Spin-triplet correlations in superconductor-ferromagnet multilayers

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Abstract. We study transport phenomena in clean superconductor-ferromagnet (S-F) multilayers for a general case of arbitrary relative orientation of in-plane magnetizations and interface transparencies. We solve the scattering problem based on the Bogoliubov-de Gennes equation, taking into account both spin-singlet and -triplet superconducting correlations. We focus on size and coherence effects that characterize ballistic transport in two geometries, FSF and SFFS. In FSF geometry we find a monotonic dependence of conductance spectra on the angle of misorientation of magnetizations α as their alignment is changed from parallel to antiparallel. Moreover, the critical Josephson current in SFFS multilayers is also a monotonic function of α when the junction is far enough from 0-π transitions. In contrast to the diffusive case, no substantial impact of long-range spin-triplet superconducting correlations neither on conductance nor on the Josephson current has been found in the clean limit.

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