One, two, three, many: few body losses in many-body ensembles

FREDERIC CHEVY, SEBASTIEN LAURENT, MATTHIEU PIERCE, TARIK YEFSAH, CHRISTOPHE SALOMON, Ecole Normale Superieure — Recent experiments have demonstrated the possibility of achieving dual superfluidity in Bose-Fermi mixtures. In my talk I will address the remarkable stability of these systems and show that in weakly-coupled mixtures, the loss rate is proportional to Tan's contact parameter that quantifies the short-range behaviour of two-body correlations in the fermionic system. Using a $^7\text{Li}/^6\text{Li}$ mixture we probe the recombination rate in both the thermal and dual-superfluid regimes. We find excellent agreement with our model in the BEC-BCS crossover. At unitarity where the fermion-fermion scattering length diverges, we show that the loss rate is proportional the $4/3$ power of the fermionic density. Our result interpolate between the three-body losses expected in the weakly attractive (BCS) limit and the dominant two-body dimer-dimer processes in the strongly attractive (BEC) regime.