Light nuclei production in a multiphase transport model for relativistic heavy ion collisions

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Based on an improved multiphase transport (AMPT) model [1,2], which gives a good description of proton production with a smooth quark matter to hadronic matter transition in relativistic heavy ion collisions, we have studied deuteron and triton productions from the coalescence of nucleons at the kinetic freezeout of these collisions. For central Au+Au collisions at center-of-mass energies from 7.7 GeV to 200 GeV available at the Relativistic Heavy Ion Collider (RHIC), we have found that the yield ratio N_tN_p/N_d^2 of proton, deuteron, and triton is a monotonic function of collision energy, as shown in Fig. 1 [3]. Our study confirms the results from similar studies based on different dynamic model, which have

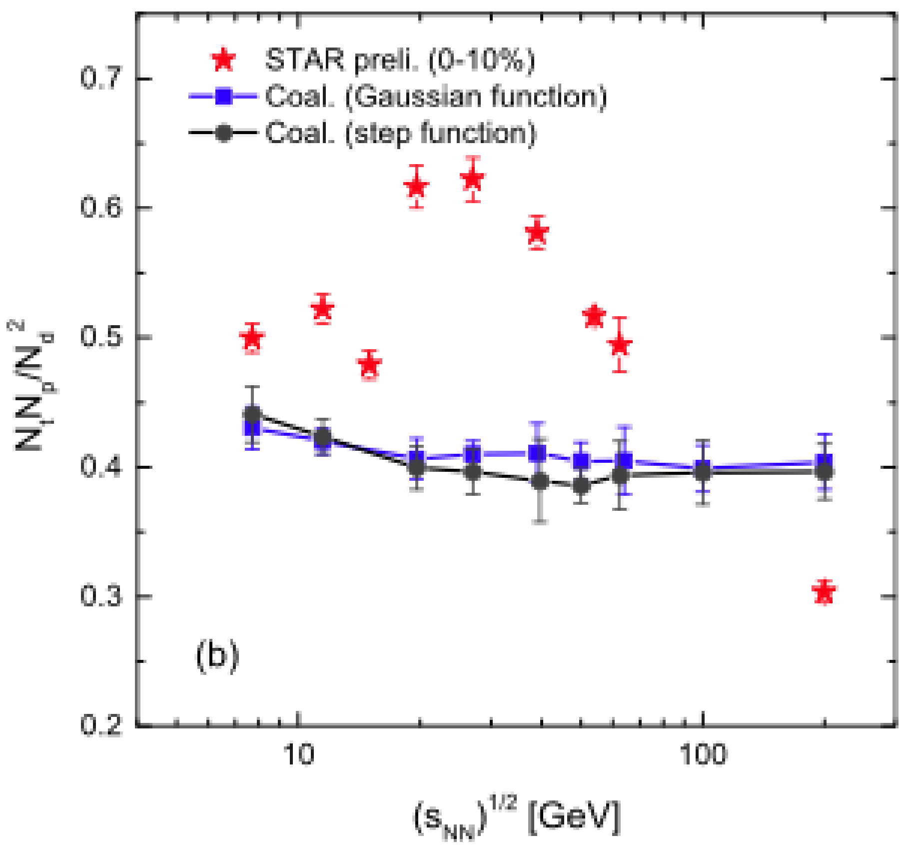

Fig. 1. . The yield ratio N_d/N_p of deuteron to proton and N_t/N_p of triton to proton (left window) as well as the yield ratio N_tN_p/N_d2(right window) as functions of the collision energy in central Au+Au collisions. Results from the AMPT model are denoted by lines with filled squares and circles obtained by using Gaussian and step functions, respectively. The experimental data taken from Refs. [4-6] are shown by solid and open stars after correcting the weak-decay contribution from hyperons to protons [7].

either no phase transition [4] or a crossover transition [5] between the quark-gluon plasma and the hadronic matter, that this yield ratio does not show any nonmonotonic behavior in its collision-energy dependence. The observed nonmonotonic structure of this ratio in the preliminary data from the STAR Collaboration [6-9], shown by stars in Fig. 1, thus indicate that the produced matter might have undergone a first-order phase transition [10,11] or evolved towards a critical point in the QCD phase diagram [12,13].

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