Anisotropic Flow Measurements of Identified Particles in The STAR Experiment

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Anisotropic flow, v_1, v_2, and v_3, are important observables in the relativistic heavy-ion collisions. They are sensitive to dynamics in the early stage of the system evolution, and can allow us to access the collective properties of the expanding QCD medium. In this talk, we will present the results of identified particle ($\pi^{\pm}$, $K^{\pm}$, K^0_S, p, ϕ, and Λ) v_1 and v_2 in Au+Au collisions at $\sqrt{s_{NN}} = 3$ GeV with the fixed-target mode at STAR. The transverse momentum (p_T) and rapidity (y) dependence of identified particle v_1 and v_2 will be presented. Results of v_2 and v_3 from higher colliding energies $\sqrt{s_{NN}} = 27$, 39, 54.4 and 200 GeV will also be shown.

In high energy collisions, the number of constituent quark (NCQ) scaling and the difference between particle and antiparticle will be discussed. At 3 GeV, we observe positive slope of directed flow with rapidity (dv_1/dy) for all particles except π^+, and negative elliptic flow at mid-rapidity for all particles. We observe that NCQ scaling for v_2 is absent at 3 GeV. These results are different from those for energies above 7.7 GeV and could be consistent with a change in the equation of state (EOS) of the nuclear matter created in such low energy collisions. This result indicates that nucleonic interactions dominate the dynamics of collectivity at the high baryon density region.