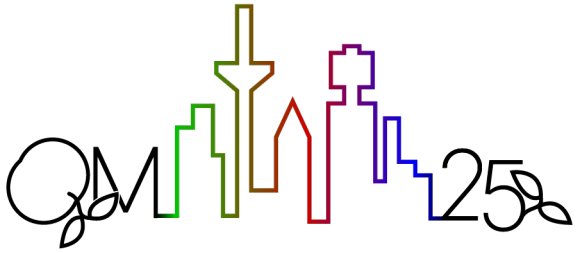

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Measurements of $\Lambda(\bar{\Lambda})$ hyperons' local spin polarization in Au+Au collisions from the RHIC Beam Energy Scan-II

The second harmonic cosine and sine modulations of the local spin polarization of $\Lambda(\bar{\Lambda})$ hyperons out-of-plane (P_y) and in-plane (P_z), denoted as P_{2y} and P_{2z}, respectively, are newly proposed observables for probing spin Hall effect (SHE) in high-density baryonic region. P_{2y} and P_{2z} are measured in Au+Au collisions at $\sqrt{s_{NN}} =$ 7.7, 9.2, 11.5, 14.6, 17.3, 19.6 and 27 GeV from the RHIC Beam Energy Scan-II. A monotonic decrease of P_{2y} for Λ with increasing collision energy, and smaller positive P_{2z} with hints of sign change at $\sqrt{s_{NN}} = 7.7$ GeV are observed. However, P_{2y} and P_{2z} for $\bar{\Lambda}$ show no significant energy dependence within the large statistical uncertainties. The local polarization components are influenced by thermal vorticity, shear-induced effects, and baryon chemical potential. The measured Λ and $\bar{\Lambda}$ local polarization ($P^{\mathrm{local},\Lambda}_{2y,2z}$,$P^{\mathrm{local},\bar{\Lambda}}_{2y,2z}$) offer a promising avenue for probing the SHE. These measurements provide valuable insights into the spin dynamics of QCD matter in high-density baryonic environments.

Category

Experiment

Collaboration (if applicable)

STAR

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