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# Monte Carlo Simulations of the Unitary Bose Gas

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We investigate the zero-temperature properties of a diluted homogeneous Bose gas made of N particles interacting via a two-body square-well potential by performing Monte Carlo simulations. We tune the interaction strength to achieve arbitrary positive values of the scattering length and compute by Monte Carlo quadrature the energy per particle E/N and the condensate fraction N_0/N of this system by using a Jastrow ansatz for the many-body wave function which avoids the formation of the self-bound ground-state and describes instead a (metastable) gaseous state with uniform density. In the unitarity limit, where the scattering length diverges while the range of the inter-atomic potential is much smaller than the average distance between atoms, we find a finite energy per particle (E/N=0.70 hbar^2(6\pi^2 n)^{2/3}/2m, with n the number density) and a quite large condensate fraction (N_0/N=0.83).

**Author:** Dr ROSSI, Maurizio (Università degli Studi di Padova)

**Co-auteur:** Prof. SALASNICH, Luca (Department of Physics, University of Padova)

**Orateur:** Dr ROSSI, Maurizio (Università degli Studi di Padova)

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