Abstract Submitted
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An Improved Antihydrogen Trap RITA KALRA, STEPHAN ETTENAUER, NATHAN JONES, WILLIAM KOLTHAMMER[1], ROBERT MCCONNELL[2], PHILIP RICHERME[3], ERIC TARDIFF, GERALD GABRIELSE[4], Harvard University Physics Department, ATRAP COLLABORATION — The recent demonstration of trapped atomic antihydrogen for 15 to 1000 seconds is a milestone towards precise spectroscopy for tests of CPT invariance. The confinement of a total of 105 ± 21 atoms in a quadrupole magnetic trap was made possible by several improved methods. Improved accumulation techniques give us the largest numbers of constituent particles yet: up to 10 million antiprotons and 4 billion positrons. A novel cooling protocol leads to 3.5 K antiprotons, the coldest ever made. Characterizing and controlling the geometry and density of these confined antimatter plasmas allow for consistency in antihydrogen production. Continued use of these methods, along with the larger trap depth of a unique second-generation magnet, are expected to yield greater numbers of trapped antihydrogen. The new magnet generates both quadrupole and octupole trap geometries, which can reduce charged particle loss and prove useful for laser cooling and spectroscopy. The ultra-low inductances of the magnet lead to vastly reduced turn-off times, required for single-atom detection. The successful operation of the magnet and its turnoff times has been experimentally demonstrated.

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