

Density excitations of weakly interacting Bose gas

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Abstract

Dynamic structure factor and transverse current relaxation spectra of a homogeneous, weakly interacting BOSE gas have been calculated for finite temperatures within the random-phase approximation (RPA) and compared to corresponding results for gases obeying Fermi-Dirac and Maxwell-Boltzmann statistics. Approaching T_c from high temperatures, the boson $S(q, \omega)$ exhibits a noteworthy BEC precursor. Temperature-dependent renormalization of the Bogoliubov frequency and the Landau damping of density excitations in the BOSE gas are discussed in detail. The isothermal compressibility of the condensed boson gas is independent of T for all temperatures $0 \leq T \leq T_c$, implying a T -independent velocity of first sound c_0 .