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Title: Coordinate-space Hartree-Fock-Bogoliubov for Superfluid Fermi Systems in Large Boxes

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The self-consistent Hartree-Fock-Bogoliubov problem can be solved accurately in the 2D coordinate space with the recently developed HFB-AX solver, which is based on B-spline techniques. It is particularly useful in the context of weakly bound systems and nuclear configurations possessing large deformations[1]. This solver was also adapted to describe the ultracold fermionic atoms. By applying the recently proposed antisymmetric superfluid local density approximation [2] to spin-imbalanced atomic gases at unitarity in very elongated traps, we find families of Larkin-Ovchinnikov type of solutions with prominent transversal oscillation of pairing potential[3]. The properties of the trapped system have been investigated as a function of trap aspect ratios. Furthermore, the up-to-date HFB-AX solver uses the hybrid MPI and OpenMP programming, and advanced threaded LAPACK and BLAS libraries to enable parallel calculations of problems in very large boxes on modern supercomputers. This work was supported in part by the U.S. Department of Energy under Contract Nos.DE-FG02-96ER40963 (University of Tennessee) and DE-FC02-09ER41583 (UNEDF SciDAC Collaboration). [1] J.C. Pei et al., Phys. Rev. C 78, 064306 (2008). [2] A. Bulgac and M.M. Forbes, Phys. Rev. Lett.101, 215301 (2008). [3] J. C. Pei, J. Dukelsky, and W. Nazarewicz, Phys. Rev. A 82, 021603(R)(2010).