INFLUENCE OF MAGNONS ON THE SUPERCONDUCTING STATE IN SUPERCONDUCTOR-MAGNET HETEROSTRUCTURES

Yanovskaia A.S.[1], *Bobkov A.M.*[1], *Bobkova I.V.*[1]
[1] Moscow Institute of Physics and Technology, Moscow, Russia
sveti24h@mail.ru

It is well known that the proximity effect in thin-film hybrid superconductor/ferromagnetic insulator structures provides the suppression of the superconductivity [1] and Zeeman splitting of the density of states in the superconductors [2]. In this work we investigate the influence of ferromagnetic magnons on this effect. The density of states in the superconductor (DOS) and the quasiparticle spectra are calculated in the framework of Gor'kov Green's function approach (Fig. 1). It is obtained that the interaction of superconducting electrons with magnons can result in a decrease of the Zeeman splitting of the DOS coherence peaks. It also inverts the ratio between the internal and external coherence peaks and smears the external peaks. The temperature dependence of the observed DOS characteristic features is investigated. It is demonstrated that quasiparticle spectra are also strongly modified by the electron-magnon interaction revealing characteristic kinks (Fig. 2). The sensitivity of the results to the choice of materials and relevance to experiments are discussed.

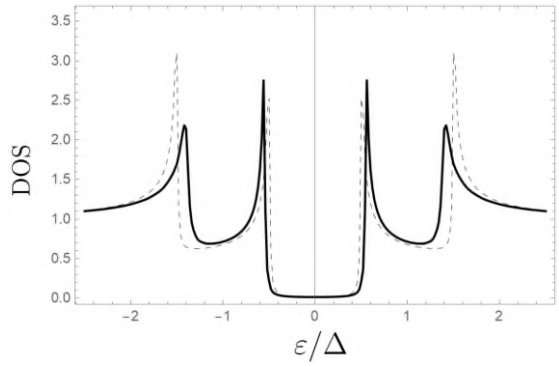

Fig. 1. DOS. Dashed line is for the standard DOS of a superconductor; solid line is for the DOS, which is modified by the electron-magnon interaction.

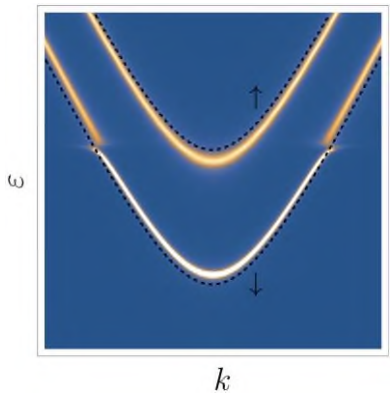

Fig. 2. Quasiparticle spectra. Dashed lines are the branches of the standard spectra of the superconductor; solid lines are for the branches of the spectra, which are modified by the magnon influence.

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[1] Sarma G. Journal of Physics and Chemistry of Solids, 24, 1029 (1963).

[2] E. Strambini, V. N. Golovach, G. De Simoni, J. S. Moodera, F.S. Bergeret, F. Giazotto, Phys. Rev. Materials 1, 054402 (2017).