Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Detecting Onset of BCS-Superfluidity Using a BEC Probe B. RAMACHANDHRAN, S.G. BHONGALE, H. PU, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, TX 77005, USA
— Recent experiments[1] have used Feshbach resonance to tune the interactions in a two-component ultracold Fermi gas to obtain (Bardeen-Cooper-Schrieffer) BCS-type pairing and hence superfluidity. For this degenerate gas, we propose using Bose Einstein Condensate (BEC) as a matter wave probe of the BCS superfluid state. Towards this end, we explore the phase diagram of a 3-dimensional mixture of BEC and a two-component superfluid fermi gas at finite temperature. In particular, we identify the regime in which the homogenous mixture becomes unstable against phase separation. We show that, under proper conditions, this spatial phase separation phenomenon occuring in the presence of the BEC can be used to probe the "local" value of the superfluid Gap parameter and possibly help detect the onset temperature of the BCS superfluidity.

[1]Zwierlein et al. Nature 435, 1047, (2005), and references therein

Ramachandhran Balasubramanian
Department of Physics and Astronomy, and Rice Quantum
Institute, Rice University, Houston, TX 77005, USA

Date submitted: 08 Dec 2008 Electronic form version 1.4