



High Energy Physics - Theory

Effective field theory for hydrodynamics: Wess-Zumino term and anomalies in two spacetime dimensions

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We develop the formalism that incorporates quantum anomalies in the effective field theory of non-dissipative fluids. We consider the effect of adding a Wess-Zumino-like term to the low-energy effective action to account for anomalies. In this paper we restrict to two spacetime dimensions. We find modifications to the constitutive relations for the current and the stress-energy tensor, and, more interestingly, half a new propagating mode (one-and-a-halfth sound): a left- or right-moving wave with propagation speed that goes to zero with the anomaly coefficient. Unlike for the chiral magnetic wave in four dimensions, this mode propagates even in the absence of external fields. We check our results against a more standard, purely hydrodynamical derivation. Unitarity of the effective field theory suggests an upper bound on the anomaly coefficient in hydrodynamics.

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