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Post-blind Analysis of Isobar Collisions and Background-controlled Upper Limit on the Chiral Magnetic Effect from STAR

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The STAR Collaboration has reported results from a blind analysis of isobar collisions ($^{96}_{44}$Ru + $^{96}_{44}$Ru, $^{96}_{40}$Zr + $^{96}_{40}$Zr) at $\sqrt{s_{\rm NN}}$ = 200 GeV on the search for the chiral magnetic effect (CME). Significant differences were observed in the measured multiplicity (N) and elliptic anisotropy (v_2) between the two isobar systems [1]. The isobar ratio (Ru/Zr) of CME-sensitive observable, v_2-scaled charge separation ($\Delta\gamma/v_2$) is close to but systematically larger than the inverse multiplicity ($1/N$) ratio. This indicates the potential existence of a CME signal, as well as the presence of remaining background that is different between the isobars [2]. In this contribution, we present two post-blind analyses of the isobar data that address the remaining backgrounds and attempt to extract any possible CME signal. One of the analysises applies a weighting procedure such that the two isobar systems have identical distributions of N and v_2, and then compares the CME-sensitive observables ($\Delta\gamma$ correlator and signed Balance Functions [3]) between two isobars with matched N and v_2. The other analysis examines the two- and three-particle nonflow contributions to the isobar ratio of $\Delta\gamma/v_2$ using real data as well as HIJING simulation. This allows the estimation of a modified background baseline for the $\Delta\gamma/v_2$ ratio. The overall contribution of nonflow is found to be positive, resulting in a background baseline larger than the inverse multiplicity ratio and generally consistent with the isobar measurements. We extract an upper limit of the CME signal in isobar collisions.

[1] M. Abdallah *et al.* (STAR Collaboration), Phys. Rev. C **105**, 014901 (2022)
[2] D.E.Kharzeev, J.Liao and S.˜Shi, Phys. Rev. C **106**, L051903 (2022)
[3] S. Choudhury *et al.*, Chinese Phys. C **46** 014101 (2022)

Category

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