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Progress towards measuring the Rydberg Constant Using Circular Rydberg Atoms in an Intensity-Modulated Optical Lattice[1] ANDIRA RAMOS, KAITLIN MOORE, GEORG RAITHEL, Univ of Michigan - Ann Arbor — Recent significant disagreement with the previously established size of the proton demonstrates a need to reconsider the current value of the Rydberg constant, the effects of the nuclear charge distribution and QED in hydrogen-like atoms. An experiment is in progress to obtain a measurement of the Rydberg constant by studying circular Rydberg atoms, which exhibit very small QED shifts and electron wavefunctions which do not overlap with the nucleus. Cold Rydberg atoms are trapped using a ponderomotive potential. To drive the transitions, a novel type of spectroscopy is used which utilizes an optical-lattice field that is intensity-modulated at the frequencies of atomic transitions [1]. The method is free of typical spectroscopic selection rules and has been shown to drive transitions up to fifth order [2]. Combined with optical Rydberg-atom trapping, the method enables the measurement of narrow, sub-THz transitions between long-lived circular Rydberg levels. Energy shifts affecting this precision measurement will also be discussed.

[1] K.R. Moore, S.E. Anderson, G. Raithel; Forbidden atomic transitions driven by an intensity-modulated laser trap. Nature Communications (FIX)

[2] K.R. Moore, G. Raithel; Nonlinear and Magic Ponderomotive Spectroscopy (in preparation).

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