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Quantum Monte Carlo study of a Fermi gas in the BCS-BEC crossover

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We calculate the equation of state of a two-component Fermi gas with attractive short-range interspecies interactions using the fixed-node diffusion Monte Carlo method. The interaction strength is varied over a wide range by tuning the value a of the s -wave scattering length of the two-body potential. For $a > 0$ and a smaller than the inverse Fermi wavevector our results show a molecular regime with repulsive interactions well described by the dimer-dimer scattering length $a_m = 0.6a$. The momentum distribution of atoms, the pair correlation functions and the condensate fraction of pairs are discussed as a function of the interaction strength.