

Higher-Order Net-Proton Cumulants (C_5 and C_6) in Au+Au Collisions at RHIC-STAR

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In the search of QCD phase boundary and the critical point, higher-order cumulants of conserved quantities are proposed as promising observables and have been studied extensively both experimentally and theoretically. Results from lattice QCD calculations suggest that 5th- and 6th-order cumulants are connected to the smooth crossover phase transition at $\mu_B = 0$. At high baryon density region, on the other hand, the higher-order cumulants are also sensitive to the first-order phase boundary.

In this talk, we will present the 5th- and 6th-order of proton cumulants in fixed-target Au+Au collisions at $\sqrt{s_{NN}} = 3$ GeV and net-proton cumulants from Au+Au collisions (colliding mode) at $\sqrt{s_{NN}} = 7.7$ -200 GeV. The energy dependence of the higher-order cumulants and the implication in the high baryon density region will be discussed. Results of lattice QCD as well as the hadronic transport model calculations will be compared for the discussion.