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 via the coalescence formation mechanism. 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 fluctuations arising from critical phenomena are expected to span both longitudinal and azimuthal phase space. Leveraging the azimuthal symmetry of RHIC collisions with respect to the reaction plane along with utilizing mixed events as a baseline may allow for the measurement of correlation length proxies that are less sensitive to common experimental complications. Measurements of proton multiplicity fluctuations 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 also compared with AMPT model calculations.