

Revealing the Andreev degree of freedom in the Josephson effect

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The Josephson effect describes the flow of supercurrent in a weak link – such as a tunnel junction, nanowire, or molecule – between two superconductors. Microscopically this current is carried by peculiar pair states localized at the weak link. These Andreev states come in doublets with energies symmetric about the Fermi energy, and carry supercurrent in opposite directions. We present photon absorption spectroscopy revealing the transitions between Andreev states in the simplest Josephson element, a superconducting one-atom contact. Our results demonstrate the accessibility of a spin-like internal degree of freedom in Josephson junctions.

[1] Reference: arXiv:1305.4091; to be published in Nature