Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Nonequilibrium dynamics of weakly and strongly paired superconductors[1] VICTOR GURARIE, University of Colorado — We study small oscillations of the order parameter in weakly and strongly paired superconductors driven slightly out of equilibrium, in the collisionless approximation. While it was known for quite some time that the amplitude of the oscillations in a weakly paired superconductor decays as $1/t^{1/2}$, we show that in a superconductor sufficiently strongly paired so that its fermions form bound states usually referred to as molecules, these oscillations decay as $1/t^{3/2}$. The transition between these two regimes happens when the chemical potential of the superconductor vanishes, thus the behavior of the oscillations can be used to distinguish weakly and strongly paired superconductors. These results are obtained in the mean field approximation which may not be reliable in the crossover region between the strong and weak pairing, so we also obtain identical results within the two-channel model, which can be tuned to be reliable throughout the entire crossover, although it then describes a special type of interactions between the fermions which may be difficult to observe experimentally. Finally, we interpret the result in the strongly paired superconductor as the probability of the molecular decay as a function of time.

[1]Work supported by the NSF grant DMR-0449521

Victor Gurarie
University of Colorado

Date submitted: 20 Nov 2009 Electronic form version 1.4