Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Universal Quantum Viscosity in a Unitary Fermi Gas CHENGLIN CAO, ETHAN ELLIOTT, HAIBIN WU, JOHN THOMAS, Physics Department Duke Univ — We measure the shear viscosity in a two-component Fermi gas of atoms, tuned to a broad s-wave Feshbach resonance. At resonance, the atoms strongly interact and exhibit universal behavior, where the equilibrium thermodynamic properties and the transport coefficients are universal functions of the density n and temperature T. By properly including both the friction force and the heating rate in the universal hydrodynamic equations, we determine the shear viscosity in units of $\hbar\, n$ as a function of the reduced temperature at the trap center from nearly the ground state to the unitary two-body regime. The temperature of our strongly interacting Fermi gas is calibrated by using a smooth power law curve to fit the energy versus entropy curve, for which $T = \partial E/\partial S$ determines the temperature. The measured trap-averaged entropy per particle and shear viscosity are used to estimate the ratio of the shear viscosity to the entropy density, which is compared to that of a perfect fluid.

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Date submitted: 16 Feb 2011 Electronic form version 1.4