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Spin Polarization in Heavy-Ion Collisions: Effects of Late-Stage Spin Dynamics

In 2017, the STAR collaboration at RHIC unveiled the global polarization of Λ hyperons, establishing a connection between angular momentum in heavy-ion collisions and the vorticity of the quark-gluon plasma (QGP). However, a comprehensive understanding of how spin-states - and thus polarization - evolve throughout the hadronic phase presents a significant challenge. This study investigates the impact of spin-flip processes during (in)elastic scatterings on Λ polarization in the hadronic rescattering phase.

We incorporate spin-flip cross sections, derived from both s- and t-channel processes as calculated by Sung, Ko, and Lee [arXiv:2404.15890v1], into the SMASH-vHLLE hybrid approach. This integration enables a dynamic representation of spin states within the hadronic transport regime. Our research systematically implements spin-flip effects in hadronic transport simulations, yielding critical insights into the late-stage evolution of polarization in heavy-ion collisions. The findings hold direct relevance for interpreting experimental results from RHIC and the LHC, advancing our understanding of spin dynamics in the context of QCD.

Category

Theory

Collaboration (if applicable)

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