Trapped Fermi gases with Rashba spin-orbit coupling[1]
MENDERES ISKIN, Koc University — We use the Bogoliubov-de Gennes formalism
to analyze harmonically trapped Fermi gases with Rashba-type spin-orbit coupling
in two dimensions. We consider both population-balanced and -imbalanced Fermi
gases throughout the BCS-BEC evolution, and study the effects of spin-orbit cou-
pling on the spontaneously induced countercirculating mass currents and the associ-
ated intrinsic angular momentum. In particular, we find that even a small spin-orbit
coupling destabilizes Fulde-Ferrel-Larkin-Ovchinnikov (FFLO)-type spatially mod-
ulated superfluid phases as well as the phase-separated states against the polarized
superfluid phase. We also show that the continuum of quasiparticle and quasihole
excitation spectrum can be connected by zero, one or two discrete branches of inter-
face modes, depending on the number of interfaces between a topologically trivial
phase (e.g. locally unpolarized/low-polarized superfluid or spin-polarized normal)
and a topologically nontrivial one (e.g. locally high-polarized superfluid) that may
be present in a trapped system.

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