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High-frequency spectroscopy and emission properties of a single-Cooper pair transistor PIERRE-MARIE BILLANGEON, Laboratoire de Physique des Solides, associé au CNRS, Bât. 510 Université Paris-Sud, FRÉDÉRIC PIERRE, Laboratoire de Photonique et Nanostructures, associé au CNRS, Route de Nozay, HÉLÈNE BOUCHIAT, RICHARD DEBLOCK, Laboratoire de Physique des Solides, associé au CNRS, Bât. 510 Université Paris-Sud — We have characterized the high-frequency properties of a single-Cooper pair transistor (SCPT), by a capacitive coupling with a Josephson junction. We have alternately used the Josephson junction (JJ) as a high-frequency generator by using the AC Josephson effect, and as a high-frequency detector by using the photo-assisted tunneling current. We have been able to induce transitions between the first energy levels of a SCPT, thanks to the high-energy photons emitted by the AC Josephson effect. This allowed us to perform a high-frequency spectroscopy of a SCPT(10-200 GHz). Moreover, as the emitted photons can have an frequency higher than the superconducting gap of the island, we can not only induce the transfer of Cooper pairs, but also quasiparticles, allowing us to control the poisoning of the SCPT. Then, we used the Squid geometry of the Josephson junction in order to tune its Josephson energy to zero, and use it as a high-frequency detector. We have been able to detect different kinds of high-frequency emission process associated with the coherent transfer of Cooper pairs through the SCPT (AC Josephson effect), and the resonant transfer of Cooper pairs, already characterized in transport measurements by Joyez et al.

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