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Manipulation of trapped atoms on cryogenic atom chips ADRIAN LUPASCU, ANDREAS EMMERT, JONAS MLYNEK, CEDRIC ROUX, GILLES NOGUES, MICHEL BRUNE, JEAN-MICHEL RAIMOND, Laboratory Kastler-Brossel, ENS, UPMC, CNRS, SERGE HAROCHE, Collège de France — Atom chips are flexible tools for trapping and manipulation of neutral atoms. We use a superconducting atom chip to trap 87Rb atoms [1]. Due to the cryogenic temperatures, the vacuum conditions are improved, resulting in very long trapping lifetime, in the 10 minutes range. The lifetime of trapped atoms near metallic structures is limited by Johnson-Nyquist noise at the surface. We study the lifetime as a function of the distance between the atoms and a gold surface. We find longer times than in similar room temperature experiments, in good agreement with theoretical predictions [2]. For a superconducting surface, one expects a further increase, by several orders of magnitude. In the long term, we intend to use a cryogenic atom chip for deterministic preparation of long- lived single Rydberg atoms, by use of dipole blockade. We present preliminary results on the spectroscopy of Rydberg atoms on the superconducting atom chip. [1] T. Nirrengarten *et* al, PRL 97, 200405 (2006). [2] A. Emmert *et al*, EPJD (2009).

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