MP 5: QFT Far From Equilibrium

Time: Tuesday 11:45–12:25 Location: H-HS VII

MP 5.1 Tue 11:45 H-HS VII

Transport, entanglement, and chaos in chiral quantum fluids far from equilibrium — •Matthias Kaminski[1], Casey Cartwright[1], Jana Ingram[1], Roshan Koirala[1], and Martin Ammon[2] — [1]Department of Physics and Astronomy, University of Alabama, Tuscaloosa, AL 35487, USA — [2]Theoretisch-Physikalisches Institut, Friedrich-Schiller University of Jena, 07743 Jena, Germany

First, applying recently developed methods, we systematically construct and complete the hydrodynamic description of charged chiral quantum fluids in strong external magnetic fields as an effective field theory. This description includes the effect of chiral anomalies, magnetization and polarization. Novel transport effects arise.

Second, as a proof of existence, within a holographic (gauge/gravity correspondence) model, we compute most of the linear response coefficients describing these transport effects. The holographic model on the gravity side consists of charged magnetic black hole solutions to Einstein-Maxwell-Chern-Simons theory.

Third, as the main part of this work, we drive that same gravitational model far from equilibrium through rapid mass accretion. From this, we compute entanglement entropy and correlation functions of the corresponding fluid far from equilibrium. We derive relations between the linear response coefficients mentioned above, such as diffusivity, and the quantities characterizing the chaotic behavior of the system, such as the butterfly velocity.

MP 5.2 Tue 12:05 H-HS VII

Effective Transport Coefficients in Time-Dependent Field Theory: Far-from-Equilibrium Shear Viscosity via Holography — •Michael Florian Wondrak[1,2], Matthias Kaminski[3], and Marcus Bleicher[1,2] — [1]Frankfurt Institute for Advanced Studies (FIAS), Frankfurt am Main, Germany — [2]Institut für Theoretische Physik, Goethe-Universität Frankfurt am Main, Germany — [3]Department of Physics and Astronomy, University of Alabama, Tuscaloosa, USA

The gauge/gravity duality offers an elegant way of characterizing field theories at strong coupling. Close to equilibrium, hydrodynamic transport coefficients have been calculated successfully. Far from equilibrium, mainly thermodynamic properties have been focused on.

In this talk, we extend the definition of the transport coefficients from the quasi-static to the highly dynamic regime. Our approach is based on Wigner transformations within the Green–Kubo formalism. Furthermore, we contrast field-theory and bulk-spacetime generalizations of the entropy density.

We consider a conformal field theory at time-dependent temperature and chemical potential corresponding to an accreting black hole in the bulk. Asymptotically, we consistently recover the well-known quasi-static value of the shear viscosity to entropy density ratio. During the dynamic regime, we find substantial deviations of order one.