Odd-frequency superconductivity revealed by thermopower

Sun-Yong Hwang[1], Pablo Burset[2], and Björn Sothmann[1]

[1]*Theoretische Physik, Universität Duisburg-Essen and CENIDE, D-47048 Duisburg, Germany*

[2]*Department of Applied Physics, Aalto University, FIN-00076 Aalto, Finland*

Superconductivity is characterized by a nonvanishing superconducting pair amplitude. It has a definite symmetry in spin, momentum, and frequency (time). While the spin and momentum symmetry have been probed experimentally for different classes of superconductivity, the odd-frequency nature of certain superconducting correlations has not been demonstrated yet in a direct way. Here, we propose the thermopower as an unambiguous way to assess odd-frequency superconductivity [1]. This is possible since the thermoelectric coefficient given by Andreev-like processes is only finite in the presence of odd-frequency superconductivity. We illustrate our general findings with a simple example of a superconductor-quantum-dot-ferromagnet hybrid.

[1] S.-Y. Hwang, P. Burset, and B. Sothmann, Phys. Rev. B 98, 161408(R) (2018).