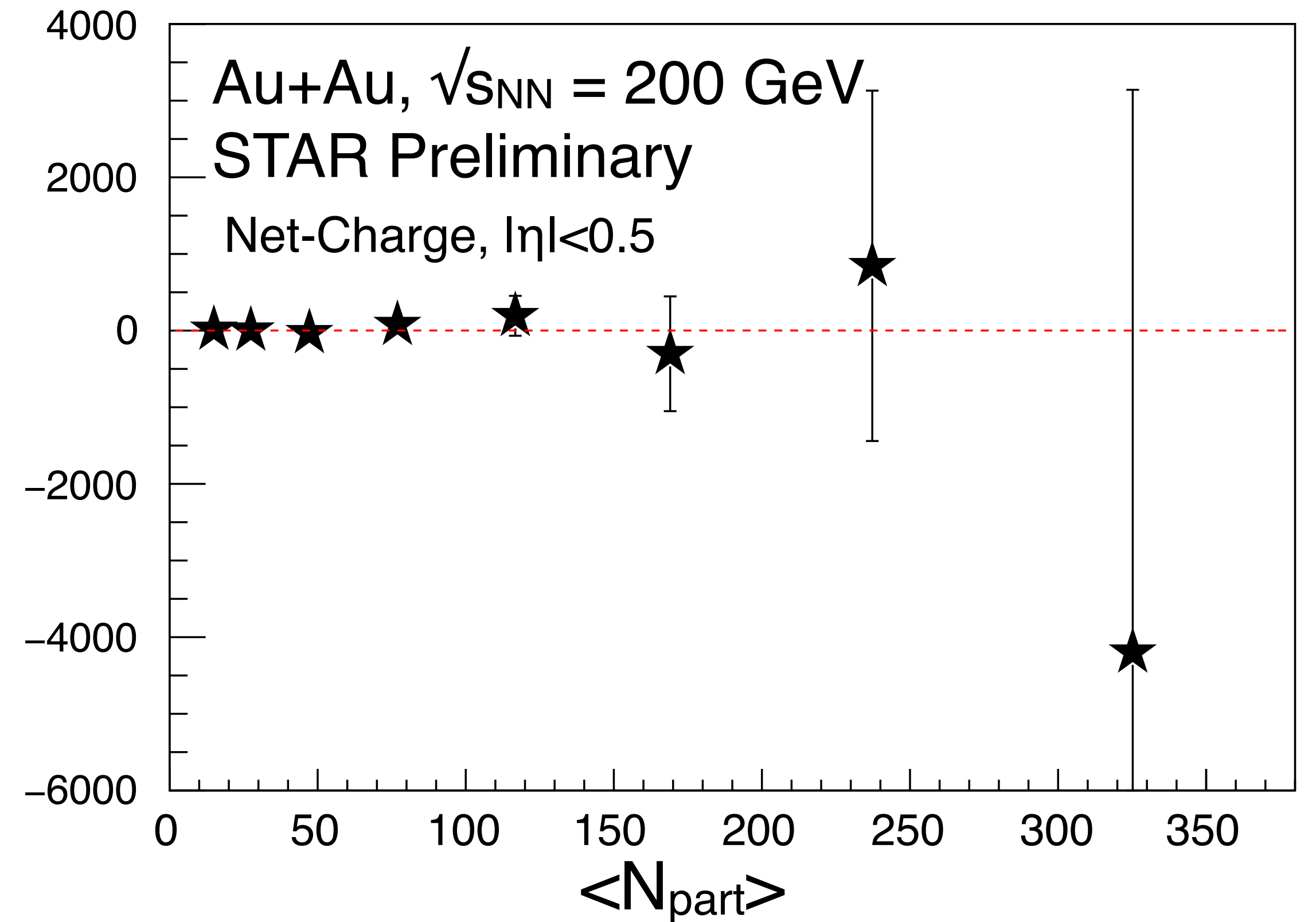
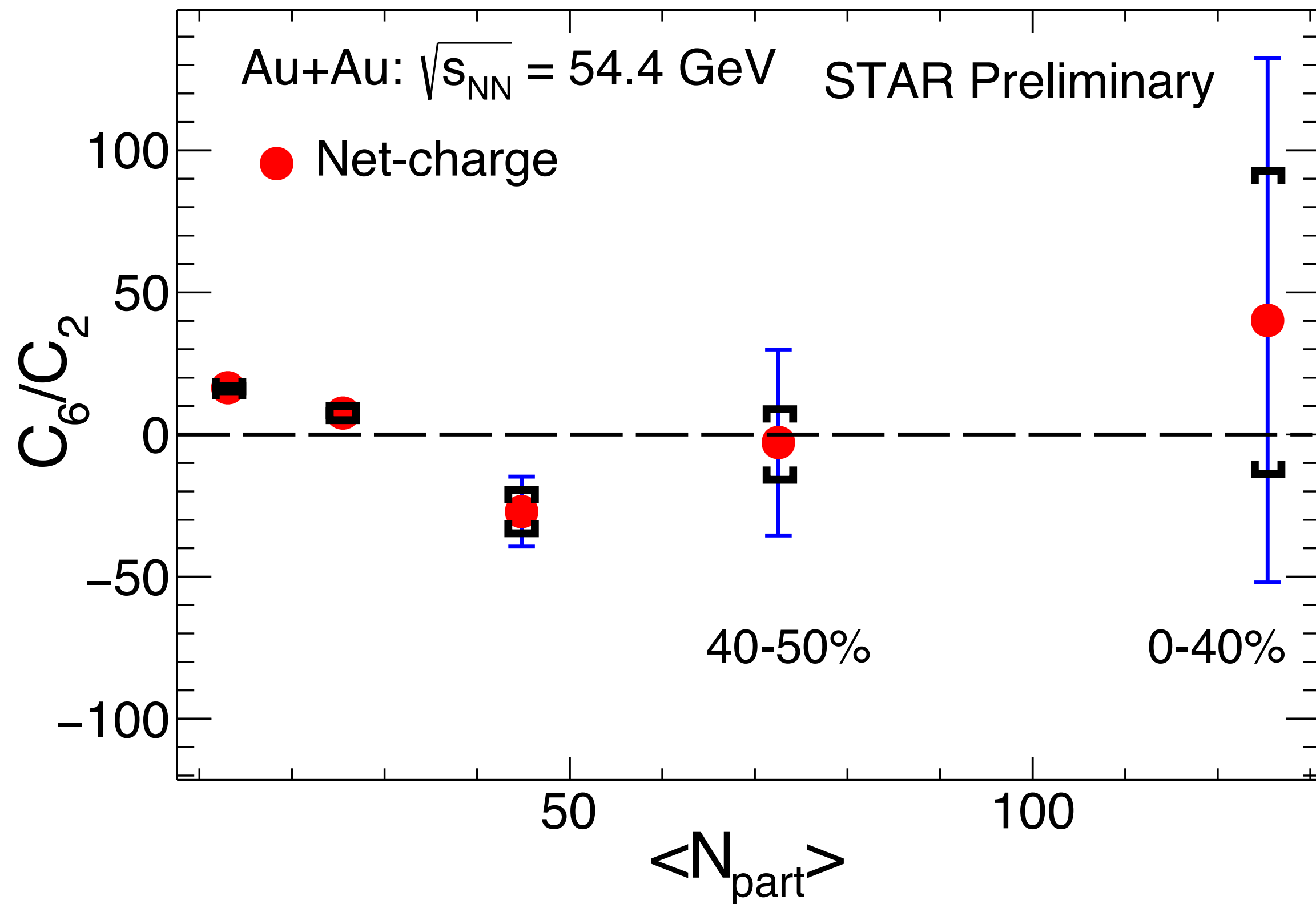
Predicted scenario for this measurement

