SFB 1432
Seminar

Universität Konstanz

Fr Dec 16, 2022
at 10:00
P 602

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Dissipation and friction in the quantum phase dynamics of Josephson junctions

The currently most advanced realizations of quantum information processors are based on superconducting circuits, which have Josephson junctions as their central electronic elements. Quantum mechanically, the state of a Josephson junction can be described as a particle in a cos(φ) potential with a tilt (either linear or quadratic with φ), where φ is the phase drop across the Josephson junction. The quantum dynamics of the phase experiences friction, which depends on the junction parameters. I will present two experiments on the phase dynamics in Josephson junctions, in the high and low friction limits, respectively. In the highly damped case, we perform a calorimetry experiment to detect the heat dissipated by a 2π slip of the phase, that is, a jump between two adjacent valleys of the tilted Josephson potential. In the second experiment, we investigate a weakly damped Josephson junction involving a single magnetic atom. The electron-hole symmetry breaking in the magnetic bound states' spectral function leads to non-reciprocal friction with applied bias. This manifests as an asymmetry in the retrapping currents, that is, a Josephson diode effect.

Calorimetry of a phase slip in a Josephson junction, E. Gümüs, D. Majidi, D. Nikolic, P. Raif, B. Karimi, J.T. Peltonen, E. Scheer, J.P. Pekola, H. Courtois, W. Belzig, and C.B. Winkelmann, Nature Physics (in press). arXiv: 2202.08726 (2022).

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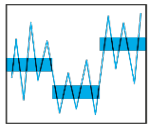

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