Eta Absorption by Mesons

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Using the $[SU(3)_L x SU(3)_R]_{global} x [SU(3)_V]_{local}$ chiral Lagrangian with hidden local symmetry, we have evaluated the cross sections for the absorption of eta meson (η) by pion (π), rho (η), omega (ω), kaon (K), and kaon star (K^*) in the tree-level approximation [1]. With empirical masses and coupling constants as well as reasonable values for the cutoff parameter Λ in the form factors at interaction vertices, we find that most cross sections are less than 1 mb, except the reactions $\rho\eta \to KK^*(KK^*)$, $\omega\eta \to KK^*(KK^*)$, $K^*\eta \to \rho K$, and $K^*\eta \to \omega K$, which are a few mb, and the reactions $\pi\eta \to KK$ and $K\eta \to \pi K$, which are more than 10 mb. Including these reactions in a kinetic model based on a schematic hydrodynamic description of relativistic heavy ion collisions, we find that the abundance of eta mesons likely reaches chemical equilibrium with other hadrons in nuclear collisions at the Relativistic Heavy Ion Collider as shown in Fig.1.

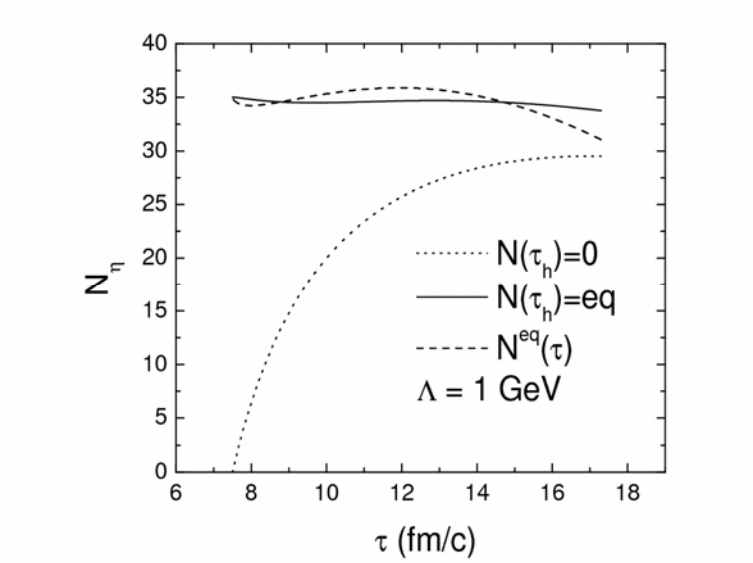

Figure 1. Time dependence of the abundance of midrapidity eta mesons in the hot hadronic gas formed from central Au+Au collisions at $s^{1/2}_{NN}$=200 GeV at RHIC for cutoff parameter Λ=1 GeV. Solid and dotted lines correspond, respectively, to eta mesons that are chemically equilibrated or absent at beginning of the hadronic phase, while the dashed line corresponds to eta mesons that are always in chemical equilibrium.

[1] W. Liu and C.M. Ko, Nucl. Phys. A **765**, 401 (2006).