C_6 corresponds to 6-th derivative of the pressure w.r.t chemical potential



Net-charge C_6/C_2

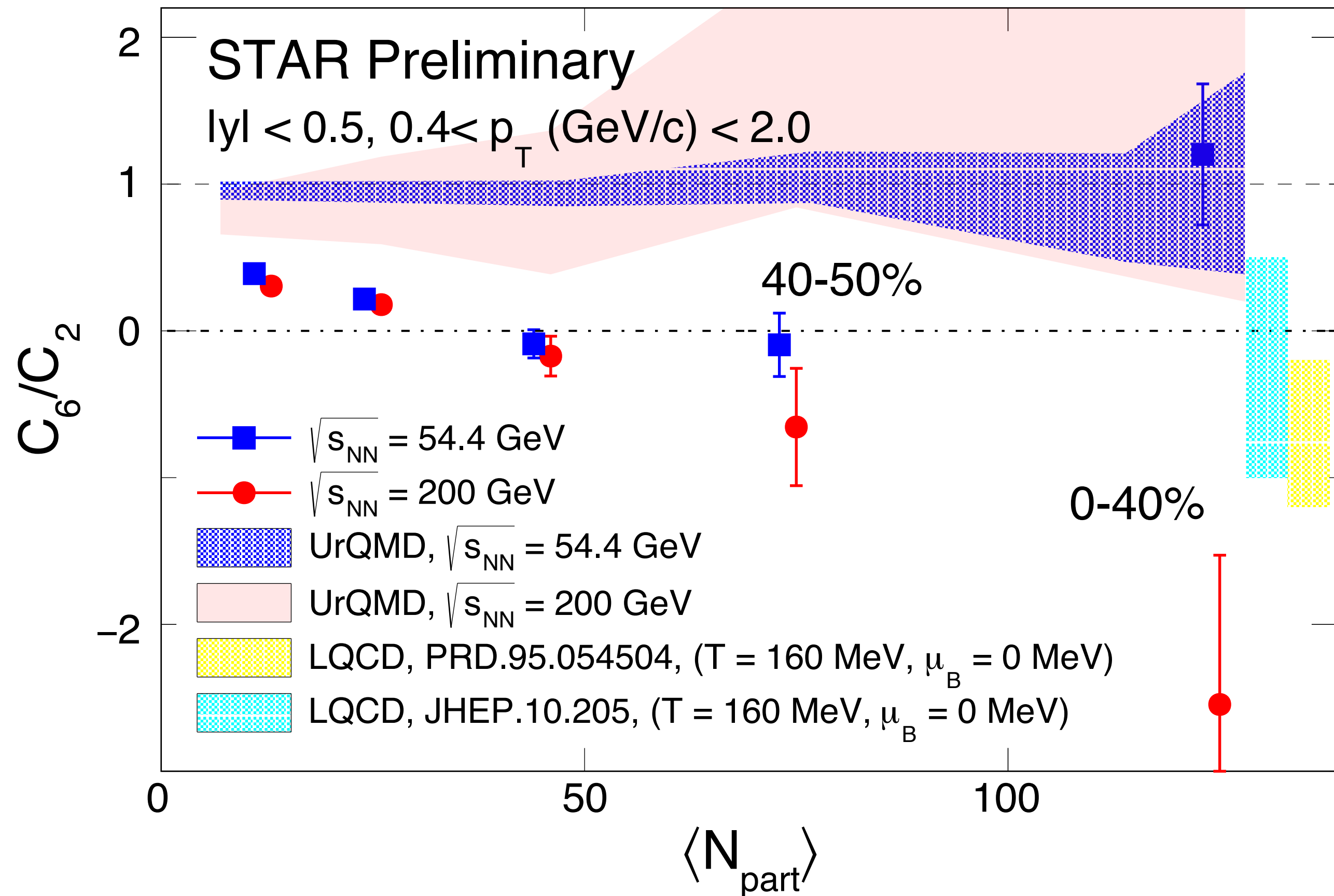
✓ The C_6/C_2 values is consistent with zero.





Net-proton C_6/C_2

- ✓ Results are consistent between two energies in peripheral collisions.
- ✓ $C_6/C_2 > 0$ at 54.4 GeV and $C_6/C_2 < 0$ at 200 GeV in central collisions.

