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Non-static analysis of the anomalous chiral conductivities

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The possible violation of parity in high-energy nuclear collisions has been gaining an increasing attention in recent years. Namely, convincing evidences show that the electromagnetic fields present at the initial stage of the collision, and also the vorticity of the QGP fluid reach such large values that the microscopic dynamics might be affected by them. It has been theorized, that these intense fields combined with the chiral imbalance of the QCD plasma at high temperatures (due to the chiral anomaly) result the anomalous transport phenomena such as the chiral magnetic (CME) and chiral vortical effects (CVE).
It is crucial to have realistic simulations in hand in order to evaluate possible experimental signals of CME and CVE. The fast fluctuation of the QCD chiral charge requires time and space dependent description of the transport coefficients. In this contribution we give the CME conductivities for arbitrary frequencies in terms of the fermionic spectral density using real-time Keldysh-formalism. These conductivities are suitable to calculate the medium response induced by fast perturbations in the chiral charge. We discuss the time dependence of the induced electric current both for realistic patterns of chiral imbalance as well as the fast change of EM-fields. Our treatment are also able to incorporate interactions between the fermions which could possibly lead damping effects. The presented conductivity expressions are reliable not only in equilibrium, which might be useful to improve the numerical tools used for simulating the evolution of the hot QGP fluid.

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