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 find that due to the cancellation between the effects from pion-nucleon s-wave [4] and p-wave [5] interactions in nuclear medium, the π^+/π^- ratio generally decreases after including the pion in-medium effect as shown in Fig.1. The effect is larger at lower collision energies as a result of narrower pion spectral functions at lower temperatures.
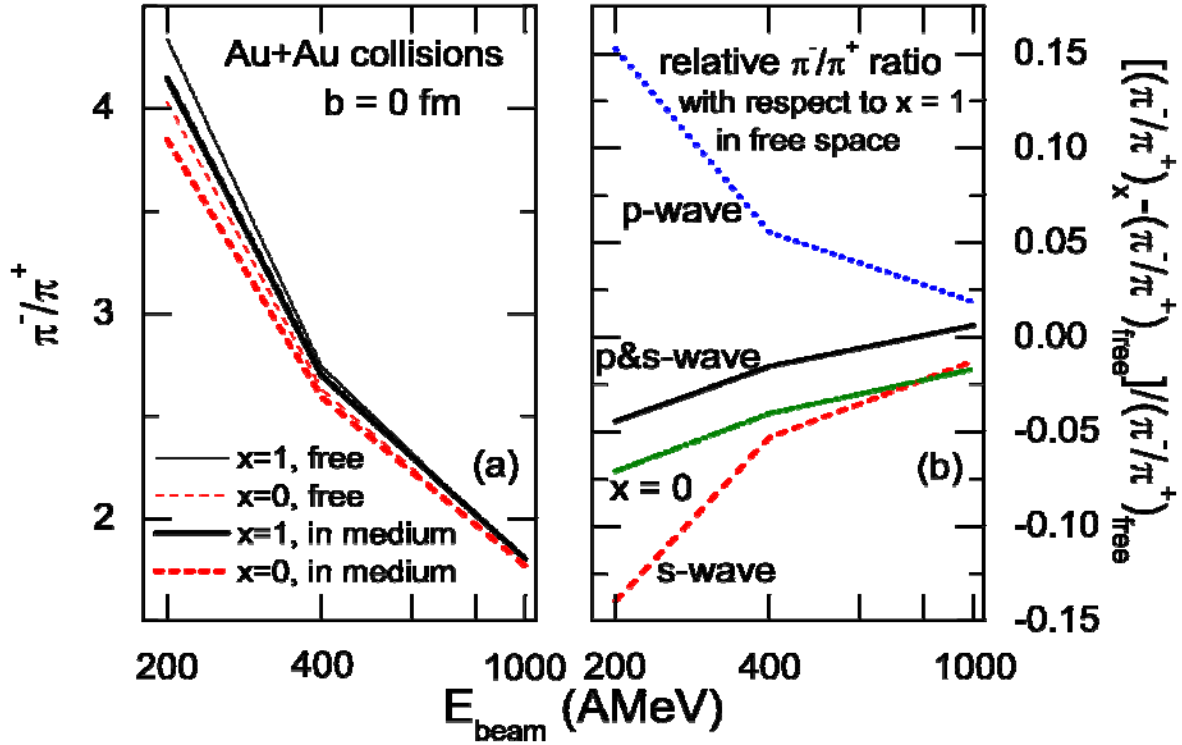

FIG. 1. Left panel: π^+/π^- ratios with and without pion in-medium effects from the thermal model calculation corresponding to central Au+Au collisions at different beam energies; Right panel: Relative π^+/π^- ratios from pion-nucleon s-wave interaction, p-wave interaction, both p-wave and s-wave interactions, and x=0 (stiffer symmetry energy) with respect to that from x=1 (softer symmetry energy) in free space at different collision energies.

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