

# Quark Matter 2019 - the XXVIIIth International Conference on Ultra-relativistic Nucleus-Nucleus Collisions



Contribution ID: 750

Type: Oral Presentation

## Differential measurements of $\Lambda$ polarization in Au+Au collisions and a search for the magnetic field by STAR

Wednesday, 6 November 2019 14:00 (20 minutes)

Lambda polarization  $P_{\Lambda/\bar{\Lambda}}$  was measured by the STAR collaboration [1], confirming the existence of extremely large vorticities within the Quark-Gluon Plasma (QGP). A recent study using a high-statistics data set at  $\sqrt{s_{NN}} = 200$  GeV has shown the dependence of  $P_{\Lambda/\bar{\Lambda}}$  on collision centrality, azimuthal angle ( $\varphi$ ), transverse momentum ( $p_T$ ), pseudorapidity ( $\eta$ ), etcetera [2][3]. Additionally suggested in [1] is an enhanced  $P_{\Lambda}$  relative to  $P_{\bar{\Lambda}}$  across all beam energies; however, the statistics are too limited to make a significant measurement. No such splitting is observed in the high-statistics  $\sqrt{s_{NN}} = 200$  GeV data set, but this splitting is expected to increase at lower beam energies. The splitting in polarization would be consistent with the effects of hyperon magnetic-moment coupling with the magnetic field sustained in the QGP; it would have far-reaching consequences important to magnetic-field-dependent observables such as the chiral magnetic effect and would set the scale on the conductivity of the QGP.

Recently, STAR has taken high-statistics data sets at  $\sqrt{s_{NN}} = 27$  and 54.4 GeV. The 27 GeV data set is considered suitable to study the splitting between  $P_{\Lambda}$  and  $P_{\bar{\Lambda}}$  since it includes the recently installed Event-Plane Detector (EPD), which significantly increases the event-plane resolution. Both data sets are used to study the splitting between  $P_{\Lambda}$  and  $P_{\bar{\Lambda}}$  as well as the various differential measurements of  $P_{\Lambda/\bar{\Lambda}}$ . Implications of these measurements will also be discussed.

[1] The STAR Collaboration, Global  $\Lambda$  hyperon polarization in nuclear collisions, *Nature* 548 (2017) 62.

[2] The STAR Collaboration, Global polarization of Lambda hyperons in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV, *Phys. Rev. C* 98 (2018) 14910.

[3] The STAR Collaboration, Polarization of  $\Lambda(\bar{\Lambda})$  hyperons along the beam direction in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV, arXiv:1905.11917.

**Primary author:** ADAMS FOR THE STAR COLLABORATION, Joseph (Ohio State University)

**Presenter:** ADAMS FOR THE STAR COLLABORATION, Joseph (Ohio State University)

**Session Classification:** Parallel Session - Chirality III

**Track Classification:** Chirality, vorticity and spin polarization