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Laser Spectroscopy of Rydberg Atoms in Deep Optical Lattices[1]

YUN-JHIH CHEN, GEORG RAITHEL, The University of Michigan — We are constructing a new setup to investigate the spectroscopic studies of Rydberg atoms inside a deep optical lattice. Instead of counter-propagating laser beams, the new setup uses an optical resonator to produce the lattice. A 1064 nm lattice laser is focused at the center of a concentric cavity, which is composed of two spherical mirrors with high reflectivity. The laser intensity inside the cavity can be enhanced hundreds of times, so an optical lattice of 10 GHz deep can be realized with fairly low laser input. With the lattice depth in the GHz regime, we expect to see the rich structure of adiabatic Rydberg-atom trapping potentials, which correspond to highly mixed states. We will summarize the current stage of the experiment, including how we stabilize the concentric cavity and how it is integrated with the atom trapping apparatus. We will also present further details about how the laser spectroscopy in deep optical lattice can be achieved.

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