ONE-PARTICLE DENSITY MATRIX OF LIQUID ^{4}He IN THE PAIR CORRELATION APPROXIMATION

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S u m m a r y

Using the expression for the total density matrix of the system of interacting Bose particles [J. Phys. Stud. **8**, 223 (2004)], the one-particle density matrix for helium-4 in the coordinate representation has been calculated, which reproduces, at low temperatures, the known expression of the Bogolyubov theory and, at high temperatures, the result of the classical liquid theory. The elimination of theoretical infra-red divergences by the renormalization of the one-particle spectrum gives rise to a temperature dependence of the effective atomic mass in the liquid. All final formulas contain the experimentally measurable structural factor of liquid helium-4 extrapolated to the zero temperature rather than the interatomic potential. The temperature $T_c = 2.26$ K of the Bose–Einstein condensation of liquid helium-4 has been calculated. The Bose–Einstein condensate fraction in superfluid ^{4}He has been calculated in a wide temperature range.