On-line SPICE-SPIN+X Seminars

Wednesday, 21st April 2021, 15:00 (German Time)

The seminar will be via Zoom (Meeting ID 892 0565 6411) and live streamed in the SPICE YouTube Channel.

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Spin transport in a conventional superconductor

I will give an overview of our work in collaboration with the Department of Materials Science and Metallurgy in Cambridge [1-5] on the spin pumping into a Nb thin film. Unlike conventional spin-singlet Cooper pairs, spin-triplet pairs can carry spin. Triplet supercurrents were discovered in Josephson junctions with metallic ferromagnet spacers, where spin transport can occur only within the ferromagnet and in conjunction with a charge current. Ferromagnetic resonance injects a pure spin current from a precessing ferromagnet into adjacent non-magnetic materials. For spin-singlet pairing, the ferromagnetic resonance spin pumping efficiency decreases below the critical temperature (Tc) of a coupled superconductor. Here we present ferromagnetic resonance experiments in which spin sink layers with strong spin–orbit coupling are added to the superconductor. We show that the induced spin currents, rather than being suppressed, are substantially larger in the superconducting state compared with the normal state and show that this cannot be mediated by quasiparticles and is most likely a triplet pure spin supercurrent. By carrying angular dependence studies of the Gilbert damping we are able to link the emergence of the triplet condensate to the Rashba spin-orbit coupling.

[1] Nature Materials 17, 499 (2018)

[2] Phys. Rev. Appl., 11, 014061 (2019)

[3] Phys. Rev. B 99, 024507 (2019)

[4] Phys. Rev. X 10, 031020 (2020)

[5] Phys. Rev. B 99, 144503 (2019