Contribution ID: **26** Type: **Poster presentation**

Light nuclei production with/without critical fluctuation

Light nuclei production is a hot research topic in heavy-ion collision at RHIC-BES. The observed non-monotonic behavior with the colliding energies[1,2] was declared to be related to the critical point of the QCD phase diagram[3,4]. In this talk, we focus on investigating the light nuclei production with and without critical fluctuations within the framework of the coalescence model.

In the first part [5], we derive the yield of light nuclei in terms of various orders of cumulants for the density distribution function by the implementation of the characteristic function of the phase space density without considering the critical fluctuations. We found that the leading terms of the phase-space cumulants in the yield of light nuclei share a similar form and could be canceled out in light nuclei ratio, whereas the higher-order ones (non-Gaussian shaped density profile) remain and play an important role in the interpretation of the behavior of light nuclei yield ratio.

In the second part [6], we introduce the static critical correlation contribution to the phase space density and derive the light nuclei production in terms of phase space cumulant. Because the leading terms of the phase-space cumulants in the yield of light nuclei share the similar form, we can construct a new light nuclei yield ratio, which is directly proportional to the critical contribution. By mapping the equation of state from the three-dimension Ising model, the new light nuclei yield ratio ($N_t N_p/N_d^2 - g_t/g_d^2$) has a double peak as a function of collision energy. And we also predict more obvious double peak structure of ratio $N_{^4He}N_p^2/N_d^3 - g_{^4He}/g_d^3$, requiring further experiment measurements.

[1] H. Liu, D. Zhang, S. He, K.-j. Sun, N. Yu, and X. Luo, Phys. Lett. B 805, 135452 (2020).
[2] D. Zhang (STAR), JPS Conf. Proc. 32, 010069 (2020).
[3] E. Shuryak and J M.Torres-Rincon, Eur.Phys.J.A 56 (2020) 9,241.
[4] K.-j. Sun, F.Li and C.M.Ko, Phys.Lett.B 816 (2021) 136258.
[5] S.Wu, K.Murase, S.Tang and H.Song, in preparation.
[6] S.Wu, K.Murase, S.Zhao and H.Song, in preparation.

Primary author: WU, Shanjin

Co-authors: SONG, Huichao; MURASE, Koichi (Yukawa Institute for Theoretical Physics, Kyoto University)

Presenter: WU, Shanjin

Session Classification: Poster session