Contribution ID: **119** Type: **Talk**

Estimate of a new baseline for the chiral magnetic effect in isobar collisions at RHIC

Tuesday 14 June 2022 14:20 (20 minutes)

Recently, STAR reported the isobar ($^{96}_{44}$Ru + $^{96}_{44}$Ru, $^{96}_{40}$Zr + $^{96}_{40}$Zr) results for the chiral magnetic effect (CME) search [1]. The Ru+Ru to Zr+Zr ratio of the CME-sensitive observable $\Delta\gamma$, normalized by elliptic anisotropy (v_2), is observed to be close to the inverse multiplicity (N) ratio. In other words, the ratio of the $N\Delta\gamma/v_2$ observable is close to the naive background baseline of unity. However, nonflow correlations are expected to cause the baseline to deviate from unity. To further understand the isobar results, we study nonflow effects using the isobar data by studying two-particle correlations as functions of pseudorapidity and azimuthal angle differences ($\Delta\eta$, $\Delta\phi$) of the pairs. We fit this 2D distribution of same-sign pairs and attempt to extract the "true" v_2, whose difference from the measured v_2 is estimated as the nonflow contribution to the latter. We decompose the nonflow contributions to $N\Delta\gamma/v_2$ (isobar ratio) into three terms [2] and quantify each term by using the nonflow in v_2 measurement, published STAR data [1] and HIJNG simulations. From these estimates, we arrive at a new baseline of the isobar ratio of $N\Delta\gamma/v_2$ for the CME. We report this new baseline and discuss its implications.

[1] M. Abdallah *et al.* [STAR], Phys. Rev. C **105**, no.1, 014901 (2022)
[2] Y. Feng, J. Zhao, H. Li, H. j. Xu and F. Wang, Phys. Rev. C **105**, no.2, 024913 (2022)

Present via

Online

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Session Classification: PA-Other topics

Track Classification: Other topics