

MODIFIED BOGOLYUBOV'S DERIVATION OF THE TWO-FLUID HYDRODYNAMICS

P. Shygorin, A. Svidzynskyj

Lesya Ukrainka Volyn National University
(13, Volya Ave., Lutsk 43000, Ukraine;
e-mail: pashyg@univer.lutsk.ua)

S u m m a r y

A consistent microscopic derivation of the two-fluid hydrodynamics for superfluid helium-4 in the ideal approximation is represented. The starting point in our formalism is a system of Heisenberg's equation of motion for both normal and anomalous correlation functions. The use of a mixed Wigner representation allows us to perform the expansion of the equations of motion for correlation functions in gradients directly, very easily, and with a rigorous mathematics. To find the hydrodynamic flows, we have constructed a local equilibrium statistical operator for superfluid helium in the reference frame, where the condensate is at rest.