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Relativistic hydrodynamics of Polarized Matter

Tuesday, 15 May 2018 19:10 (30 minutes)

The observation of hadronic polarization in the reaction plane in heavy ion collisions has heightened interest in the behavior of relativistic fluids where microscopic degrees of freedom carry spin.
We use Lagrangian Effective Field theory techniques to understand the ideal hydrodynamic limit for such systems. After discussing the relation between this limit, transport theory, and ideal hydrodynamics we derive the equations of motion for a polarized fluid. We show that this system will generally require non-dissipative dynamics at higher order in gradient than first order, leading to breakdown of stability and causality. Thus, such a system necessitates relaxation-type dynamics already in the ideal fluid limit, unlike unpolarized hydrodynamics where the ideal limit is known to be causal.
We discuss this result in light of the conjectured lower limit of viscosity for strongly coupled fluids, and comment on phenomenological applications.
Based on
https://arxiv.org/abs/1701.08263
https://arxiv.org/abs/1703.03079
(both published, PRD) as well as ongoing work.

Content type

Theory

Collaboration

Centralised submission by Collaboration

Presenter name already specified

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