EFFECTIVE SPIN-FLIP SCATTERING IN DIFFUSIVE SUPERCONDUCTING PROXIMITY SYSTEMS WITH MAGNETIC DISORDER

D.A. Ivanov[1], Ya.V. Fominov[2], M.A. Skvortsov[2], and P.M. Ostrovsky[2,3]

[1] *Institute of Theoretical Physics, Ecole Polytechnique Füdürale de Lausanne (EPFL), CH-1015 Lausanne, Switzerland*

[2] *L.D. Landau Institute for Theoretical Physics RAS, 142432 Chernogolovka, Moscow region, Russia*

[3] *Institut fьr Nanotechnologie, Forschungszentrum Karlsruhe, 76021 Karlsruhe, Germany*

E-mail: fominov@landau.ac.ru

We revisit the problem of diffusive proximity systems involving superconductors and normal metals (or ferromagnets) with magnetic disorder. On the length scales much larger than its correlation length, the effect of sufficiently weak magnetic disorder may be incorporated as a local spin-flip term in the Usadel equations. We derive this spin-flip term in the general case of a three-dimensional disordered Zeeman-type field with an arbitrary correlation length. Three different regimes may be distinguished: pointlike impurities (the correlation length is shorter than the Fermi wavelength), medium-range disorder (the correlation length between the Fermi wavelength and the mean free path), and long-range disorder (the correlation length longer than the mean free path). We discuss the relations between these three regimes by using the three overlapping approaches: the Usadel equations, the non-linear sigma model, and the diagrammatic expansion. The expressions for the spin-flip rate agree with the existing results obtained in less general situations.

References

[1] D.A. Ivanov, Ya.V. Fominov, M.A. Skvortsov, and P.M. Ostrovsky, *Effective spin-flip scattering in diffusive superconducting proximity systems with magnetic disorder*. Phys. Rev. B, **80**, 134501 (2009)