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A weakly coupled impurity in a resonant Fermi gas: Connecting few-body inelastic decay to quantum correlations in a many-body system (ONSITE presentation)

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We study the lifetime of a mixture of quantum degenerate fermions and bosons [1]. We show that when the interspecies coupling is weak, the loss rate is proportional to Tan's Contact parameter. When the fermion-fermion interactions are varied from weakly to strongly attractive, our prediction interpolates between three-body (2 free fermions + 1 boson) to two-body (bound fermion molecule + boson) losses. At the unitary limit when the fermion-fermion scattering length is infinite, we predict a fractional loss-rate proportional to $n^{4/3}$ where n is the density of fermions. We confirm our analysis by measuring the lifetime of a $6\text{ Li} / 7\text{ Li}$ dual superfluid mixture in the BEC-BCS crossover.

[1] S. Laurent, M. Pierce, M. Delehaye, T. Yefsah, F. Chevy, C. Salomon, Phys. Rev. Lett., 118, 103403 (2017)

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