Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Observation of scale invariance and conformal symmetry breaking in expanding Fermi gases[1] ETHAN ELLIOTT, Department of Physics, Duke University, Durham, NC 27708, USA and Department of Physics, North Carolina State University, Raleigh, NC 27695, USA, JAMES JOSEPH, JOHN THOMAS, Department of Physics, North Carolina State University, Raleigh, NC 27695, USA — We precisely test scale invariance and examine local thermal equilibrium in the hydrodynamic expansion of a Fermi gas of atoms as a function of interaction strength. After release from an anisotropic optical trap, we observe that a resonantly interacting gas obeys scale-invariant hydrodynamics, where the mean square cloud size $\langle \mathbf{r}^2 \rangle = \langle x^2 + y^2 + z^2 \rangle$ expands ballistically (like a noninteracting gas) and the energy-averaged bulk viscosity is consistent with zero, $0.00(0.04)\,\hbar\, n$, with n the density. In contrast, the aspect ratios of the cloud exhibit anisotropic "elliptic" flow with an energy-dependent shear viscosity. Tuning away from resonance, we observe conformal symmetry breaking, where $\langle \mathbf{r}^2 \rangle$ deviates from ballistic flow.

[1]NSF, DOE, ARO, AFO

Ethan Elliott
Department of Physics, Duke University, Durham, NC 27708, USA
and Department of Physics, North Carolina State University,
Raleigh, NC 27695, USA

Date submitted: 28 Jan 2014 Electronic form version 1.4