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Simulation of a 3D MOT-Optical Molasses Hybrid for Potassium-41 Atoms[1] W. A. PETERSON, JONATHAN WRUBEL, Creighton University — We report a design and numerical model for a 3D magneto-optical trap (MOT)-optical molasses hybrid for potassium-41 atoms. In this arrangement, the usual quadrupole magnetic field is replaced by an octupole field. The octupole field has a central region of very low magnetic field where our simulations show that the atoms experience an optical molasses, resulting in sub-doppler cooling not possible in a quadrupole MOT. The simulations also show that the presence of the magneto-optical trapping force at the edge of the cooling beams provides a restoring force which cycles atoms through the molasses region. We plan to use this hybrid trap to directly load a far off-resonance optical dipole trap. Because the atoms are recycled for multiple passes through the molasses, we expect a higher phase-space density of atoms loaded into the dipole trap. Similar hybrid cooling schemes should be relevant for lithium-6 and lithium-7, which also have poorly resolved D2 hyperfine structure.

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