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Fulde-Ferrell-Larkin-Ovchinnikov-like pairing of attractively interacting fermions on a two-leg ladder geometry FABIAN HEIDRICH-MEISNER, RWTH Aachen University, ADRIAN FEIGUIN, Microsoft Q, UC Santa Barbara, and U of Maryland — Recent experiments on spin-imbalanced ultracold Fermi gases at MIT and Rice have stimulated an active search for conditions that would allow for the Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) state to be realized in ultracold atomic gases. Theoretical work indicates that FFLO-like pairing is favored in low-dimensions (see [1] and references therein). Indeed, in one-dimensional (1D) optical lattices, the FFLO pairing mechanism is a dominating feature and survives in the presence of a confining potential. Here we extend our previous study [1] to the case of a two-leg ladder geometry [2]. Experimentally, ladders can be realized as arrays of double wells. Using a numerically exact approach, the density matrix renormalization group method, we show that FFLO-like pairing is found in a large part of the respective phase diagram, with an order parameter with a much richer structure than in the strict 1D case. We further shed light on the effect of a harmonic potential as present in optical lattices and establish the emergence of two-dimensional physics and a novel phase separation scenario not encountered in 1D chains.
[1] A. E. Feiguin and F. Heidrich-Meisner, Phys. Rev. B 76, 220508(R) (2007)
[2] A. E. Feiguin and F. Heidrich-Meisner, preprint arXiv:0809.1539.

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