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Novel spontaneous decay driven scheme of Sisyphus cooling in optical dipole traps VLADYSLAV IVANOV, SUBHADEEP GUPTA, University of Washington, ULTRACOLD ATOMS AND MOLECULES TEAM — We present a spontaneous decay driven Sisyphus cooling scheme for atoms trapped in far-off-resonant optical dipole traps (ODT). The cooling is achieved by exploiting the difference in the potential energy for atoms trapped in different electronic states. The cooling cycle consists of optical pumping of atoms into the excited state near the bottom of the trap followed by spontaneous decay into the ground state at random position in the ODT. There are no inherent atomic losses in this method. Our cooling scheme shares similarities with one proposed in J. Janis et al. Phys. Rev. A **71**, 013422 (2005) for cooling atoms in a magnetic trap. The presented cooling method sets constraints on the wavelength of the ODT and requires a narrow cooling transition with linewidth on order of the trapping frequencies. Therefore narrow transitions are preferred. However hyperfine splitting of the ground state is not required and optical cooling is combined with a tight spatial confinement. We investigate this problem theoretically and perform numerical simulations for the particular case of ^{88}Sr. The presented scheme is promising for cooling atomic species with an available narrow transition for example alkali-earth elements such as strontium and calcium.

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