Abstract Submitted
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Laser Trapping of Circular Rydberg Atoms[1] CLMENT SAYRIN, RODRIGO CORTIAS, MAXIME FAVIER, BRICE RAVON, PAUL MHAIGNERIE, YOHANN MACHU, JEAN-MICHEL RAIMOND, MICHEL BRUNE, LKB, CNRS, Coll de France, CNRS, ENS-Unive PSL, Sorbonne Univ — Rydberg are well suited to quantum simulations, quantum optics, quantum information and quantum sensing. Most experiments use low-orbital-angular-momentum levels. The lifetime of these levels about 100us only and the fact that they are not trapped currently limit the measurement times. Circular Rydberg atoms (CRAs) have lifetimes of few tens of ms and can be laser-trapped over long times. Measurement times of several seconds are even realistic when trapping the atoms in a spontaneous-emission inhibiting structure. They would benefit most of current Rydberg-based quantum technologies. I will present our latest experimental results regarding the preparation of long-lived CRAs from laser-cooled Rubidium atoms in a cryogenic environment. We demonstrate their laser trapping in 2D for up to 10ms [1]. The ponderomotive trap is formed by a hollow Laguerre-Gauss laser beam at 1064nm. We observe no loss of atoms over the measurement time. We measure the CRAs lifetime to be a of a few ms, revealing a low temperature of the microwave blackbody radiation. Our results open the route towards novel quantum simulators [2] and to enhanced measurement times in hybrid CQED experiments or quantum sensors using CRAs. [1] R. Cortinas et al., arXiv :1911.02316 [2] T. L. Nguyen et al., PRX 9, 011032

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