A SELF-CONSISTENT MICROSCOPIC MODEL OF THE ENERGY SPECTRUM OF SUPERFLUID ^{4}He WITH THE HERMITIAN FORM OF THE BOGOLYUBOV–ZUBAREV HAMILTONIAN

K.V. Grigorishin, B.I. Lev

Bogolyubov Institute for Theoretical Physics,
Nat. Acad. of Sci. of Ukraine
(*14-b Metrolohichna Str. Kyiv 03680, Ukraine;*
e-mail: konst_ dark@mail.ru)

S u m m a r y

Based on the representation of collective variables with the Hermitian form of the Bogolyubov–Zubarev Hamiltonian, a self-consistent oscillator model of the ground state and excited states of a Bose liquid has been proposed. A new method of calculation of anharmonic terms in this Hamiltonian and its interpretation have been presented. The dispersion equation for a collective excitation in superfluid ^{4}He has been obtained in a self-consistent way, where the real and virtual processes of decay of a collective excitation are considered. The end point, which is determined by the threshold of collective excitation's decay into two rotons, of the dispersion curve has been obtained, and it is shown that the dispersion curve strongly depends on the property of its stability. An approach with a structure factor has been realized without use of any fitting parameters. Based on the oscillator model, a new method of self-consistent calculation of the ground-state energy and the density of a Bose condensate has been proposed. The model of suppression of a Bose condensate has been presented.