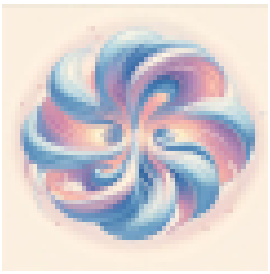

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The weak magnetic effect on the direct photon production and hyperon local spin polarization

mardi 23 juillet 2024 12:30 (30 minutes)

It is expected that there exists an ultra-central strong magnetic field during the early stages of heavy-ion collisions. However, due to the rapid decay, it is a weak magnetic field that along with the evolution of quark-gluon plasma (QGP)

In this work, we study the dissipative correction induced by a weak magnetic field during the QGP stage. Employing the viscous hydrodynamics simulation, we calculate two associated probes with weak magnetic dissipation, i.e., the direct photon elliptic flow and the hyperon local spin polarization.

We find that the magnetic field can lead to a large enhancement of the photon momentum anisotropy when coupled with the longitudinal dynamics of the background medium. With a finite magnetic field, the experimental measured direct photon v_2 can be well reproduced but with less than a 10% increment on the photon yield. On the other hand, we find that the weak magnetic correction on the quark phase distribution has a significant contribution to the local spin polarization and even flips the sign. The spin cooper frye formula with the weak magnetic correction is obtained. After incorporating this novel effect, one can reproduce the second and third modulation of local spin polarization along the beam direction, not only the sign but also the centrality dependence. Finally, the required magnetic field for these two observables is about 0.1 m_π^2.

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