

Energy dependence of pion in-medium effects on π^+/π^- ratio in heavy-ion collisions

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Within the framework of a thermal model [1] with its parameters fitted to the results from an isospin-dependent Boltzmann-Uehling-Uhlenbeck (IBUU) transport model [2], we have studied the pion in-medium effect on the charged-pion ratio in heavy-ion collisions at various energies [3]. We have found that despite the cancellation between the pion-nucleon s-wave interaction [4], which reduces the π^-/π^+ ratio, and the p-wave interaction [5], which increases the π^-/π^+ ratio, the π^+/π^- ratio generally decreases after including the pion in-medium effect as shown in Fig.1. Although at lower energies the charged-pion ratio is more sensitive to the symmetry energy, the pion in-medium effect is also larger, especially at collision energies below the pion production threshold. Our results thus indicate that to understand quantitatively the symmetry energy effect on pion production in heavy-ion collisions, it is important to include the isospin-dependent pion in-medium effects.

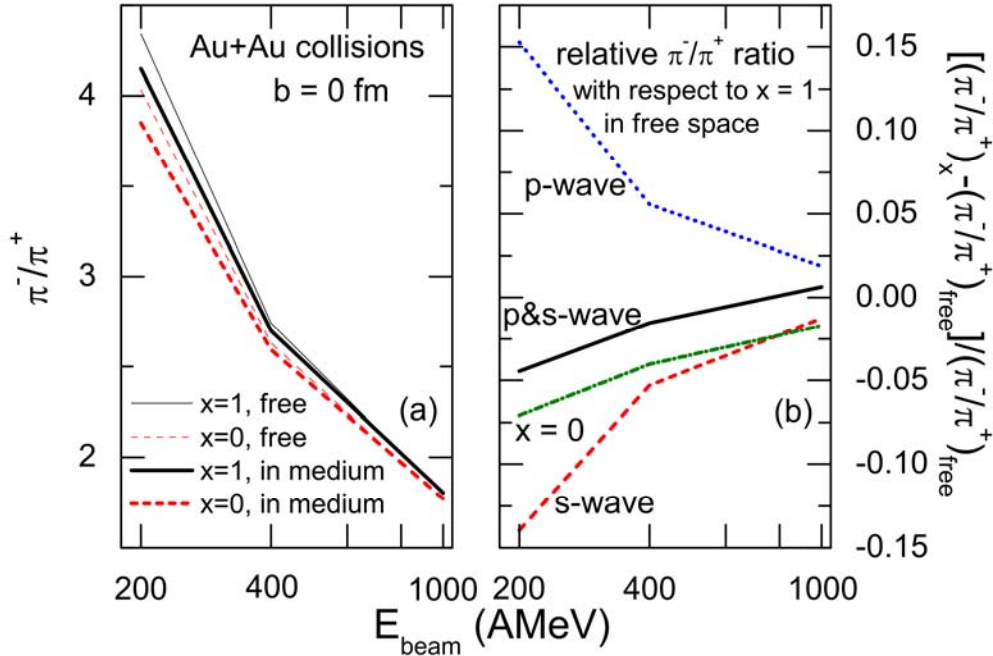


FIG. 1. Collision energy dependence of (a) π^-/π^+ ratios with and without pion in-medium effects and (b) relative π^-/π^+ ratios from pion-nucleon s-wave interaction, p-wave interaction, both p- and s-wave interactions, and $x = 0$ (stiffer symmetry energy) with respect to that from $x = 1$ (softer symmetry energy) in free space from the thermal model for central Au + Au collisions at different energies.

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