



Contribution ID: 1013

Type: Oral

The space of transport coefficients allowed by causality

As an effective theory, relativistic hydrodynamics is fixed by symmetries up to a set of transport coefficients. A lot of effort has been devoted to explicit calculations of these coefficients. Here we adopt a more general approach, deploying bootstrap techniques to rule out theories that are inconsistent with microscopic causality. What remains is a universal convex geometry in the space of transport coefficients, which we call the hydrohedron. The landscape of all consistent theories necessarily lies inside or on the edges of the hydrohedron. We analytically construct cross-sections of the hydrohedron corresponding to bounds on transport coefficients that appear in sound and diffusion modes' dispersion relations for theories without stochastic fluctuations.

Category

Theory

Collaboration (if applicable)

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Track Classification: New theoretical developments