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Energy Dependence of the Identified Hadron Elliptic Flow and QCD Phase Structure

One of the most exciting goals for the field of the high-energy nuclear collisions is to understand the phase structure of matter with partonic degrees of freedom and the transition from partonic phase to hadronic phase. In this talk, we will utilize the elliptic flow (v2) as a tool to address phase boundary issue. The v2 reflects the early collision dynamics [1]. Using transport models AMPT [2] and UrQMD [3], we study the energy dependence of the identified hadron elliptic flow in Au+Au collisions. While in high-energy collisions where hadrons are formed dominantly via the process of parton coalescence, we find the observed number of quark scaling in v2 [1] for all hadrons, the violation of the scaling is evident for collisions at lower energies where the hadronic interactions become dominant. Due to the high baryon density, the violation is particularly strong for the case of proton and anti-proton. In this talk we will discuss the boundaries of the region of beam energy, above which partonic interactions clearly dominate and below which hadronic interactions dominate. Other thermodynamic parameters, extracted around the energy region, like freeze-out temperature and baryonic chemical potential will also be discussed.

References:

[1] J. Adams et al. (STAR Collaboration), Nucl. Phys. A757, 102(2005) and references therein.
[2] Z.W. Lin et al., Phys. Rev. C72, 064901(2005).
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