MAR05-2004-000280

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Single particle excitations in the BCS-BEC crossover region

YOJI OHASHI, University of Tsukuba

We present a theoretical study of the single particle excitations in the BCS-BEC crossover region of a trapped Fermi superfluid at $T = 0$. We self-consistently solve the Bogoliubov-de Gennes coupled equations in a harmonic trap, including molecular bosons associated with a Feshbach resonance. We show that the single particle excitation gap E_g, which is the same magnitude as the order parameter in a *uniform* BCS superfluid, is much smaller than the magnitude of the order parameter $\tilde{\Delta}(r = 0)$ at the center of the trap in the crossover region[1]. The excitation gap E_g is determined by the lowest Andreev bound state localized at the edge of the trapped gas. We also calculate the rf-tunneling current spectrum and show how E_g and $\tilde{\Delta}(r = 0)$ appear in the spectrum. We compare our results with the recent experimental data for superfluid ^{6}Li[2] as well as the recent theoretical work based on an LDA[3]. [1] Y. Ohashi and A. Griffin, cond-mat/0410220. [2] C. Chin et. at. Science **305**, 1128 (2004). [3] J. Kinnunen et. al. Science **305**, 1131 (2004).