Higher-Order Cumulants of Net-Proton Multiplicity Distributions from RHIC-STAR

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In the study of QCD phase structure and search of the QCD phase boundary and critical point, higher-order cumulants of conserved quantities are proposed as promising observables and have been studied extensively both experimentally and theoretically. For 4th-order cumulants it is predicted that there will be a non-monotonic energy dependence trend. For 5th- and 6th-order cumulants results from Lattice calculations suggest that they are connected to the smooth crossover 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 net-proton cumulants up to 6th-order in Au+Au collisions at $\sqrt{s_{NN}} = 7.7$ - 200 GeV from STAR Beam Energy Scan phase I and $\sqrt{s} = 200$ GeV p+p collisions. Analysis update on STAR fixed target energy $\sqrt{s_{NN}} = 3$ GeV will also be shown. Physics implication as well as comparisons with various models will be discussed.