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Robust Larkin-Ovchinnikov-Fulde-Ferrell phases in a wide class of lattice models[1] MENG CHENG, University of Maryland, College Park, CHRISTOPHER VARNEY, Georgetown University, KAI SUN, VICTOR GALITSKI, University of Maryland, College Park — We consider BCS pairing of fermions on lattice whose normal state breaks both time-reversal and spatial inversion symmetries. Due to the asymmetric band structure, unusual pairing states exist: Cooper pairs condense at finite momentum, which is known as the Fulde- Ferrel-Larkin-Ovchinnikov (FFLO) state. A one-dimensional lattice model of spinless fermions is studied in detail and two types of FFLO states are found: (1) a FF state with spontaneous supercurrent and (2) a nodeless LO state where the amplitude of order parameter oscillates. This conclusion is obtained via mean-field theory, bosonization, and exact diagonalization. The transition between the two phases can be tuned by the filling. We also find that the FF state is a topological superconductor. We further consider a generalization to two dimensions, where similar physics is realized.

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