Measurement of global hyperon polarization in Au+Au collisions at $\sqrt{s_{\rm NN}} = 3 - 27$ GeV with the STAR detector

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Global polarization of Λ and $\bar{\Lambda}$ hyperons, $\overline{P}_{\rm H}$, has previously been measured in heavy-ion collisions ranging from $\sqrt{s_{\rm NN}} = 7.7$ GeV to 5.02 TeV and successfully reproduced by hydrodynamic and transport models, implying a large global vorticity within the Quark-Gluon Plasma (QGP). Recent high-statistics data sets of Au+Au collisions at low $\sqrt{s_{\rm NN}}$ of 3 and 7.2 GeV were acquired in fixed-target collision mode [1]. The statistics and detector acceptance allowed a measurement of significant $\overline{P}_{\rm H} > 0$ as well as the study of the dependence of $\overline{P}_{\rm H}$ on collision centrality, transverse momentum, $p_{\rm T}$, and rapidity, y. A notable advantage of the STAR acceptance at low $\sqrt{s_{\rm NN}}$ is the ability to measure the dependence of $\overline{P}_{\rm H}$ on y across the full range of hyperon production in rapidity, which allows comparison with a large number of model calculations which attempt to understand this dependence. Contrary to these calculations, which tend to show a stronger dependence of $\overline{P}_{\rm H}$ on rapidity with decreasing $\sqrt{s_{\rm NN}}$, we see no such trend within uncertainties. Our measurement may challenge the understanding of the distribution of voriticity within the QGP.

Additionally, Ref. [2] studied the dependence of $\overline{P}_{\rm H}$ on collision centrality, $p_{\rm T}$, and y with high statistics at $\sqrt{s_{\rm NN}} = 200$ GeV. Recent high-statistics data sets at $\sqrt{s_{\rm NN}} = 19.6$ and 27 GeV allow for more significant measurements of global $\overline{P}_{\rm H}$ as well as these differential measurements, which allow for a characterization of the vortical flow structure between these collision-energy extremes.

[1] M. S. Abdallah et al. Global Λ-hyperon polarization in Au+Au collisions at $\sqrt{s_{\rm NN}} = 3$ GeV. 7 2021. arXiv:2108.00044.

[2] Jaroslav Adam et al. Global polarization of Λ hyperons in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. *Phys. Rev. C*, 98:014910, 2018.