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Applications of Ponderomotive Potentials to Rydberg Atoms B. KNUFFMAN, G. RAITHEL, FOCUS Center, Department of Physics, University of Michigan, Ann Arbor — The ponderomotive potential is a time-averaged potential experienced by free electrons in a light field and is proportional to the intensity of that field. A Rydberg atom is essentially composed of a quasi-free electron that is weakly bound to an ionic core. This being the case, Rydberg atoms can be manipulated via the ponderomotive interaction between the quasi-free Rydberg electron and laser fields. In this poster, we present experimental plans for several applications of ponderomotive potentials to Rydberg atoms. For optical standing waves, the ponderomotive potential is spatially periodic and may be used to form an optical lattice for Rydberg atoms. In addition to trapping Rydberg atoms, driving transitions between Rydberg states may be achieved by amplitude- or phase-modulating the potential experienced by the Rydberg atoms. Using this method, coupling Rydberg states should be possible in a spatially-selective way without the direct application of microwaves to the Rydberg-atom sample. This technique could provide future opportunities for Rydberg spectroscopy, including high-precision measurements of the Rydberg constant.

Brenton Knuffman
FOCUS Center
Department of Physics
University of Michigan
Ann Arbor, MI 48109

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