

Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

A “Dilution Refrigerator” Using Spin-Polarized Fermions SOURISH BASU, ERICH J. MUELLER, Laboratory of Atomic and Solid State Physics, Cornell University, Ithaca, New York 14853 — We present an analogy between a population imbalanced two component Fermi gas on the BEC side of a Feshbach resonance and a ^3He - ^4He mixture. The bosonic pairs are analogous to ^4He and the fermionic unpaired atoms to ^3He . These systems have topologically indistinguishable phase diagrams: at low temperatures the system phase separates into a fermion rich and a fermion poor region. As in standard cryogenic setups, one can in principle create a refrigerator which cools based upon the fact that there is a latent heat associated with pulling particles from the fermion rich region into the fermion poor one. We explore this idea, calculating the entropy of mixing, and suggesting cold atom geometries which mimic the anatomy of a standard ^3He - ^4He dilution refrigerator.

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Date submitted: 24 Jan 2009

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