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Energy Dependence of Moments of Net-Kaon Multiplicity Distributions at STAR

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One of the main goals of the RHIC Beam Energy Scan (BES) program is to study the QCD phase structure, including the search for the critical point, over a wide range of the collision energy. Theoretical calculations predict that fluctuations of conserved quantities, such as baryon number (B), charge (C), and strangeness (S), are sensitive to the correlation length [1] of the dynamical system. Experimentally, higher moments of multiplicity distributions have been utilized to search for the QCD critical point and extract freeze-out conditions [2] in heavy-ion collisions.

The STAR Collaboration has published moments of net-proton and net-charge multiplicity distributions [3]. In this talk, we will report recent efficiency corrected cumulants and higher moments of the net-kaon multiplicity distributions at mid-rapidity ($|y| < 0.5$) in Au+Au collisions at $\sqrt{s_{NN}} = 7.7, 11.5, 14.5, 19.6, 27, 39, 62.4,$ and 200 GeV obtained from the first phase of the RHIC BES program. The collision energy and centrality dependence of cumulants up to the fourth order, as well as their ratios, will be shown. Furthermore, we will also present studies of their rapidity and pT dependence. The comparisons with baseline calculations (Poisson, NBD) and non-critical point models (UrQMD, AMPT) will also be discussed.

[1] M. A. Stephanov, Phys. Rev. Lett. 102, 032301 (2009); Phys. Rev. Lett. 107, 052301 (2011); C. Athanasiou et al., Phys. Rev. D 82, 074008 (2010).

[2] S. Gupta et al. Science 332, 1525 (2011); F. Karsch and K. Redlich, Phys. Lett. B 695, 136 (2011); A. Bazavov et al., Phys. Rev. Lett., 109, 192302 (2012); S. Borsanyi et al., Phys. Rev. Lett. 111, 062005 (2013).

[3] STAR Collaboration, Phys. Rev. Lett. 112, 032302 (2014); Phys. Rev. Lett. 113 (2014) 92301

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