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Study of nuclei deformation effect on fluctuations and correlations to geometry response mapping with AMPT

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Preliminary STAR-BNL data shows Pearson coefficient ($\rho\left(v_n\{2\}^2, [p_T]\right)$) could be an intriguing observable to probe the shape deformation in atomic nuclei. Using a well-built and popular multi-phase transport calculation (AMPT), millions of collision events are produced from initial stages to final hadrons comparing with limited statistics from hydrodynamics. The flow fluctuations, event-by-event mean p_T ($\langle p_T \rangle$) fluctuations and Pearson correlations ($\rho\left(v_n\{2\}^2, [p_T]\right)$) between mean p_T and anisotropy flow are performed mapping from final particles to initial geometry in Au+Au at $\sqrt{s_{NN}} = 200$ GeV and U+U at $\sqrt{s_{NN}} = 193$ GeV collisions. These observables can serve as direct probes of the deformation in the colliding nuclear species in our transport AMPT model. An instructive description of hadronic evolution is also achieved, and such kind of study can be helpful to compare with STAR data to further constrain the deformation value, medium properties as well as final state effects in these collisions.

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