MODIFIED THERMODYNAMICS AS AN APPROACH TO THE DESCRIPTION OF SOME UNIVERSAL PROPERTIES OF "NEARLY PERFECT FLUIDS"

A.D. Sukhanov[1], *V.G. Bar'yakhtar*[2], *O.N. Golubjeva*[3]

[1]Bogoliubov Laboratory of Theoretical Physics, JINR
(*Dubna, Russia; e-mail: ogol@mail.ru*),
[2]National Academy of Science
(*Kiev, Ukraine; e-mail: vbar@imag.kiev.ua*),
[3]Peoples' Friendship University of Russia
(*Moscow, Russia; e-mail: ogol@oldi.ru*)

S u m m a r y

We show that the quantum statistical mechanics describing quantum and thermal properties of objects has only the sense of a particular semiclassical approximation. We propose a more general (than that theory) microdescription of objects in a heat bath taking a vacuum into account as an object environment; we call it $(\hbar, k)-$dynamics ($\hbar kD$). We introduce a new generative operator, a Schrödingerian or a stochastic action operator, and will show its fundamental role in the determination of such macroquantities as internal energy, effective temperature, and effective entropy. We establish that $\hbar kD$ can serve as an initial microtheory for constructing a modified thermodynamics. On this ground, we can explain the universality of the ratio "effective action to effective entropy" at zero temperature and its minimal value in the form $\hbar/2k$. This result corresponds to experimental data obtained recently under studying a new matter state – a nearly perfect fluid.