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Chiral Magnetic Effect in Heavy Ion Collisions

High-energy heavy ion collisions result in a deconfined phase transition where instead of ordinary nuclear matter in form protons and neutrons one can study the strongly coupled quark-gluon plasma (QGP). In peripheral heavy ion collisions, the presence of the strong magnetic fields and the chiral anomaly is predicted to induce an electric current which induces a charge separation along the field direction known as the chiral magnetic effect (CME). This effect is one of the direct predictions of Quantum Chromodynamics (QCD) therefore the experimental discovery of CME would allow for a greater insight of QCD as well as the physics of the early universe. Experimental observation of the CME could be achieved through measurements of final state charge separation, but complicated by multiple background contributions obscuring interpretation of the data. In this work, the CME signal extraction is executed by using a charge-sensitive in-event correlator $R(\Delta S)$[1], that quantifies the charged particle azimuthal distribution at low momentum. We will present the $R(\Delta S)$ correlator in different model scenarios that will lead to discernible correlator response between background-driven and CME-driven charge separation relative to the second-order and third-order event planes. The tests also indicate a degree of sensitivity which would allow for characterization of the CME via anomalous viscous fluid dynamics model comparisons.

[1]Niseem Magdy et al., A new correlator to detect and characterize the chiral magnetic effect, Phys.Rev.C97,061901(2018)

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