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Synchronization versus dephasing in the pairing dynamics of cold fermions ROMAN BARANKOV, University of Illinois at Urbana-Champaign, LEONID LEVITOV, Massachusetts Institute of Technology — Motivated by recent experiments on degenerate Fermi gases with time-dependent interaction [1,2], we consider the time dynamics of BCS-paired fermions with switchable interaction. Several new regimes [3] of dissipationless coupled dynamics of the collective BCS mode and individual fermion pair states are identified and explored. The system can exhibit synchronized evolution in which all pair states are fully phased-locked, trasnforming to a Landau-damped dephased behavior upon variation of coupling strength. At the synchronization-dephasing transition the amplitude of long-time persistent oscillations vanishes. A second transition is found in the dephased regime, at which the long-time asymptotic constant value of pairing amplitude vanishes. Using a combination of numerical and analytical methods we establish a continuous (type II) character of both transitions. We also propose an experiment which could probe these new dynamical states.
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