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Local Lambda polarization and feed-down effect in heavy-ion collisions

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Spin polarization of Λ hyperon has been observed by STAR in non-central heavy-ion collisions [1,2,3]. Among these measurements, the global polarization reflects the bulk-averaged value of the vorticity, while the local polarization probes more detailed structure of the vorticity field.

We have studied the Λ polarization in heavy-ion collisions using a multi-phase transport (AMPT) model. The results show that:

1. The value of global polarization decreases with increasing collision energy [4]. This is in agreement with the measurement [1,2].
2. Because of the non-uniform transverse expansion of the fireball, it can produce transverse vorticity circling the beam direction and further generate transverse local polarization [5].
3. The result for the longitudinal local polarization [5] is consistent with the hydrodynamic calculation. However, these calculations have an opposite sign comparing to the experiment measurement [3].

To resolve this sign puzzle, we further study the effect of feed-down decay on local Λ polarization [6]. We develop a theoretical framework to study how spin polarization is transferred from parent to daughter particle in two-body decay. After Monte-Carlo simulation, we find that the feed-down effect suppresses the primordial Λ polarization, but can not flip the sign.

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