# ENTROPY OF THE GROUND STATE AND THE ELECTRIC ACTIVITY OF SUPERFLUID HELIUM ON THE EXCITATION OF SECOND-SOUND WAVES

*K.V. Grigorishin, B.I. Lev*

Bogolyubov Institute for Theoretical Physics,
Nat. Acad. Sci. of Ukraine
(*14b, Metrolohichna Str., Kiev 03680, Ukraine;*
*e-mail: gkonst@ukr.net; blev@i.kiev.ua*)

S u m m a r y

We propose a possible explanation of the nature of the temperature-independent component of the entropy of He II, whose existence was assumed by E.A. Pashitskii and S.M. Ryabchenko [Fiz. Nizk. Temp. **33**, 12 (2006)] on the consideration of the polarization of superfluid helium during the propagation of a second-sound wave. The ground state of He II is considered in the random phase approximation (RPA), and it is shown that the energy of this state can be rewritten in terms of the distribution function of virtual quasiparticles (phonons or rotons), rather than that of particles, as it is made in the impulse approximation limit, because the proposed representation seems to be more general. With this distribution function, the temperature-independent contribution to the entropy of superfluid helium is calculated. This part has sense of the Shannon entropy as a measure of a quantum mechanical uncertainty, because the given quasiparticles are quantum mechanical fluctuations against the background of the ground state of superfluid helium.