

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

Qiang Hu for the STAR Collaboration

Abstract

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) driven by the gradient of baryonic chemical potential [1, 2]. 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. These measurements provide valuable insights into the spin dynamics of QCD matter in high baryon density environments.

References

- [1] S. Y. F. Liu et al., Phys. Rev. D **104**, 054043 (2021).
- [2] B. Fu et al., arXiv:2201.12970.