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Hydrodynamic fluctuations and long time tails of a baryon charged expanding fluid

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Recent studies of hydrodynamic fluctuations in rapidly expanding fluids suggest the existence of a universal renormalization which characterizes the long time behaviour of the equilibrium correlators of energy and momentum and transport coefficients. These results were obtained by assuming zero densities of conserved charges. In this work we study the effects of hydrodynamic fluctuations when the chemical potentials conjugated to the conserved charges are turned on. We study the small frequency behavior of different response functions using stochastic fluid dynamics. We obtain a number of model independent results, including the long-time tail of different transport coefficients, and the leading non-analyticity of the correlators of energy, momentum and particle density for a system undergoing Bjorken flow. When applying our formalism to the lattice QCD equation of state at finite chemical potential we find lower bounds on the heat conductivity, shear and bulk viscosities. These bounds are weakly dependent on assumptions regarding the range of applicability of fluid dynamics. We comment on the phenomenological consequences of our findings in Ultrarelativistic Heavy Ion Collisions

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