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Progress towards laser-controlled formation of antihydrogen in a Penning-Ioffe trap ROBERT MCCONNELL, Harvard University, ATRAP COLLABORATION — The recent announcement of trapped antihydrogen ($\bar{H}$) [1] opens the door to precise tests of CPT symmetry via spectroscopic comparison of magnetically confined atoms and anti-atoms. An important challenge is to trap sufficient numbers of $\bar{H}$ atoms to allow high-precision spectroscopy. Laser-controlled charge-exchange has been shown to be an efficient method of producing $\bar{H}$ [2]. Laser-controlled charge exchange allows large numbers of positrons (e^+) to be used in the $\bar{H}$ formation process and should produce atoms with speeds given by the initial thermal velocities of the antiprotons ($\bar{p}$) involved, which may be adiabatically cooled to 3.5 K or below [3]. We report progress towards the laser-controlled formation and trapping of $\bar{H}$ in a Penning-Ioffe trap. A Rydberg Cs beam charge-exchanges with trapped e^+ to produce metastable $Ps*$ atoms which undergo a second charge-exchange and produce $\bar{H}$. As many as 3,600 $\pm$ 600 $\bar{H}$ atoms per trial are likely being produced by this method, a 100-fold increase over previous efforts, although some outlying difficulties in the detection process remain. Experiments towards trapping $\bar{H}$ produced by this method are underway. [1]. G. B. Andresen et al. (ALPHA Collaboration), Nature (London) 468, 673 (2010). [2]. C. H. Storry, et al. (ATRAP Collaboration), Phys. Rev. Lett. 93, 263401 (2004). [3] G. Gabrielse, et al. (ATRAP Collaboration), Phys. Rev. Lett. (in press).

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