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Quantum Phases of Fermionic Cold Atoms Through Pairing and Dissociation NICOLAS LOPEZ, SHAN-WEN TSAI, UCR, E. TIMMERMANS, LANL, CHI-YONG LIN, National Dong Hwa University, Taiwan — Cold atom experiments have realized molecule creation consisting of paired fermions and dissociation of weakly bound molecules into correlated fermions by tuning of the interactions with external fields [1,2]. We study many-body correlations in such system where molecules are weakly bound and therefore pairs of fermionic atoms convert into and dissociate from the bound molecule state. This exchange mediates a long-range interaction between the fermions. We consider a simple many-body Hamiltonian that includes the destruction of fermionic atom pairs to form single bosonic molecules and vice versa [3]. We employ a functional renormalization-group approach to search for instabilities from the disordered quantum liquid phase that may arise from a boson mediated fermion-fermion interaction. We calculate the renormalized frequency-dependent fermion interactions vertices and renormalized molecular binding energy.

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