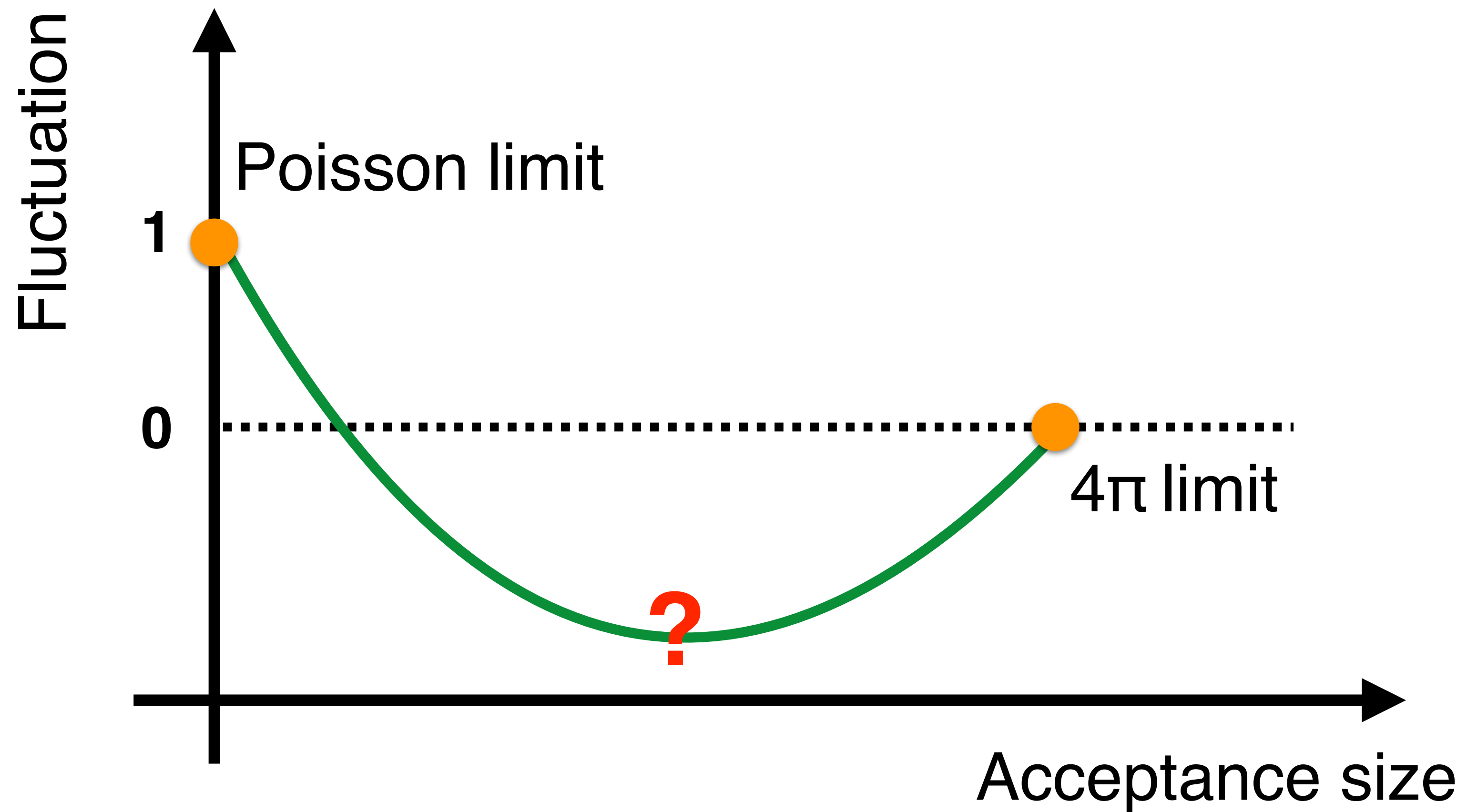


Also see new LQCD results
- Heng-Tong Ding @ 14:00 MON
- Dennis Bollweg @ 17:20 WED



Acceptance dependence?

