Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Universal physics in the dilute Fermi gases[1] SOON YONG CHANG, MOHIT RANDERIA, NANDINI TRIVEDI, The Ohio State University — Using Quantum Monte Carlo techniques, we investigate universal properties of the repulsive upper branch as well as the superfluid ground state across the Feshbach resonance. We test the Tan relations by computing (a) the equation of state, (b) the short distance behavior of the two-particle density matrix, and (c) the large-k tail of the momentum distribution $n(k)$. We have used twisted boundary conditions to improve the approach to the thermodynamic limit, which allows us to probe $n(k)$ at a dense set of k values. We find consistent estimates of the $1/k_F a$ dependence of the contact C at $T = 0$ from all three methods. We show that, just like the superfluid ground state across the BCS-BEC crossover, the repulsive upper branch also obeys these relations, albeit with different values of C. This reflects the universal behavior of dilute Fermi gases with a short range potential, in contrast to, for instance, the hard sphere gas in the $k_F a \sim 1$ regime.

[1]We acknowledge support from ARO W911NF-08-1-0338 and NSF-DMR 0706203 and the use of computational facilities at the Ohio Supercomputer Center.

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Date submitted: 19 Nov 2010 Electronic form version 1.4