

Measurement of global and local spin polarization of Λ and $\bar{\Lambda}$ in Au+Au collisions from the RHIC Beam Energy Scan-II

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Abstract

Significant global hyperon polarization has been observed in non-central heavy ion collisions, providing evidence of the vorticity of the quark-gluon plasma (QGP). This effect can serve as a new probe for exploring the fluid properties of strongly interacting matter. A difference between the global polarization of $\bar{\Lambda}$ and Λ could originate from the strong late-stage magnetic field in heavy ion collisions. In addition, local vorticity in the transverse plane, related to collective flow and density fluctuations, can lead to polarization along the beam direction, known as local polarization. A baryonic spin Hall effect is also predicted, with local polarization difference of Λ and $\bar{\Lambda}$ induced by the gradient of the baryonic chemical potential.

In this talk, we will present new results of Λ and $\bar{\Lambda}$ global polarization in Au+Au collisions at $\sqrt{s_{NN}}=7.7, 9.2, 11.5, 14.6$ and 17.3 GeV from RHIC BES-II with upgraded STAR detector systems. We also present results of local polarization for Λ and $\bar{\Lambda}$ in Au+Au collisions at $\sqrt{s_{NN}}=7.7 - 27$ GeV from BES-II. Our measurements can provide important insights into the late-stage magnetic field sustained by the QGP and the spin Hall currents possibly created in a highly dense baryonic environment.