

SEMINAR

Wednesday, 5th of March 2014 at 11:30

Dipartimento di Fisica e INO-CNR BEC center Universita` degli Studi di Trento

Abstract

“Quantum Monte Carlo approach to dynamic properties of ultracold Bose systems”

Using quantum Monte Carlo methods, we perform zero-temperature calculations of the dynamic structure factor of a system of Bose particles interacting via a hard-sphere potential. The hard-sphere model is able to capture, in the dilute regime, the essential properties of ultracold atoms with positive scattering length, and, at higher densities, it can be used to characterize strongly interacting systems where the hard-core repulsion at short distances is the leading part of the interatomic potential, like superfluid helium. With increasing density, we observe the appearance of an incoherent, multiphonon contribution in the spectral function at frequencies higher than the single quasi-particle peak and a crossover of the dispersion of elementary excitations from a Bogoliubov-like spectrum to a phonon-maxon-roton curve. The behavior of the dynamic structure factor at the same density in the stable solid and metastable gas phase above the freezing point is also discussed.