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Dynamical instabilities of paired fermion superfluids in optical lattices GANESH RAMACHANDRAN, University of Toronto, ANTON BURKOV, University of Waterloo, ARUN PARAMEKANTI, University of Toronto — We report on a study of dynamical instabilities in cold atom fermionic superfluids in optical lattices. Of particular interest to us are the properties of such superfluids at fermion densities corresponding to noninteger average number of pairs per lattice site. In this case superfluidity competes with charge-density-wave ordered states, which has a profound effect on how such superfluids respond to flow. In particular, by varying the pairing momentum, we find a complex interplay between dynamical, pair breaking and Landau (phonon excitation) instabilities at different fillings and different magnitudes of the pairing interaction. Using insights from this study, we construct the “dynamical phase diagrams” of fermion superfluids, and discuss the experimental observability of the proposed effects.

Anton Burkov
University of Waterloo

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