Ratios of heavy baryons to heavy mesons in relativistic nucleus-nucleus collisions

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We have studied heavy baryon/meson ratios Λ_c/D_0 and Λ_b/B_0 in relativistic heavy ion collisions in the quark coalescence model [1]. For heavy baryons, we include production from coalescence of heavy quarks with free light quarks as well as with bounded light diquarks [2] that might exist in the strongly coupled quark-gluon plasma produced in these collisions. As shown in Fig. 1 and Fig. 2, the resulting Λ_c/D_0 and Λ_b/B_0 ratios, including the contribution from decays of heavy hadron resonances and also that due to fragmentation of heavy quarks that are left in the system after coalescence, in central Au+Au collisions at $s_{NN}^{1/2}$= 200 GeV are about a factor of five and ten, respectively, larger than those given by the thermal model, and about a factor of ten and twelve, respectively, larger than corresponding ratios in the PYTHIA model for pp collisions. These ratios are reduced by a factor of about 1.6 if there are no diquarks in the quark-gluon plasma. The momentum dependence of the heavy baryon/meson ratios is found to be sensitive to the heavy quark mass, with the Λ_b/B_0 ratio being much flatter than the Λ_c/D_0 ratio, which peaks at the transverse momentum $p_T \sim 0.8$ GeV but the peak shifts to $p_T \sim 2$ GeV in the absence of diquarks.

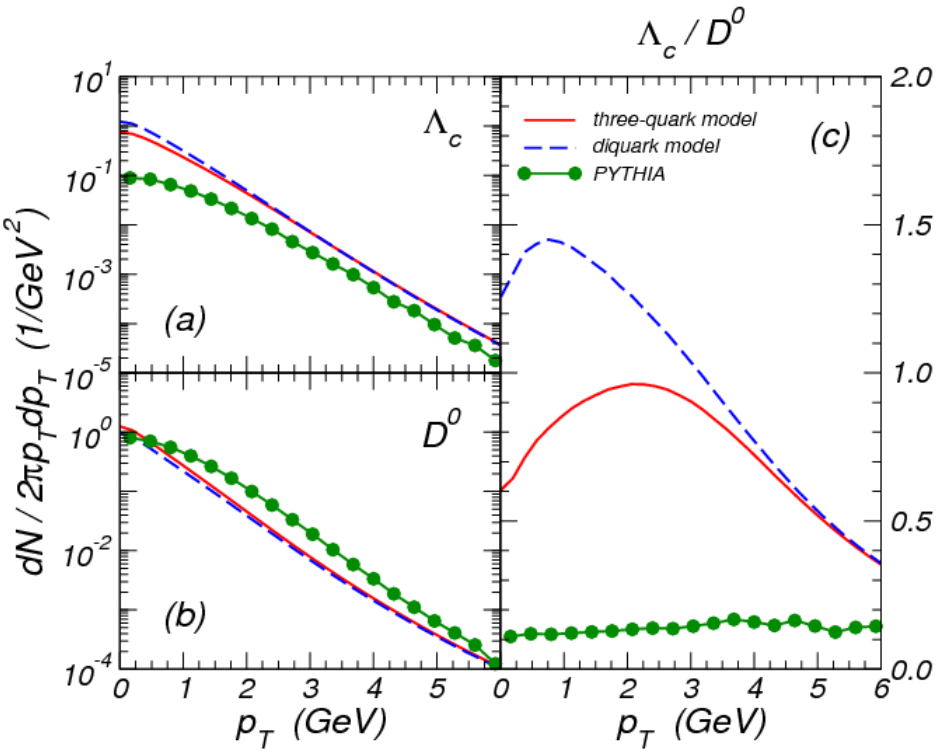

FIG. 1. Spectra of (a) Λ_c and (b) D_0 as well as (c) the ratio Λ_c/D_0. Solid lines are for the three-quark model and dashed lines are for the diquark model. Results from the PYTHIA model are shown by filled circles.

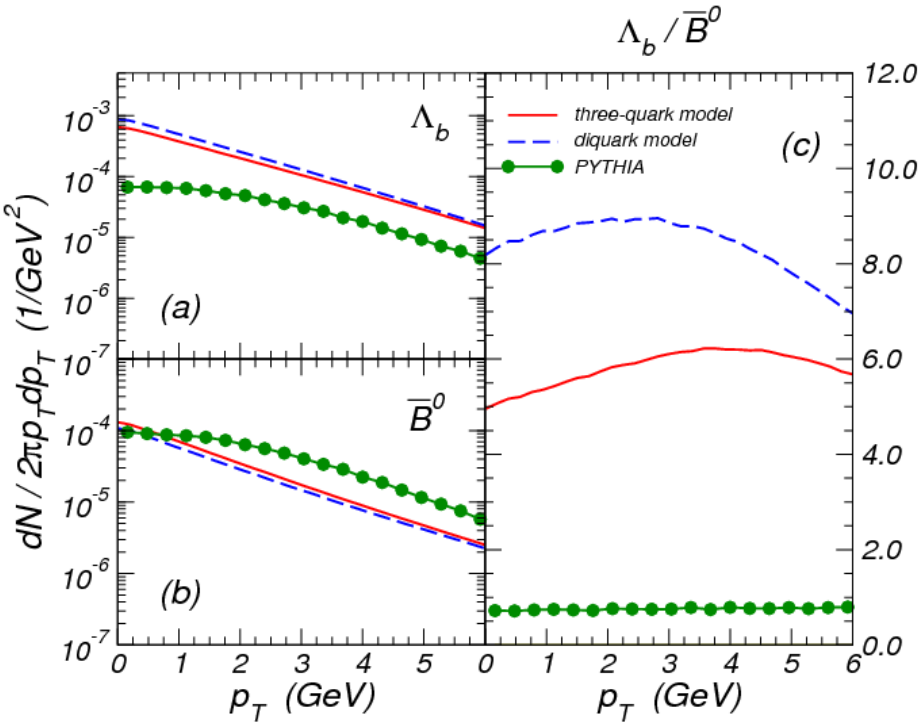

FIG. 2. Same as Fig.1 for (a) Λ_b and (b) B_0 spectra, and (c) the Λ_b/B_0 ratio.

[1] Y. Oh, C. M. Ko, S. H. Lee, and S. Yasui, Phys. Rev. C **79**, 044905 (2009).

[2] S. H. Lee, K. Ohnishi, S. Yasui, I. K. Yoo, and C. M. Ko, Phys. Rev. Lett. **100**, 222301 (2008).