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Boundary conditions for the superconducting junctions at temperatures close to critical

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To calculate the current-phase relation in superconducting junctions, it is necessary to investigate the spatial behavior of the order parameter in the superconducting regions of the junction. In the case of temperatures close to the critical one, the Ginzburg-Landau theory [1] is used for this purpose. However, to apply this theory there is necessary to find the corresponding boundary conditions for the Ginzburg-Landau equation. Boundary condition can be found using the Wiener–Hopf method [2-3], however, use of this method for complicated superconducting junctions is problematic.
In our investigation, the problem of finding boundary conditions for the
Ginzburg-Landau equation, was considered in the case of different superconducting junctions. In particular, superconducting junctions, combining tunnel effects and the proximity effect, with nonmagnetic impurities in superconducting regions were investigated. For finding the boundary condition for the Ginzburg-Landau equation the method of quasiorthogonality to asymptotics was used [4]. In addition, there were no restrictions on the values of the electron transmission coefficient and the thickness of the normal layer.
It has been shown that the boundary condition for the Ginzburg-Landau equation contains unknown constants for the calculation of which the quasiorthogonality to the asymptotics method was used. This method proved to be quite effective for complicated superconducting systems which contain the combination of dielectric layer and normal layer. In addition, boundary conditions obtained using this method, are valid for the arbitrary concentration of nonmagnetic impurities.

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