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Ball Lens Optical Trap LEO NOFS, MICHAEL A. VIRAY, CAINAN S. NICHOLS, Univ of Michigan - Ann Arbor — We provide a demonstration of a rubidium MOT with ball lenses. The ball lens design provides a new range of possible improvements towards the goal of miniaturization of MOT and optical molasses systems, as well as improved electric-field control. The ball lenses subtend a sub-percent solid angle from the trapped atoms. The 1.5 mm diameter ball lenses are embedded in a cubic mounting frame with a side length of about 15 mm that acts as a Faraday cage. The cage reduces the effects of outside fields and variable black body radiation. The 2-mW trap laser beams are collimated onto the ball lenses (Full Width Half Max (FWHM) between 400 and 750 μm), which generate high-NA, divergent trapping beams that expand to about 6 mm FWHM at the trap location at the center of the cage, with intensities of $3I_{sat}$. We characterize atom numbers and loading rates, and discuss peculiarities that arise from the highly divergent character of the trapping beams. The ball lens trap is power efficient due to its compact design. It is conducive for MOT operation with low viable magnetic-field gradients, it is well-suited for systems that require specific electromagnetic boundary conditions, and it may be effective at controlling black-body radiation in atomic clocks Rydberg-atom experiments.

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