Investigating the CME in isobaric ($^{96}_{44}Ru$+$^{96}_{44}Ru$ and $^{96}_{40}Zr$+$^{96}_{40}Zr$) collisions at $\sqrt{s_{\rm NN}} = 200$ GeV using Sliding Dumbbell Method with the STAR detector at RHIC

Jagbir Singh
(for the STAR Collaboration)
Instituto de Alta Investigación, Universidad de Tarapacá, Arica, Chile
email: jagbir@rcf.rhic.bnl.gov

Abstract

The chiral imbalance, coupled with the presence of a strong magnetic field produced during heavy-ion collisions, results in charge separation along the magnetic field axis, a phenomenon known as the Chiral Magnetic Effect (CME). A novel technique, the Sliding Dumbbell Method (SDM) [1, 2] has been developed to investigate the CME with the RHIC's isobar program. The SDM facilitates the selection of events corresponding to various charge separations (f_{DbCS}) across the dumbbell. A partitioning of the charge separation distributions for each collision centrality into ten percentile bins is done in order to find potential CME-like events corresponding to the highest charge separation across the dumbbell. The study reports the results on CME sensitive γ-correlator ($\gamma = \langle\cos(\phi_a + \phi_b - 2\Psi_{RP})\rangle$) and δ-correlator ($\delta = \langle\cos(\phi_a - \phi_b)\rangle$) for each bin of f_{DbCS} in each collision centrality for isobaric collisions (Ru+Ru and Zr+Zr) at $\sqrt{s_{\rm NN}} = 200$ GeV measured with the STAR detector. Furthermore, the background scaled ratio ($\Delta\gamma_{Ru/Zr}/\Delta\gamma_{Bkg}$) will be presented to check for the expected enhancement of the CME in Ru+Ru collisions as compared to Zr+Zr collisions. Overall, this research aims to understand and detect the CME through an innovative experimental method.

References

[1] J. Singh, A. Attri, and M. M. Aggarwal, Proceedings of the DAE Symp. on Nucl. Phys. **64**, 830 (2019).

[2] J. Singh (for STAR Collaboration), Springer Proc. Phys. **304**, 464 (2024).