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Double superfluidity of Bose-Fermi mixtures FRÉDÉRIC CHEVY, MARION DELEHAYE, IGOR FERRIER-BARBUT, SÉBASTIEN LAURENT, CHRISTOPHE SALMON, Ecole Normale Supérieure — Since the discovery of superfluid ^{3}He in 1972, the realization of a doubly-superfluid Bose-Fermi mixture has been one the major goals in the field of quantum liquids. However, due to strong repulsive interactions between helium atoms, the fraction of ^{3}He inside ^{4}He cannot exceed 6%. This high dilution of the fermionic species reduces dramatically its critical temperature from 2.5 mK for pure ^{3}He to a predicted value of 40 μK in the mixture. Despite decades of efforts, this range of temperature is still inaccessible to experimental investigation and has prevented the observation of a dual superfluid phase in liquid helium. In cold atoms however, Feshbach resonances make it possible to control the strength of interatomic interactions and realize stable Bose-Fermi mixtures. In my talk I will discuss the physical properties of weakly-coupled superfluid mixtures of ^{6}Li and ^{7}Li. Superfluidity was revealed by the existence of a critical velocity below which the relative motion of the two species is undamped and the energy transfer between the two gases is coherent. We could interpret this critical velocity using a generalized Landau mechanism in which excitations are shed in both superfluids.

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