Directed and elliptic flow of deuteron, identified and charged hadrons in Au+Au collisions in STAR

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The flow harmonics (v_n) especially, the first order (directed flow, v_1) and the second order (elliptic flow, v_2) are the sensitive probes to study QCD matter formed in heavy-ion collisions. Hydrodynamic models suggest that the double sign change of v_1 slope ($\mathrm{d}v_1/\mathrm{dy}$) at midrapidity for net baryon as a function of $\sqrt{s_{NN}}$ is a signature of the first-order phase transition [1]. The light nuclei and strange hadrons might be more sensitive to the early EoS due to heavier mass and smaller hadronic interaction cross section, respectively. Because of the different sensitivity of strange particles to hadronic phases, the mass ordering of v_n is expected to be violated between proton and ϕ meson in the low p_T range (p_T <1.5 GeV/c) [2]. Furthermore, a comprehensive v_1 and v_2 measurement of light nuclei, multistrange, strange and non-strange hadrons enable a precision study of the coalescence sum rule, which will lead to better understanding of particle production mechanism. A measurement of charged hadron v_1 as a function of pseudorapidity allows one to test the validity of limiting fragmentation and also compared with other experimental data.

In this talk, we will present new measurements of v_n for deuterons, identified and charged hadrons in Au+Au collisions at $\sqrt{s_{NN}}$ = 7.7, 11.5, 14.5, 19.6, 27, 39 and 54.4 GeV. The collision energy, centrality and transverse momentum dependence of these particles are discussed and compared to model calculations.

References

[1] Dirk H. Rischke *et al*, arXiv:nucl-th/9505014 (1995).; H. Stöcker, Nucl. Phys. A 750, 121 (2005).

[2] T. Hirano *et al.*, Phys. Rev. C 77, 044909 (2008).; S. Takeuchi *et al.*, Phys. Rev. C 92, 044907 (2015).