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Spacetime dynamics of chiral magnetic currents in a hot non-Abelian plasma

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The correlations of electric currents in hot non-Abelian plasma are responsible for the experimental manifestations of the chiral magnetic effect in heavy-ion collisions. We evaluate these correlations using holography, and show that they are driven by large-scale topological fluctuations. In a non-Abelian plasma with chiral fermions, local axial charge can be generated either by topological fluctuations (creating domains with nonzero Chern-Simons number) or by thermal fluctuations. Within holography, we investigate the dynamical creation of the axial charge and isolate the imprint of the topological dynamics on the spatial correlations of electric current. In particular, we show that the spatial extent of the current correlation is quite large (~ 1 fm) and grows with time, which is consistent with sphaleronlike dynamics. We provide numerical estimates for this spatial size that can be used as an input in phenomenological analyses.

Auteurs principaux: KHARZEEV, Dmitri E. (Stony Brook University); GRIENINGER, Sebastian (Stony Brook University)

Orateur: GRIENINGER, Sebastian (Stony Brook University)

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