Self-bound Bose-Fermi Liquids

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We study stability of a zero temperature mixture of attractively interacting degenerate bosons and spin-polarized fermions in free space. Our analysis shows that higher order corrections to the standard mean field energy of the system can lead to a formation of liquid droplets, which are self-bound incompressible systems in a three-dimensional space. In addition to the quantum Lee-Huang-Yang correction to the boson-boson interaction energy, a higher order correction term in the Bose-Fermi coupling constant plays crucial role in stabilizing these systems. We investigate various mixtures of species with different mass ratios as a function of the ratio of Bose-Fermi to Bose-Bose scattering length. We further support our analysis via numerical simulations of droplet formation dynamics starting with a trapped system which is subsequently released from the trap.

[1] T. Karpiuk, D. Rakshit, M. Brewczyk and M. Gajda, *Liquid quantum Bose-Fermi droplets*, arXiv:1801.00346.