

Nonlinear Chiral Transport Phenomena from Holography

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We study nonlinear chiral transport phenomena in the holographic context by considering anomalous $U(1)_V$ times $U(1)_A$ Maxwell theory in Schwarzschild- AdS_5 . Off-shell constitutive relations for vector/axial currents are derived for the setup of inhomogeneous charge densities (chemical potentials) and constant electric and magnetic fields in a weak external field approximation. The momentum-dependent transport coefficients are first computed analytically in the hydrodynamic limit, up to third order in the derivative expansion and then numerically for generic values of momenta. In addition to the generalization of known anomaly induced transport phenomena in the literature, we also derive new nonlinear transports, including the ones recently proposed (by using the chiral kinetic theory) in [1] and [2].

(This work is In progress with Y. Bu and M. Lublinsky)

[1] J. Chen, T. Ishii, S. Pu, N. Yamamoto

“Nonlinear Chiral Transport Phenomena”, Phys.Rev. D93 (2016) no.12 125023, arXiv: 1603.03620.

[2] E.V. Gorbar, I.A. Shovkovy, S. Vilchinskii, I. Rudenok, A. Boyarsky, O. Ruchayskiy, “Anomalous Maxwell equations for inhomogeneous chiral plasma”, Phys.Rev. D93 (2016) no.10 105028, arXiv:1603.03442.

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