Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Recoil-free even- and odd-parity transitions in an amplitude-modulated lattice potential[1] GEORG RAITHEL, University of Michigan, Ann Arbor, MI, VLADIMIR MALINOVSKY, US Army Research Laboratory, Adelphi, MD, KAITLIN MOORE, ANDIRA RAMOS, University of Michigan, Ann Arbor, MI — Transitions of Rydberg atoms trapped in a ponderomotive lattice can be driven by lattice amplitude modulation, which causes a ponderomotive (A-square) interaction. This spectroscopic method is ideal for high-resolution spectroscopy of Rydberg atoms, with applications in measuring the Rydberg constant and other atomic constants. We model the spectroscopic line shapes semiclassically, with classical center-of-mass motion (CM), and by using two descriptions with quantized CM (based on solving the time-dependent Schrödinger equation and on transition rates between spinor Bloch states). We find that the transitions allow Doppler-free, fourier-limited spectroscopy, with sub-kHz linewidth, at temperatures and lattice depths that require only moderate laser cooling. The change in vibrational quantum number can be even or odd, for even- and odd-parity electronic transitions, respectively. Certain even-parity cases minimize the trap-induced shift of the transition frequency. Results of the models, applications in high-precision spectroscopy, and related ongoing experimental work are discussed. [1] S. Anderson, K. Younge, G. Raithel, PRL **107**, 263001 (2011). [2] K. Moore, G. Raithel, PRL **115**, 163003 (2015). [3] A. Ramos, K. Moore, G. Raithel, PRA **96**, 032513 (2017).

[1]Support by NSF (PHY1506093) and NASA (NNH13ZTT002N NRA). K.M. present address: NIST Boulder, CO 80305, USA

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Date submitted: 28 Jan 2018 Electronic form version 1.4