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In- and out-of-equilibrium aspects of the Chiral Magnetic Effect

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In this work, we study the Chiral Magnetic Effect (CME) from lattice QCD simulations considering two different scenarios, in particular focusing on the leading-order coefficient of the vector current in a chiral chemical potential expansion. In the first scenario, we consider continuum extrapolated QCD with 2+1 flavors of improved staggered fermions, a system in thermal equilibrium, with a non-uniform magnetic background. We show that local chiral magnetic currents appear in this setup, following non-trivially the magnetic field profile. We check that these currents average to zero in the full volume, confirming that the total CME conductivity vanishes in equilibrium. In the second case, we present the first steps towards studying the out-of-equilibrium aspects of CME on the lattice.

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