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Study of non-flow baseline for the CME signal via two-particle ($\Delta\eta$, $\Delta\phi$) correlations in isobar collisions at STAR

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Recently, STAR reported the isobar ($^{96}_{44}$Ru$+^{96}_{44}$Ru, $^{96}_{40}$Zr$+^{96}_{40}$Zr) results for 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 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, non-flow correlations are expected to cause the baseline to deviate from unity. To further understand the isobar results, we study non-flow effects using the same isobar data by two-particle correlations as functions of pseudorapidity and azimuthal angle differences ($\Delta\eta$, $\Delta\phi$) of the pairs. We extract the charge-dependent correlations by the difference between the opposite-sign (OS) and same-sign (SS) charge pairs, properly normalized such that the correlations vanish at $|\Delta\eta| \to \infty$. These charge-dependent correlations come primarily from resonance decays, intra-jet (near-side) correlations, and Coulomb effects. We study the charge-independent correlations by examining the small and large $|\Delta\eta|$ behaviors of the SS correlations. The intra-jet (near-side) can be well isolated at small $|\Delta\eta|$ and $|\Delta\phi|$. We investigate the inter-jet (away-side) correlations by exploiting Pythia and HIJING simulations, together with the knowledge of near-side correlations obtained from the data. By comparing the two isobar systems, many systematic uncertainties can be minimized. By studying how non-flows differ between the two isobar systems, we can gain insights into the baseline of the CME.

[1] M. Abdallah et al. [STAR], [arXiv:2109.00131 [nucl-ex]].

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