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Fluctuations in the electron system of a superconductor exposed to a photon flux PIETER DE VISSER[1], JOCHEM BASELMANS, JUAN BUENO, SRON, Netherlands Institute for Space Research, NURIA LLOMBART, TEUN KLAPWIJK, Delft Univ of Tech — In a superconductor, in which electrons are paired, the density of unpaired electrons should become zero when approaching zero temperature. Therefore radiation detectors based on breaking of pairs promise supreme sensitivity, which we demonstrate using an aluminium superconducting microwave resonator. We show that the resonator also enables the study of the response of the electron system of the superconductor to pair-breaking photons, microwave photons and varying temperatures. A large range in radiation power (at 1.54 THz) can be chosen by carefully filtering the radiation from a blackbody source. We identify two regimes. At high radiation power, fluctuations in the electron system caused by the random arrival rate of the photons are resolved, giving a straightforward measure of the optical efficiency ($48 \pm 8\%$) and showing an unprecedented detector sensitivity. At low radiation power fluctuations are dominated by excess quasiparticles, the number of which is measured through their recombination lifetime.

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