Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Ultracold fermion cooling cycle using heteronuclear Feshbach resonances M.A. MORALES, University of Illinois at Urbana-Champaign, N. NYGAARD, J.E. WILLIAMS, CHARLES W. CLARK, National Institute of Standards and Technology — Ideal gas models have given much insight into the physics of dilute fermion gases that can form into bosonic molecules via a Feshbach resonance, and have even given good quantitative agreement with the molecular and Bose-Einstein condensate fractions observed in recent experiments. [1] We develop such a model for a harmonically -trapped ideal gas with three components: bosonic atoms, fermionic atoms, and a fermionic diatomic molecule produced by a Feshbach resonance involving the two atomic species. Such systems have been produced in recent experiments. [2,3] We map out the phase diagram for this three-component mixture in chemical and thermal equilibrium. Considering adiabatic association and dissociation of the molecules, we identify a possible cooling cycle, which in ideal circumstances can yield an exponential increase of the phase-space density.

[1] J. E. Williams, N. Nygaard and C. W. Clark, *New J. Phys.* **6**, 123 (2004)
[2] C. A. Stan *et al., Phys. Rev. Lett.* **93**, 143001 (2004)
[3] S. Inouye *et al., Phys. Rev. Lett.* **93**, 183201 (2004)

Charles Clark
National Institute of Standards and Technology

Date submitted: 03 Dec 2004 Electronic form version 1.4