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Light Nuclei (d, t) Production in Au+Au Collisions at $\sqrt{s_{\mathrm{NN}}}$=7.7-200 GeV from the STAR experiment

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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 $\sqrt{s_{\mathrm{NN}}}$ = 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.

[1] K. J. Sun et al., Phys. Lett. B 774 (2017) 103.
[2] K. J. Sun et al., Phys. Lett. B 781 (2018) 499.

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