Search for the Chiral Magnetic Effect with Isobar Collisions at $\sqrt{s_{NN}}$= 200 GeV by the STAR Collaboration at RHIC

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The chiral magnetic effect (CME) is predicted to emerge as a result of a local violation of P and CP symmetries of the strong interaction medium amidst a strong electro-magnetic field developed in relativistic heavy-ion collisions. A measurable consequence of the CME involves a separation of positively and negatively charged hadrons along the direction of the magnetic field. Prior measurements of the CME-sensitive charge-separation measurements stay inconclusive because of enormous background contributions. To better handle the impact of CME-signal and -backgrounds, the STAR Collaboration conducted a blind analysis of a large data sample of approximately 3.8 billion isobar collisions of Ru+Ru and Zr+Zr at $\sqrt{s_{NN}}$=200 GeV. Before the blind analysis, the CME signatures are predefined for the CME-sensitive observables considering larger magnetic field in Ru+Ru collisions than in Zr+Zr collisions. Precision down to 0.4% is achieved, as intended, in the relative magnitudes of the relevant observables between the isobars. Experimentally observed differences in the multiplicity and flow harmonics at the same centrality show that the magnitude of the CME background is not similar between the two isobars. No CME signature that satisfies the predefined benchmarks has been observed in isobar collisions in the blind analysis.