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Characterization of a far-off resonant optical lattice trap for quantum entanglement of neutral atoms RAYMOND NEWELL, JINWEI WU, XINXIN ZHAO, DAVID VIEIRA, Los Alamos National Laboratory — Far-off resonant optical lattice (FORL) traps offer several advantages for manipulating neutral atoms toward quantum entanglement. Low photon scattering rates can lead to long coherence times, properly chosen lattice constants permit single-site resolution and addressing, and atoms may be transported by altering the phase or geometry of intersecting lattices. We describe our efforts to combine all these advantages in a CO-2 laser standing-wave lattice trap. After loading Rb-87 atoms from a standard magneto-optical trap (MOT) into our CO-2 lattice, we will adiabatically transfer them into a lattice of smaller lattice constant (0.5 microns) which will allow a spin-spin entanglement rate near 0.2 Hz. Adiabatically transferring the atoms back into the CO-2 lattice will permit readout of the atomic state and study of the entanglement effects. Our progress toward optical resolution of the 5.3 micron lattice sites is discussed, and characterization of the FORL potential by parametric excitation is presented.

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