SFB 767
Seminar

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Thermospin effects and their influence on superconductivity in hybrid structures

Recently, in addition to the giant thermoelectric effect, thermally-induced pure spin currents were predicted for hybrid structures composed of Zeeman-split superconductors and normal metals. I show that this “thermospin current” frequently results in a pure spin imbalance accumulation in the system. The magnitude of the spin imbalance can reach the value of the Zeeman splitting of the superconducting DOS and it strongly influences superconductivity in the system.
As opposed to the common point of view, the influence of the spin imbalance on superconductivity does not reduce to the suppression only. The key parameter here is the sign of the temperature difference between the normal and the superconducting parts of the structure. If the normal part is colder than the superconducting one, the superconductivity, originally suppressed by the Zeeman field, is recovered.
If the normal part of the structure is hotter than the superconducting one, the thermally-induced spin imbalance additionally (together with the Zeeman field) suppresses the zero-temperature superconducting state. As a result, an unusual superconducting state, which starts to develop at a finite temperature, can be realized in the system.

[1] I. V. Bobkova and A. M. Bobkov, PRB 96, 104515 (2017) [2] I. V. Bobkova and A.M. Bobkov, PRB 84, 140508(R) (2011)

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