In high energy nuclear collisions, light nuclei can be regarded as a cluster of baryons and their yields are sensitive to the baryon density fluctuations. Thus, the production of light nuclei can be used to study the QCD phase transition, at which the baryon density fluctuation will be enhanced. For example, the ratio of proton ($N(p)$) and triton ($N(t)$) to deuteron ($N(d)$) yields, which is defined as $N(t)\cdot N(p)/N^2(d)$, could be used as a sensitive observable to search for the signature of the 1st order phase transition and/or QCD critical point in heavy-ion collisions [1][2].

In this talk, we will present the energy and centrality dependence of (anti-)deuteron and triton production in Au+Au collisions at $\sqrt{s_{NN}}=7.7, 11.5, 14.5, 19.6, 27, 39, 54.4, 62.4,$ and $200$ GeV measured by the STAR experiment at RHIC. Especially, the new results from 14.5, 27, and 54.4 GeV high statistics data allow us to examine the previously observed hint of a non-monotonic behavior in the neutron density fluctuations around 20 GeV with much better precision. Further, we will show the beam energy dependence for the coalescence parameter $B_2(d)$ and $B_3(t)$, particle ratios ($d/p, t/p,$ and $t/d$), and the yield ratio of $N(t)\cdot N(p)/N^2(d)$. Their physics implications on QCD critical point search and change of equation of state will be discussed.


Primary author: ZHANG FOR THE STAR COLLABORATION, Dingwei (Central China Normal University (CCNU))

Presenter: ZHANG FOR THE STAR COLLABORATION, Dingwei (Central China Normal University (CCNU))

Session Classification: Parallel Session - Search for the CP II

Track Classification: Search for the critical end point