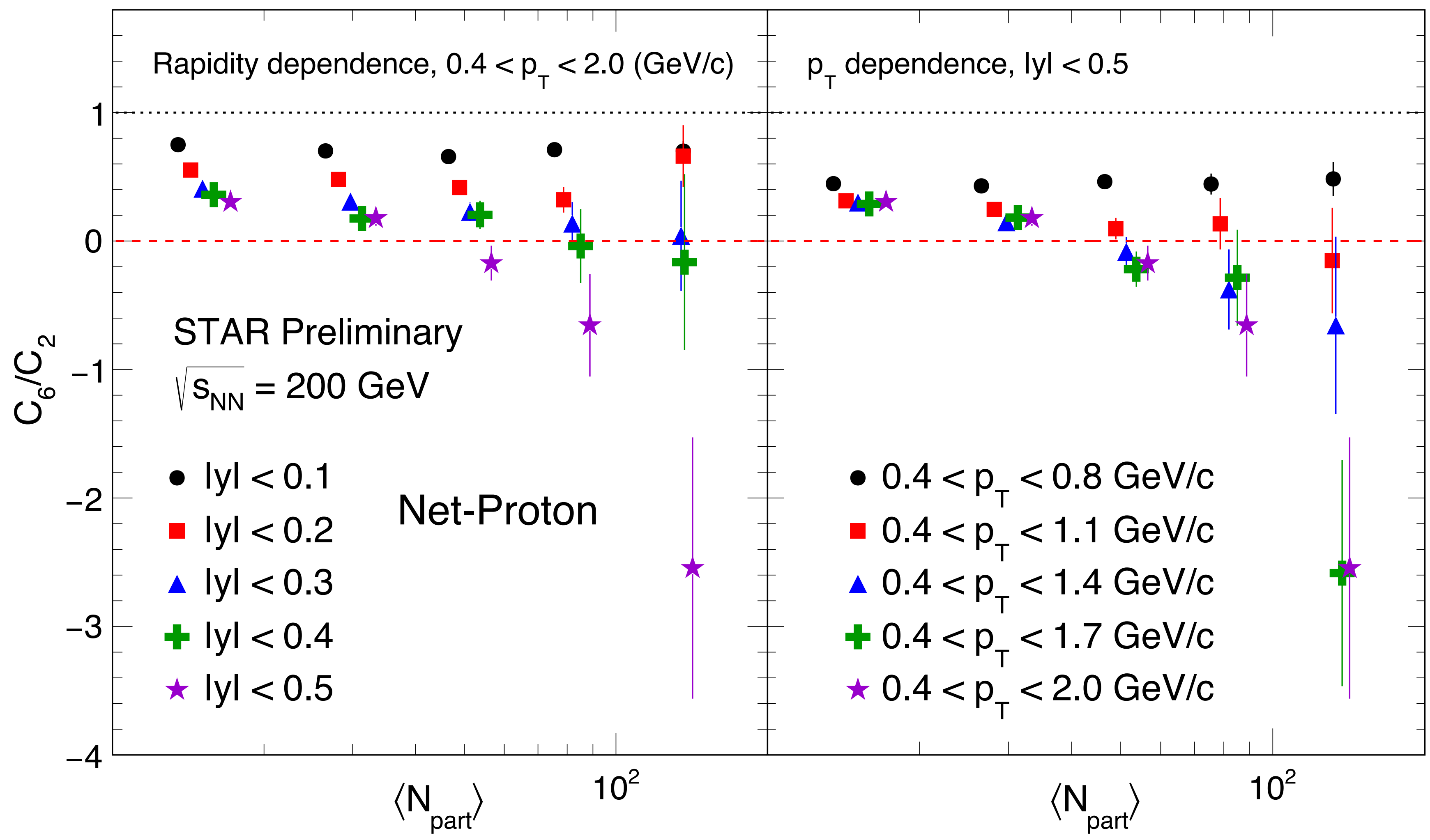
- ✓ Which acceptance should be compared with LQCD calculations?
- ✓ Fluctuations should have minimum/maximum somewhere in acceptance size.





