

Search for the Chiral Magnetic Effect by the STAR Experiment

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Abstract

The quark gluon plasma created in high-energy heavy-ion collisions has been conjectured to exhibit a spontaneous electric-charge separation in the direction of a strong magnetic field through the chiral magnetic effect (CME). The experimental confirmation of the CME in heavy-ion collisions will uncover fundamental aspects of strong interaction physics such as the QCD chiral symmetry restoration and the topological configurations of non-Abelian gauge fields. Over the past decade, the STAR experiment has performed a series of charge-separation measurements in Au+Au collisions at various beam energies from $\sqrt{s_{NN}} = 200$ GeV down to 7.7 GeV, and in different collision systems including p+Au, d+Au, Cu+Cu, Au+Au and U+U collisions, as well as the recent isobaric Ru+Ru and Zr+Zr collisions. Multiple analysis methods have also been developed to manifest the charge separation effect and suppress the flow related background. In this talk, we will review the aforementioned results, summarize our current understanding, and provide an outlook on future analyses.