Instabilities in fermions and BEC mixtures SHAN-WEN TSAI, University of California at Riverside, RYAN M. KALAS, T-4/Center for Nonlinear Studies, Los Alamos National Laboratory, EDDY TIMMERMANS, Center for Nonlinear Studies, Los Alamos National Laboratory — We study instabilities in a mixture of interacting fermionic and bosonic ultra-cold atoms. We focus on BCS transitions of the fermions that can be generated from attractive interactions mediated by bosons that are in a BEC phase. We study the p-wave instability [1] for indistinguishable (single spin) fermions in detail, taking into account the dynamical part of the mediated interaction. We employ a functional renormalization-group approach that takes retardation effects into account [2], calculate the renormalized interaction vertices and self-energies for this system, and obtain the phase diagram, sub-dominant instabilities, and transition temperatures, giving estimates for realistic parameters. We also investigate what happens in this system close to the phase-separation transition [3], and explore other possible fermionic phases, including fermion BCS pairings with other pairing symmetries.

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