Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Sound propagation in an elongated unitary gas MUNEKAZU HORIKOSHI, JST,ERATO, SHUTA NAKAJIMA, Univ. of Tokyo, YASUHISA INADA, JST,ERATO and Univ. of Tokyo, SWARUPANANDA PRADHAN, JST,ERATO, MASAHITO UEDA, JST,ERATO and Univ. of Tokyo, TAKASHI MUKAIYAMA, JST,ERATO — We have measured temperature dependence of a speed of sound waves propagating along the axial direction in an elongated unitary Fermi gas of ^{6}Li atoms in an optical trap where the magnetic field is tuned at the Feshbach resonance. The measurement is repeated at various temperatures, and the data shows a notable change of the speed below the superfluid phase transition temperature which is determined by an additional experiment using a technique of projection. Under the universal hypothesis and an isentropic process, the speed of sound can be given by the temperature and the ratio of the interaction energy to the kinetic energy, which is defined as $\beta^* = E_{int}/E_{kin}$. Whereas β is normally defined only for $T = 0$, we introduce (*) to denote that the system is at a finite temperature. Since the temperature of the unitary gas can be determined from the cloud width, we can estimate the β^* value from the speed and the temperature which are obtained experimentally. The result shows that the estimated β^* values start to change dramatically at the critical temperature and it implies the existence of two β^* values below the critical temperature, which are β_n^* for the normal component and β_n^* for the superfluid component.

Takashi Mukaiyama
JST,ERATO

Date submitted: 23 Jan 2009 Electronic form version 1.4