

# Interplay between the quantum interference and electron pairing in nanoscopic heterostructures

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When nanoscopic objects (such as atoms, molecules, or nanowires) are brought in contact with the superconducting electrodes they absorb electron pairing and become superconducting nano-grains. Besides the usual ballistic tunnelling the charge transport can be provided via such entities as the anomalous Andreev mechanism, in which electrons are converted into holes and simultaneously the Cooper pairs are injected to the superconducting reservoir. We study the multi-dot configuration and confront such mechanism with the hopping processes, responsible for the strong quantum interference effects [1]. We show that their interplay causes a substantial transfer of the quasiparticle spectral weights [2], analogous to the Dicke effect known in quantum optics [3]. We discuss experimental methods for detecting these features in the subgap Andreev [4] or the Josephson [5] spectroscopies.

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