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Interaction Energy in a Paired Two-Component Degenerate Fermi Gas in the BEC-BCS Crossover¹ R.I. KAMAR, G.B. PARTRIDGE, W. LI, R.G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston TX, 77251 — We have measured the interaction energy of the ground-state of a paired Fermi gas in the BEC-BCS crossover. The crossover describes the smooth transition from a BEC of tightly bound dimers to that of a paired BCS superfluid. A Feshbach resonance is used to tune the atomic scattering length *a*. The interaction energy is extracted from *in-situ* images of a trapped two component gas of ⁶Li atoms near T = 0. Near the peak of the Feshbach resonance the interaction energy is expected to be parameterized by a single universal parameter β describing a strongly interacting, paired superfluid. We find that $\beta = -0.54 \pm 0.05$ in good agreement with recent Monte Carlo calculations giving $\beta = -0.58$. On the BEC side of resonance, we find that the molecular scattering length is 0.6*a*, in agreement with recent theory, but only for fields not too close or too far from resonance.

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