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Multi-state fermionic Hamiltonian approach to the study of the BEC-BCS crossover in ultracold fermionic atom gases. B. MIHAILA, Los Alamos National Laboratory, M.M. PARISH, Cavendish Laboratory, S. GAUDIO, Boston College and Los Alamos National Laboratory, E. TIMMERMANS, K.B. BLAGOEV, A.V. BALATSKY, D.L. SMITH, Los Alamos National Laboratory, P.B. LITTLEWOOD, Cavendish Laboratory — We study the crossover between the BEC and BCS regimes in an ultracold fermionic atom gas, in the framework of a multi-state fermionic Hamiltonian using a finite-range interaction. We compare the predictions for the ground-state properties of a 2- state (one-channel) model, with the ground-state properties of a 3-state (^{40}K-like), and a 4-state (^{6}Li-like) model, respectively. We discuss signatures of the onset of superfluidity as predicted by the s-wave mean-field approximation of the zero-temperature Hamiltonian.

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