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Controlling atom motion through the dipole-dipole force MICHAEL WALL, Colorado School of Mines, FRANCIS ROBICHEAUX, Auburn University, ROBERT JONES, University of Virginia — We describe simulations that illustrate the possibility for manipulating the position correlation of atoms in a magneto-optical trap (MOT) using the dipole–dipole interaction. The control scheme utilizes a narrow band laser that is detuned to the high-frequency side of a single-photon Rydberg transition in an isolated atom. As two atoms move near each other, they can be laser excited to repelling diatomic Rydberg-Rydberg potential energy curves which halt their approach. By chirping the laser from large to small detunings, atoms in a MOT can be pushed apart by dipole-dipole forces, thereby controlling nearest- neighbor interactions. Alternatively, by holding the frequency of the Rydberg excitation laser fixed as the MOT is loaded, it should be possible to limit the minimum distance between atoms to a prescribed value.

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