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Hydrodynamic Transport: From QFT to a Shear Viscosity Coefficient using the FRG

Tuesday 24 September 2024 14:30 (1h 40m)

Hydrodynamics is an effective, long-range field theory whose properties emerge from the underlying short-range behaviour. The description of dissipative fluids needs knowledge about transport coefficients like viscosities or conductivities that govern the relaxation of a system back to its equilibrium state and depend solely on the systems microscopic properties. In this talk I will present an approach to calculate a shear viscosity coefficient emergent from a real, massive, interacting scalar quantum field theory using the Wetterich equation at finite temperature, introduced via the imaginary time formalism. A flow equation of the viscosity coefficient is given in the framework of linear response theory and solved to extract the temperature dependence even beyond the perturbative regime. Furthermore a truncation is developed which incorporates dissipative effects like 'Landau damping' by introducing discontinuous terms that capture the appearance of a thermal decay width due to heat-bath interactions.

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