Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Quantum Decay in Coupled Bosonic Systems GEORGE CRAGG, Massachusetts Institute of Technology, ARTHUR KERMAN, Massachusetts Institute of Technology — For species having negative s-wave scattering lengths, atomic condensation is impossible above some critical number of atoms. Using a Feshbach resonance to create a coupling to a molecular state of the system enables the effective scattering length, a, to be tuned to positive values, where it is believed to then result in stability. In spite of being in the positive scattering length regime, we have found that a collapsing ground state remains. In addition, we obtain an excited state which exhibits the expected low-density dependencies, but where the imaginary part of the chemical potential quantifies the time of decay into collective phonon excitations of the collapsing ground state. Consequently, this leads to a unique decay rate dependency on both the scattering length and the density, $\sim a^{5/2}\rho^{3/2}$, which can be experimentally tested. Using our predicted rate, there is good agreement with the overall lifetime observed in ^{85}Rb.

George Cragg
Massachusetts Institute of Technology

Date submitted: 01 Dec 2004 Electronic form version 1.4