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Diagnosis of the collective flows in p+Au, d+Au and ^{3}He+Au at 200 GeV and d+Au at RHIC energy scan regions by full (3+1)D dynamical model

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STAR and PHENIX Collaborations have recently reported measurements of the anisotropic flow coefficients in p+Au, d+Au, and ^{3}He+Au collisions at the Relativistic Heavy Ion Collider (RHIC). However, some tension between STAR and PHENIX data has not been fully resolved. Because the STAR and PHENIX Collaborations applied different pseudorapidity ranges to analyze the two-particle correlations, the flow rapidity correlations in these asymmetric systems could play a crucial role in understanding the difference in the data.
This talk will present full (3+1)D dynamical simulations of asymmetric nuclear collisions at RHIC. We explore the rapidity dependence of anisotropic flow in the RHIC small system scan at 200 GeV and d+Au energy scan in the Beam Energy Scan region. By extrapolating from ^{3}He+Au to d+Au and p+Au collisions, we find that the different amounts of longitudinal flow decorrelations result in larger v_3 with the STAR definition than those with the PHENIX definition in p+Au and d+Au collisions at 200 GeV. Furthermore, our calculation demonstrates that a considerable fraction of the $v_3(p_T)$ difference in STAR and PHENIX measurements can be explained using reference flow vectors from different rapidity regions. Therefore, the longitudinal flow decorrelation is crucial to understand the anisotropic flow measurements in asymmetric nuclear collisions. We further extend our model to investigate the energy dependence of the particle productions and collective flow in d+Au collisions at BES energies and compare the results to the PHENIX measurements.

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