Abstract Submitted
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Developments in driving atomic transitions using the ponderomotive interaction[1] KAITLIN MOORE, GEORG RAITHEL, University of Michigan — We describe recent developments in a novel spectroscopic method that couples Rydberg states using an intensity-modulated optical lattice. The method is fundamentally different from traditional microwave spectroscopy: it engages the $\mathbf{A} \cdot \mathbf{A}$ (ponderomotive) term rather than the $\mathbf{A} \cdot \mathbf{p}$ term of the atom-field interaction Hamiltonian. The method allows us to drive GHz-frequency transitions between Rydberg states with optical spatial resolution and is not subject to the usual electric-dipole selection rules (i.e., higher-order multipole transitions are driven in first-order time-dependent perturbation)[2],[3],[4]. We review our previous experimental results using cold atoms, including an extension of this method into the near-sub-THz regime via modulation harmonics. We present new theoretical results showing extensions of this method to odd-parity transitions. Finally, we discuss the proposed application of this method to a precision measurement of the Rydberg constant using circular-state Rydberg atoms.

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