Excitation of a quantum gas to Rydberg states

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Rydberg atoms constitute a paradigmatic system for the study of quantum many-body physics. Very large dipole-dipole interaction between Rydberg atoms leads to the dipole blockade, at the heart of promising proposals for quantum simulation or studies of strongly correlated systems [1-2]. Dipole blockade has already been used to excite spatially organized structures of Rydberg atoms [3], realize single photon sources [4] or implement quantum gates [5]. In this talk, I will present the recent developments of our experimental setup for achieving highly coherent Rydberg excitation. I will also discuss our progress on the detection of Rydberg atoms, with preliminary spectroscopic measurements obtained for the excitation of Rydberg atoms in a nearly degenerate gas of 87Rb atoms.


1http://rydberg.quantumlah.org/