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Finite volume effects on the chiral magnetic effect

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In Heavy-Ion Collisions (HIC), the high temperature nuclear matter is expected to be produced with a chiral imbalance. The presence of a chiral imbalance can be detected in HIC by looking at observables related to the Chiral Magnetic Effect (CME). In off-central collisions, the nuclear matter also possesses a very large vorticity. In order to preserve causality, a rotating system can not extend to infinity but must be confined in a finite region, for instance by means of a boundary condition.

We study a free gas of massless fermions confined in a finite cylinder in the presence of a constant magnetic field and with chiral imbalance. We impose the boundary condition using the MIT bag model and we compute the CME. We find that in a cylinder with fixed radius the CME current is decreasing for magnetic fields below a critical value that depends on the radius. Estimates and consequences in HIC are discussed.

Category

Theory

Collaboration (if applicable)

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