Study of Baryon Fluctuations in Azimuthal Phase Space and Search for Critical Phenomena at STAR

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Divergence of correlation length is a universal feature of critical phenomena in phase transitions. In the search for a critical point in the QCD phase diagram, such a divergence may be reflected in particle yield fluctuations in phase space. Fluctuations of baryon multiplicities in heavy-ion collisions within a limited pseudo-rapidity range have been used to search for signs of a critical point in the STAR Beam Energy Scan (BES) Phase I data. Particle yield fluctuations arising from critical phenomena are expected to exist in both longitudinal and azimuthal subvolumes of phase space. Fluctuations in azimuthal subvolumes are investigated as a consistency check for current measurements made over the full azimuth. Mixed events are utilized as a baseline which may allow for the measurement of correlation length proxies that are less sensitive to common experimental complications. Measurements of transformed proton multiplicity distributions in azimuthal partitions of Au+Au collisions from the STAR BES-I program are presented along with methods for analyzing these distributions and their moments. These results are compared with AMPT model calculations.