Abstract Submitted
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Two-fluid hydrodynamic modes in a strongly interacting Fermi gas[1] EDWARD TAYLOR, University of Trento, HUI HU, XIA-JI LIU, University of Queensland, SANDRO STRINGARI, University of Trento, ALLAN GRIFFIN, University of Toronto — Landau's theory of two-fluid hydrodynamics provides an exact description of the low-energy dynamics of all strongly interacting superfluids described by a 2-component order parameter. Extending our recent work, we report on improved variational solutions of the two-fluid hydrodynamic modes in trapped two-component Fermi gases close to unitarity. We show that the two-fluid mode frequencies are identical to the predictions of regular (Euler) hydrodynamics except at certain temperatures where these in-phase modes strongly hybridize with out-of-phase modes. Although two-fluid hydrodynamic modes have been extensively studied in superfluid helium, experiments in trapped quantum gases have yet to detect a clear signal of these modes. We discuss the reasons for this and suggest several experimental signatures of two-fluid behaviour in trapped Fermi superfluids. Measuring the two-fluid mode frequencies is a promising way of testing microscopic theories of the thermodynamic and transport properties at unitarity.

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