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Superfluid Transition in a Bose Gas with Correlated Disorder

S.Pilati, N. Prokof'ev and [1]S. Giorgini

**[1]BEC Bose Einstein Condensation CNR INFM, Dipartimento di Fisica
Universita' degli Studi di Trento, 38050 Povo, Italy**

Abstract:

The superfluid transition of a three-dimensional gas of hard-sphere bosons in a disordered medium is studied using quantum Monte Carlo methods. Simulations are performed in continuous space both in the canonical and in the grand-canonical ensemble. At fixed density we calculate the shift of the transition temperature as a function of the disorder strength, while at fixed temperature we determine both the critical chemical potential and the critical density separating normal and superfluid phases. In the regime of strong disorder the normal phase extends up to large values of the degeneracy parameter and the critical chemical potential exhibits a linear dependence in the intensity of the random potential. The role of interactions and disorder correlations is also discussed.