CEA - Saclay 91191 Gif-sur-yvette Cedex
Service de Physique de l'Etat Condensé - UMR 3680

SÉMINAIRE

Mercredi 22 février 2017 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

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Dual Bose-Fermi Superfluids

We will report on the production and study of a mixture of Bose and Fermi superfluids. Such a mixture has long been sought in liquid helium where superfluidity was achieved separately in bosonic 4He and fermionic 3He. However due to strong interactions between isotopes, phase separation occurs when the 3He concentration exceeds 6%, which, so far, has prevented reaching simultaneous superfluidity for both species.
Using dilute quantum gases where interactions can be tuned, we have produced a Bose-Fermi mixture where both species are superfluid [1]. By exciting center of mass oscillations of the mixture we probe the collective dynamics of the system. Coherent energy exchange between the Bose and Fermi gas is observed with very small damping below a certain critical velocity. We compare this critical velocity for superfluid counterflow to a recent theoretical prediction [2,3]. Finally raising the temperature of the system slightly above the superfluid transition reveals an unexpected phase-locking of the oscillations induced by dissipation

1. *Igor Ferrier-Barbut, Marion Delehaye, Sebastien Laurent, Andrew T. Grier, Matthieu Pierce, Benno S. Rem, Frédéric Chevy, Christophe Salomon, A Mixture of Bose and Fermi Superfluids, Science **345,** 1035, (2014)*
2. *Y. Castin, I. Ferrier-Barbut, and C. Salomon, The Landau critical velocity for a particle in a Fermi superfluid, Comptes Rendus Physique, **16**, 241 (2015).*
3. *M. Delehaye, S. Laurent, I. Ferrier-Barbut, S. Jin, F. Chevy, and C. Salomon, Critical Velocity and Dissipation of an ultracold Bose-Fermi Counterflow, Phys. Rev. Lett., **115**, 265303 (2015).*

A coffee break will be served at 11h00. The seminar will be given in English.

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