Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Realization of a Resonant Fermi Gas with a Large Effective Range
Y. ZHANG, E.L. HAZLETT, R.W. STITES, K.M. O'HARA, The Pennsylvania State University — We have measured the interaction energy and three-body recombination rate for a two-component Fermi gas near a narrow Feshbach resonance and found both to be strongly energy dependent. Even though the deBroglie wavelength greatly exceeds the van der Waals length scale for all cases studied, the behavior of the interaction energy as a function of temperature cannot be described by atoms interacting via a contact potential. Rather, energy dependent corrections beyond the scattering length approximation are required, indicating a resonance with an anomalously large effective range. This narrow resonance can be used to study strongly correlated Fermi gases that simultaneously have a sizeable effective range and a large scattering length. Resonant Fermi gases with energy-dependent two-body interactions accurately describe dilute neutron matter found at densities in the interior of neutron stars, may exhibit extraordinarily high superfluid critical temperatures, and could enable the observation of exotic new forms of matter such as the breached-pair superfluid phase in a polarized Fermi gas.

Kenneth O'Hara
The Pennsylvania State University

Date submitted: 31 Jan 2012 Electronic form version 1.4