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Color-field induced spin transport in high-energy nuclear collisions

Despite the successful description of global polarization of Λ hyperons in heavy ion collisions through thermal voricity, the follow-up observations of local spin polarization and spin alignment of vector mesons further indicate the presence of additional mechanisms upon spin transport of quarks in the QCD medium. In high-energy nuclear collisions, the soft thermal gluons in the quark gluon plasma phase or the overpopulated gluons in the glasma phase as its precursor in the color-glass-condensate effective theory may be delineated by fluctuating chromo-electromagnetic fields (or color fields for short). By employing the recently developed quantum kinetic theory of quarks with phenomenological models and approximations, we study the momentum dependence for dynamical spin alignment of ϕ mesons from longitudinally dominant color fields in the glasma phase. Also, the non-dynamical spin alignment coming from soft thermal gluons characterized by isotropic color fields in the quark gluon plasma is qualitatively analyzed for comparison. Moreover, we investigate how color-field correlators along with anisotropic quark flow could generate local spin polarization from the corona of the glasma, which may play a significant role on longitudinal polarization of Λ hyperons particularly in small collision systems.

Primary author: YANG, Di-Lun (Academia Sinica)

Presenter: YANG, Di-Lun (Academia Sinica)

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