Lambda hyperon polarization in relativistic heavy ion collisions from a chiral kinetic approach

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Based on the chiral kinetic approach, which includes the propagation of massless quarks with definite helicity and their modified scattering in magnetic and vorticity fields [1,2], we have studied the spin polarizations of quarks and antiquarks in non-central heavy ion collisions at the Relativistic Heavy Ion Collider [3]. Using initial conditions from a multiphase transport model [4] and with the vorticity field calculated self-consistently from the velocity field of quarks and antiquarks in these collisions, we have found that quarks and antiquarks acquire appreciable spin polarizations in the direction perpendicular to the reaction plane of the collisions. Converting quarks and antiquarks to hadrons via the coalescence model, we have further calculated the spin polarizations of Lambda and anti-Lambda hyperons and found their values comparable to those measured in experiments by the STAR Collaboration [5] as shown in Fig. 1.
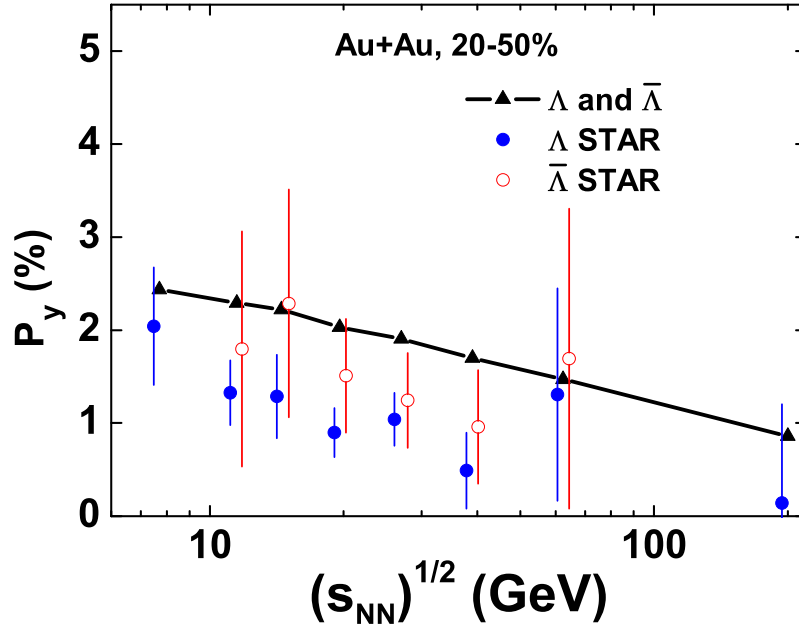

FIG. 1. Energy dependence of the spin polarization of midrapidity ($|y| \leq 1$) lambda and antilambda hyperons in Au+Au collisions at energies from 7.7 GeV to 200 GeV. Data with error bars are from the STAR Collaboration [5].

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