Nuclear Experiment

Searching for the QCD Critical Point Using Particle Ratio Fluctuations and Higher Moments of Multiplicity Distributions

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Dynamical fluctuations in global conserved quantities such as baryon number, strangeness, or charge may be observed near a QCD critical point. Results from new measurements of dynamical K/π, p/π, and K/p ratio fluctuations are presented. The commencing of a QCD critical point search at RHIC has extended the reach of possible measurements of dynamical K/π, p/π, and K/p ratio fluctuations from Au+Au collisions to lower energies. The STAR experiment has performed a comprehensive study of the energy dependence of these dynamical fluctuations in Au+Au collisions at the energies $\sqrt{s_{NN}}$ = 7.7, 11.5, 39, 62.4, and 200 GeV. New results are compared to previous measurements and to theoretical predictions from several models. The measured dynamical K/π fluctuations are found to be independent of collision energy, while dynamical p/π and K/p fluctuations have a negative value that increases toward zero at top RHIC energy. Fluctuations of the higher moments of conserved quantities (net-proton and net-charge) distributions, which are predicted to be sensitive to the presence of a critical point, are also presented.

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