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Rapid Cooling to Quantum Degeneracy in Dynamically Shaped Atom Traps[1] RICHARD ROY, ALAINA GREEN, RYAN BOWLER, SUBHADEEP GUPTA, Department of Physics, University of Washington — We report on a general method for the rapid production of quantum degenerate gases. Using ^{174}Yb, we achieve an experimental cycle time as low as (1.6–1.8) s for the production of Bose-Einstein condensates (BECs) of $(0.5-1)\times10^5$ atoms. While laser cooling to $30\,\mu$K proceeds in a standard way, evaporative cooling is highly optimized by performing it in an optical trap that is dynamically shaped by utilizing the time-averaged potential of a single laser beam moving rapidly in one dimension. We also produce large ($>10^6$) atom number BECs and successfully model the evaporation dynamics over more than three orders of magnitude in phase space density. Our method provides a simple and general approach to solving the problem of long production times of quantum degenerate gases.

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