

Study of baryon fluctuations in azimuthal phase space and the search for critical phenomena at STAR

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1 Divergence of correlation length is a universal feature of critical phenomena
2 in phase transitions. In the search for a critical point in the QCD phase diagram,
3 such a divergence may be reflected in particle yield fluctuations in phase space.
4 Fluctuations of baryon multiplicities in heavy-ion collisions within a limited
5 pseudo-rapidity range have been used to search for signs of a critical point in
6 the STAR Beam Energy Scan (BES) Phase I data. Particle yield fluctuations
7 arising from critical phenomena would naturally exist in both longitudinal and
8 azimuthal subvolumes of phase space. In this analysis, proton fluctuations in
9 azimuthal subvolumes are investigated via new observables, complementary to
10 the current measurements made over the full azimuth. Mixed events are utilized
11 as a baseline which allows for the measurement of correlation length proxies
12 that are less sensitive to common experimental complications. Measurements of
13 transformed proton multiplicity distributions in azimuthal partitions of Au+Au
14 collisions from the STAR BES-I program will be presented. The kurtosis of
15 these distributions will be shown as a function of beam energy and azimuthal
16 partition size. The observed trends are compared with those obtained from
17 the AMPT model. Future perspective with the STAR BES-II data will also be
18 discussed.