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**Few quasiparticle dynamics with a single-Cooper-pair transistor.**

NADIA COURT, ANDREW FERGUSON, ROBERT CLARK, Centre for Quantum Computer Technology, University of New South Wales — We employ the single-quasiparticle sensitivity of the single-Cooper-pair transistor (SCPT) to directly measure the quasiparticle population of a small superconducting volume. The SCPT is measured in a radio-frequency configuration allowing  $> \text{MHz}$  bandwidth and is connected to a quasiparticle trap formed using aluminium bandstructure engineering. Quasiparticles in the trap region tunnel into the SCPT, this interrupts the coherent Cooper-pair transport and is detected by changes in the reflected radio-frequency signal. The quasiparticle population is monitored both in the steady state and under non-equilibrium conditions of quasiparticle injection. In particular, we study the non-equilibrium regime where the quasiparticle recombination time is accessed via the response of the SCPT to pulsed injection. We discuss the application of the SCPT as an ultra sensitive sub-mm photon detector and also as a tool to investigate the statistical mechanics of a few quasiparticle gas.

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