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Higher moments on strangeness fluctuation using finite volume PNJL model

The strongly interacting matter is supposed to have a rich phase structure at finite temperature and density. While our Universe at present epoch contains a significant fraction of color singlet hadrons, color non-singlet states especially quarks and gluons may have been prevalent in the few microseconds after the Big bang. One of the fundamental goals of the heavy ion collision experiments is to map the QCD phase diagram and to locate the critical end point where the first order phase transition from hadronic state to quark gluon plasma (QGP) phase become continuous. This results in long range correlation and fluctuation at all length scales. The correlation length and the magnitude of the fluctuations of the conserved quantities diverge at the critical point. Since the higher non Gaussian moments such as kurtosis, skewness are much more sensitive to the correlation length, they can provide much better handle in location of CEP. Here we have investigated the 2+1 flavor Polyakov loop extended Nambu—Jona-Lasinio (PNJL) model to study the strangeness susceptibilities which are related to the moments of net-Kaon distributions. We have considered the finite volume system as the location of CEP strongly depends on the finite size of the system. We have studied the kurtosis and skewness which are the ratio of the fourth order to second order and third order to second order susceptibilities. Kurtosis and skewness have been calculated as a function of collision centrality from 7.7, 11.5, 19.6, 27, 39, 62.4 to 200 GeV in Au+Au collision. Our result has been compared with the hadron resonance gas model. Near the critical region the skewness and kurtosis for the strangeness susceptibility show large values and deviate from being constant. We have also studied the higher moments of baryon-strange (BS), baryon-charge (BQ) and charge-strange (QS) correlations with the collision centrality for better understanding of the critical region.

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