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# Quasiclassical boundary conditions for a contact of two metals

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## Abstract

Transparency of the interface between two metals is discussed in a frame of the quasiclassical theory. It is shown that the Kupriyanov–Lukichev expression for the boundary resistivity of the interface is essentially based on the approximation of the single-channel Landauer conductance. In the results, a systematic discrepancy between the theory and experiments on the superconducting proximity effect is observed. We propose a multi-channel derivation of the boundary conditions, and deduce a new quasiclassical expression for the boundary resistivity which provides better matching with the experimental data. Applied to the ferromagnetic metal–non-magnetic metal contacts the multi-channel quasiclassical approach offers a simple (compared to the numerical band-structure calculations) approach to estimate the magnitude and sign of the spin-asymmetry of the boundary resistance.

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## 1. Introduction

Metallic heterostructures are the key functional elements of modern micro- and nanoelectronics (see, for example, Refs. [1,2]). They may combine superconductors with normal metals (Josephson effect and SQUID devices [3]), superconducting and ferromagnetic metals

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