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Quantum kinetics of quenched two-dimensional Bose superfluids

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We study theoretically the non-equilibrium dynamics of a two-dimensional (2D) uniform Bose superfluid following a quantum quench, from its short-time (prethermal) coherent dynamics to its long-time thermalization. Using a quantum hydrodynamic description combined with a Keldysh field formalism, we derive quantum kinetic equations for the low-energy phononic excitations of the system and characterize both their normal and anomalous momentum distributions. We apply this formalism to the interaction quench of a 2D Bose gas and study the ensuing dynamics of its quantum structure factor and coherence function, both recently measured experimentally. Our results indicate that in two dimensions, a description in terms of independent quasi-particles becomes quickly inaccurate and should be systematically questioned when dealing with non-equilibrium scenarios.

Abstract category

Numerical Methods

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