Phonon damping in strongly interacting Fermi gases

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Résumé

We derive the phonon damping rate in a pair-condensed Fermi gases for arbitrary interaction strength. On the BCS side, the dispersion relation is concave and we obtain the damping rate due to the four-phonon Landau-Khalatnikov process using quantum hydrodynamics, thus correcting and extending the original calculation of Landau and Khalatnikov [ZhETF, 19 (1949) 637]. On the BEC side, the dispersion relation is convex and the damping rate given by Landau-Beliaev processes. Going on step beyond hydrodynamics, we derive the first correction to the Beliaev damping rate in a unitary gas at zero temperature.
Our predictions can be tested in state-of-the-art experiments with cold atomic gases in the collisionless regime.

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