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Rashba spin-orbit coupled atomic Fermi gases[1] LEI JIANG, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, TX, XIA-JI LIU, HUI HU, ARC Centre of Excellence for Quantum-Atom Optics, Swinburne University of Technology, Melbourne, Australia, HAN PU, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, TX — We investigate theoretically BEC-BCS crossover physics in the presence of a Rashba spin-orbit coupling in a system of two-component Fermi gas with and without a Zeeman field that breaks the population balance between the two components. A new bound state (Rashba pair) emerges because of the spin-orbit interaction. We study the properties of Rashba pairs using a standard pair fluctuation theory. At zero temperature, the Rashba pairs condense into a macroscopic mixed spin state. We discuss in detail the experimental signatures for observing the condensation of Rashba pairs by calculating various physical observables which characterize the properties of the system and can be measured in experiment.

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