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Precise measurement on hypertriton and anti-hypertriton masses and lifetimes with the Heavy Flavor Tracker and the production of triton in Au+Au collisions at STAR

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The Hyperon-Nucleon (Y-N) interactions play an important role for understanding the strong interaction. It is suggested that alternative Y-N couplings can be a possible solution to the recent observations of neutron star exceeding two solar masses, the so-called "hyperon puzzle". A precise measurement of masses and lifetimes of hypertriton and anti-hypertriton can enrich our knowledge on Y-N interactions. In addition, the light nuclei distributions provide an excellent tool for understanding the freeze-out conditions of system created in high-energy nuclear collisions. For example, the yield ratio of triton, $N(t)$, deuteron, $N(d)$, and proton, $N(p)$, which is defined as $N(t)N(p)/N^2(d)$ may be utilized as an alternative variable in the search of the QCD critical point.

In this talk, we will present the first precise measurement of hypertriton and anti-hypertriton masses in heavy-ion collisions at STAR with the Heavy Flavor Tracker (HFT). Hypertritons and anti-hypertritons are reconstructed through both two-body decay channel ($^3He + \pi^-$) and three-body decay channel ($p + d + \pi^-$) using the high-statistics data collected in 2014 and 2016 Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV. The binding energies and lifetimes of the (anti-)hypertriton will be extracted from this precise measurement. We will also present the centrality dependence of the mid-rapidity p_T spectra of triton (t) from Au+Au collisions at $\sqrt{s_{NN}}$ = 7.7, 11.5, 14.5, 19.6, 27, 39, 62.4, 200 GeV. The collision energy and centrality dependence of the yield ratio, $N(t)N(p)/N^2(d)$, and the coalescence parameters of d (A = 2) and t (A = 3) will be also presented. Physics implications of these measurements will be discussed.

Content type

Experiment

Collaboration

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