Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Towards strongly interacting Fermi-Fermi mixtures of ultracold atoms[1] CHENG-HSUN WU, IBON SANTIAGO, JEE-WOO PARK, PEYMAN AHMADI, MARTIN W. ZWIERLEIN, Department of Physics, MIT-Harvard Center for Ultracold Atoms, and Research Laboratory of Electronics, MIT, Cambridge, MA 02139 — Strongly interacting mixtures of unequal fermionic species promise to allow access to novel states of matter, such as Cooper pairing without time-reversal symmetry, the FFLO (Fulde-Ferrell-Larkin- Ovchinnikov) state of Cooper pairs at finite momenta, and a basic form of quark (color) superfluidity. We will present our experiments on cooling a Fermi-Fermi mixture of the fermionic Alkalis ^{6}Li and ^{40}K. The difficulty of the low natural abundance of ^{40}K (%0.01) is typically overcome with the use of enriched, but expensive, ^{40}K. In our approach we use two independent Zeeman slowers optimized for high atomic fluxes of non-enriched K and Li. This allows us to load 5 x 10^{7} fermionic K into a magneto-optical trap, and it also gives us access to the bosonic isotopes of ^{39}K and ^{41}K as possible sympathetic coolants for both ^{6}Li and ^{40}K. As a crucial step, we have produced a Bose-Einstein condensate of ^{41}K by direct evaporation and we were able to sympathetically cool the fermion ^{40}K. Our immediate goal is the production of a degenerate Fermi-Fermi mixture of ^{6}Li and ^{40}K.

[1]This work was supported by the NSF, an AFOSR-MURI grant, the DARPA-OLE program, and the Alfred P. Sloan Foundation.

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Date submitted: 21 Jan 2010 Electronic form version 1.4