**Quasiclassical approximation of the Bogolyubov equations in the theory of superfluid Fermi systems**

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The powerful mean-field tool for describing the properties of inhomogeneous superfluid Fermi system are the Bogolyubov equations (BE), also known as Bogolyubov-de Gennes equations. These ones are the analog of the Schrödinger equation for two-component $u(\mathbf{r})$ and $v(\mathbf{r})$ of the fermionic wave functions in the presence of a superconducting gap parameter were derived by Bogolyubov [1] in the microscopic theory of superconductivity. Solutions of the BE describes the thermodynamics of inhomogeneous superfluid Fermi systems. The calculation of the Josephson current also has been approached in terms of the ones [2]. Recently BE has been adopted by many to study trapped ultra-cold Fermi gases [3]. BE approach extensively have been used to describing of the density profile of the atomic cloud, Josephson tunneling, BCS–BEC crossover etc. Because of nonlinearity the analytical study of the BE is very difficult. Main results have been obtained from numerical simulation.

In this talk we study possibility of simplification of the BE, associated with spatial function smoothing on atomic lengths. For the low-temperature superconductor the motion of the Cooper pair as whole is "quasiclassical". The velocity of the Cooper pair as whole is much less then velocity of electrons that form its — Fermi velocity. Considering this fact allows us to significantly simplify the BE.

[1] N.N. Bogolyubov. Usp.Fiz.Nauk 67, 549 (1959).

[2] A.V. Svidzynskij. *Microscopic theory of superconductivity*, Lutsk, Vezha (2011).

[3] X-J. Liu *et al.* Phys.Rev.A 75, 023614 (2007).