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Shear-induced spin polarization in heavy-ion collisions

We study the spin polarization generated by fluid gradients based on data-calibrated hydrodynamic simulations. In additional to the widely studied thermal vorticity effects, we identify an undiscovered contribution from the fluid shear. The expression of the shear-induced polarization (SIP) can be obtained by quantum kinetic equation and linear response theory. Based on a realistic hydrodynamic model, we compute the azimuthal angle dependence of polarization $P_y(\phi)$ and $P_z(\phi)$ including both thermal vorticity and shear effects. We find that SIP contribution always shows the same azimuthal angle dependence as experimental data and competes with the thermal vorticity effect. In the scenario that Λ inherits and memorizes the spin polarization of strange quark, SIP wins the competition, and the resulting $P_y(\phi)$ and $P_z(\phi)$ agrees qualitatively with the experiment measurements.

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