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FFLO State in a Rotating Cold Fermionic Atom System YUN-PIL SHIM, REMBERT DUINE, ALLAN H. MACDONALD, University of Texas at Austin — Superconductors with a large Zeeman splitting are expected to have an inhomogeneous order parameter. This Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) state was proposed in the early 1960's, and recent experiments in various solid state systems have shown some progress in realizing this state. We study the FFLO state for rotating fermionic atom systems consisting of two hyperfine species with different populations. The fermi surface mismatch due to the population imbalance effectively plays the role of Zeeman splitting. In recent experiments[1,2], vortex structures were observed in rotating cold fermion systems over the whole range of the BEC-BCS crossover, but the exotic vortex structures expected for the FFLO state have yet to be observed. We use a fully quantum mechanical approach to include the Landau level quantization effect due to the rotation and present a phase diagram for superconducting phase transition with center of mass (COM) motion of the paring atoms in different Landau levels. The FFLO state is expected over small range of parameters and as the population imbalance increases, the paring condensation occurs at higher COM Landau level. [1] M. W. Zwierlein et al, Nature 435, 1047 (2005) [2] M. W. Zwierlein et al, cond-mat/0511197

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