

Production of light nuclei in Au+Au collisions at STAR

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1 The Beam Energy Scan (BES) program at Relativistic Heavy-Ion Collider (RHIC) aims to map
2 the QCD phase diagram. Finite-temperature lattice QCD calculations suggest a smooth crossover
3 transition from normal nuclear matter to the Quark-Gluon Plasma (QGP) phase at high temperature
4 and vanishing baryon chemical potential. Several QCD-based models suggest there is a first-order
5 phase transition between hadronic matter and the QGP at low temperature and high baryon chemical
6 potential, and the first-order phase transition line should end at a critical point (CP) towards the
7 crossover region. The BES program aims to experimentally locate the CP in the QCD phase diagram.
8 It is suggested that light nuclei are formed by the coalescence of nucleons close to each other in
9 phase space. This makes them sensitive to the baryon density fluctuations that become larger in
10 the vicinity of the CP. Therefore, yields and ratios of light nuclei could be an experimental probe to
11 the first-order phase transition.

12 In this talk, we will present the energy and centrality dependence of transverse momentum spectra
13 of light nuclei (d and t) in Au+Au collisions from the BES-I data. We will also report the energy
14 and centrality dependence of yields and ratios of light nuclei. STAR has also recorded high statistics
15 data from Au+Au collisions at various energies in the BES-II program which comes with enhanced
16 detector capability. The performance of light nuclei analysis in this dataset will be demonstrated.