

DEFORMED HEISENBERG ALGEBRA
IN THE THEORY OF LIQUID ^4He

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S u m m a r y

We propose a method to consider anharmonic oscillations of the density of a Bose fluid using a deformed Heisenberg algebra. The Hamiltonian of a Bose fluid consists of a main harmonic part and an anharmonic part which is usually treated perturbatively. We assume that only the former should be taken into account, whereas the anharmonic terms can be treated indirectly via a deformation of the commutation relations. For a deformation quadratic in the momentum, exact analytic expressions are found for the wave functions and the energy levels. The ground-state energy, elementary excitation spectrum, and the structure at zero temperature are calculated. A ‘physical’ value of the wave-vector-dependent deformation parameter is found by comparison of our results with ‘observable’ quantities. An ‘effective’ pair interaction energy of particles in a fluid is calculated.