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Probing the Kondo Lattice Model with Alkaline Earth Atoms[1]
MICHAEL FOSS-FEIG, Department of Physics, University of Colorado (JILA), MICHAEL HERMELE, VICTOR GURARIE, Department of Physics, University of Colorado Boulder, ANA MARIA REY, University of Colorado, JILA, NIST — It has recently been proposed that alkaline-earth atoms can be used to simulate condensed matter Hamiltonians with both spin and orbital electronic degrees of freedom[1]. For example, it is possible to create two independent optical lattices for trapping the 1S0 and 3P0 clock states, which we then associate with two orbital degrees of freedom[2]. Such a system is particularly well suited to simulation of the Kondo Lattice Model (KLM): by placing one clock state in a deep lattice and the other in a shallow lattice it is possible to mimic the interaction of localized spins with a band of conduction electrons. We suggest simple dynamical probes of the KLM phase diagram that can be implemented with current experimental techniques. In particular, we show how Kondo physics at strong coupling, low density, and in the heavy fermion phase is manifest in the dipole oscillations of the conduction band upon sudden displacement of a parabolic trapping potential. [1] A V Gorshkov et al. arXiv:0905.2610v2 [cond-mat.quant-gas], Jan 2009. [2] A Daley, M Boyd, J Ye, and P Zoller. Phys. Rev. Lett. 101, 170504 (2008).

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