Abstract Submitted
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Stability diagrams and dynamics of quantum degenerate Fermi gases of polar molecules[1] ANTUN BALAZ, VLADIMIR VELJIC, Institute of Physics Belgrade, Serbia, AXEL PELSTER, Physics Department and Research Center OPTIMAS, Technical University of Kaiserslautern, Germany — A recent experimental realization of ultracold quantum degenerate gas of ^{40}K^{87}Rb molecules opens up a new chapter in exploring strongly dipolar Fermi gases and many-body phenomena arising in that regime. This includes the deformation of the Fermi surface for polarized systems, where the electric dipoles have a preferential orientation, which can be achieved using an external field. Compared to atomic magnetic species, this effect will be significantly increased in ultracold gases of polar molecules, and the stability of the system is expected to strongly depend on its geometry. Using a mean-field variational approach based on the Wigner function, we show here that the stability of dipolar fermions depends only on the trap aspect ratios and orientation of the dipoles, thus exhibiting a universal behavior. We calculate the stability diagrams and the Fermi surface deformation, which is experimentally probed by time-of-flight expansions. Furthermore, we demonstrate how to take into account the dipole-dipole interaction in the system dynamics and that nonballistic effects during the time-of-flight expansion have to be considered for polar molecules. Our results are important for designing future experiments with dipolar fermions and for interpreting measurement data.

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