Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Superfluid phase transition and effects of mass imbalance in the BCS-BEC crossover regime of an ultracold Fermi gas: A self-consistent T-matrix theory[1] RYO HANAI, YOJI OHASHI, Keio University — We investigate a two-component Fermi gas with mass imbalance ($m_\uparrow \neq m_\downarrow$, where m_σ is an atomic mass in the σ-component) in the BCS-BEC crossover region. Including pairing fluctuations within a self-consistent T-matrix theory, we examine how the superfluid instability is affected by the presence of mass imbalance. We determine the superfluid region in the phase diagram of a Fermi gas in terms of the temperature, the strength of a pairing interaction, and the ratio of mass imbalance. The superfluid phase transition is shown to always occur even when $m_\uparrow \neq m_\downarrow$.[2] This behavior of T_c is quite different from the previous result in an extended T-matrix theory,[3] where T_c vanishes at a certain value of $m_\uparrow/m_\downarrow > 0$ in the BCS regime. Since Fermi condensates with mass imbalance have been discussed in various systems, such as a cold Fermi gas, an exciton(polariton) condensate, as well as color superconductivity, our results would be useful for further understandings of these novel Fermi superfluids.

[1]R.H. was supported by Graduate School Doctoral Student Aid Program, Keio University.
[2]R.Hanai and Y.Ohashi, J. Low Temp. Phys., DOI 10.1007/s10909-013-0909-3.
[3]R.Hanai, *et. al.*, Phys. Rev. A (2013) in press.

Ryo Hanai
Keio University

Date submitted: 13 Nov 2013 Electronic form version 1.4