Acceptance dependence at 200 GeV

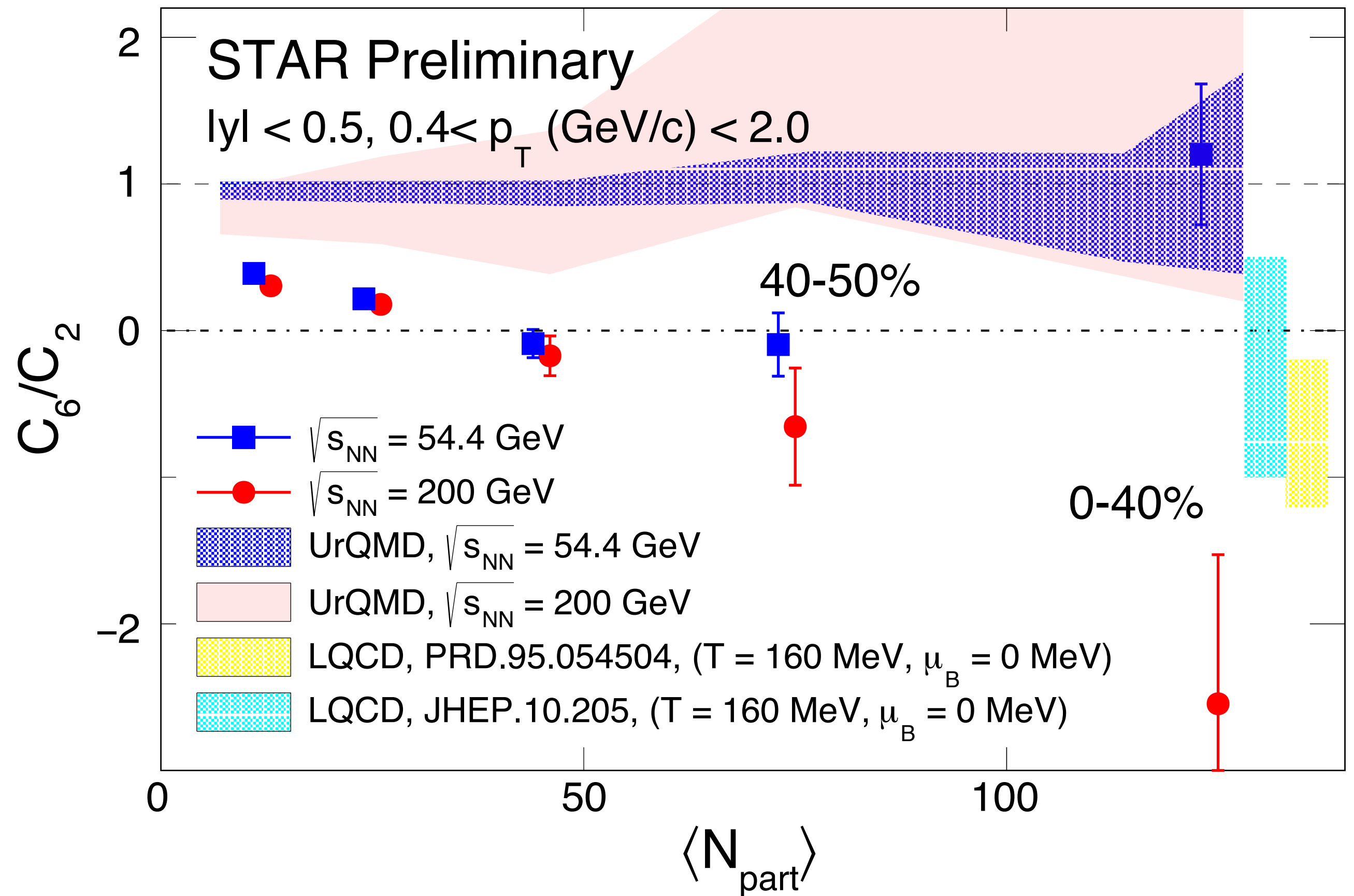
✓ C_6/C_2 values strongly depends on acceptance!





Summary

- ✓ C_6/C_2 of net-proton multiplicity distributions show
 - negative value in 0-40% centrality at $\sqrt{s_{NN}} = 200$ GeV
 - positive value in 0-40% centrality at $\sqrt{s_{NN}} = 54.4$ GeV
 - decrease with respect to p_T and rapidity coverage.



Thank you for your attention