

Superfluidity in Bose-Fermi mixtures

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Using fermionic and bosonic isotopes of lithium we produce and study ultracold Bose-Fermi mixtures [1,2]. First in a low temperature counterflow experiment, we measure the critical velocity of the system in the BEC-BCS crossover. Around unitarity, we observe a remarkably high superfluid critical velocity which reaches the sound velocity of the strongly interacting Fermi gas. Second, when we increase the temperature of the system slightly above the superfluid transitions we observe an unexpected phase locking of the oscillations of the clouds induced by dissipation. Finally, as suggested in [3], we explore the nature of the superfluid phase when we impose a spin polarization in the situation where the mean field potential created by the bosons on the fermions tends to cancel out the trapping potential of the latter.

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[2] M. Delehaye, S. Laurent, I. Ferrier-Barbut, S. Jin, F. Chevy, C. Salomon *Physical Review Letters* **115** 265303 (2015).
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