Equation of state of the hot dense matter in a multiphase transport model

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Within the framework of a multi-phase transport (AMPT) model [1], we have studied [2] the equation of state, given by the ratio of pressure to energy density, and the pressure anisotropy, given by the ratio of pressures in the longitudinal and transverse directions, of the hot dense matter produced in central relativistic heavy ion collisions. Both are found to depend on the hadronization scheme and the parton scattering cross sections. As shown in the left panel of Fig. 1, the equation of state in the default AMPT model with the partonic matter consisting of only mini jets is much softer in a wide energy density region than in the string melting model in which the partonic matter includes all valence quarks from produced hadrons. In the latter case, hardness of the equation of state further increases with increasing parton cross section. In both scenarios, the produced hot dense matter is not in thermal equilibrium as the pressure isotropy deviates significantly from unity during most of its evolution as a result of fast expansion as shown in the right panel of Fig.1.

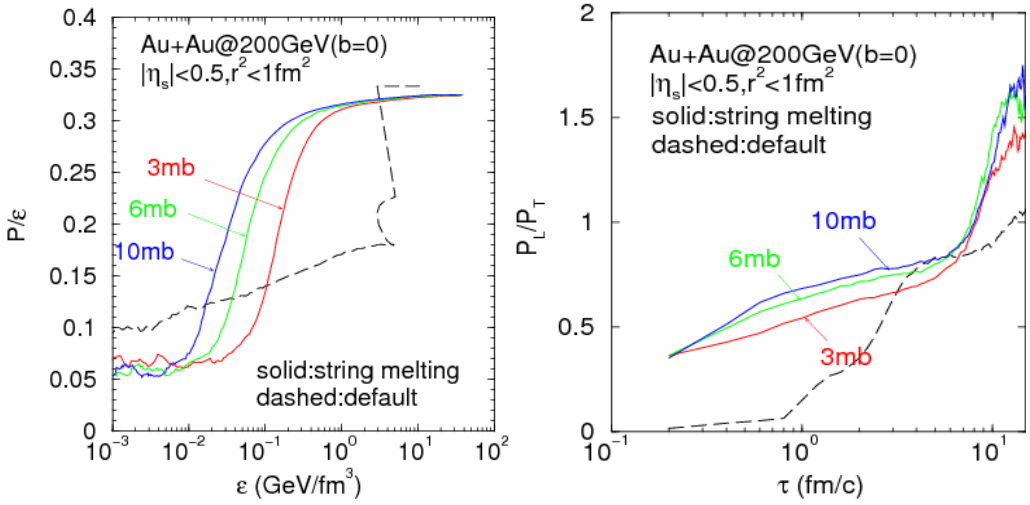

Figure 1. Equation of state P/ε as a function of ε (left panel) and the proper time evolution of the pressure anisotropy parameter (right panel) in both the default and the string melting AMPT

[1] Z. W. Lin, C. M. Ko, B. A. Li, B. Zhang, and S. Pal, Phys. Rev. C **72**, 064901 (2005).

[2] B. Zhang, L. W. Chen, and C. M. Ko, nucl-th/07053968.