

Abstract Submitted  
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**Experiments with single atoms laser-cooled to their 3D ground state in an optical tweezer** ADAM KAUFMAN, BRIAN LESTER, CINDY REGAL, JILA, University of Colorado and National Institute of Standards and Technology — We present our recent work in which we have cooled a single neutral atom to its three-dimensional vibrational ground state in an optical tweezer. We spectroscopically measure a total ground state occupation of 90% and observe coherent control of the spin-motional quantum state. Building on these results, we plan to investigate using an array of traps created by our high-NA lens as an avenue towards bottom-up quantum simulation. By combining a dynamically controlled double-well potential with Raman assisted tunneling, we will look to realize the principle ingredients of Bose-Hubbard physics, namely on-site interactions and complex tunneling amplitudes.

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