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Antihydrogen production by two stage charge exchange

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Antihydrogen ($\bar{}$H) atoms are produced via laser-controlled, two-stage charge exchange in a cryogenic Penning trap. 6x10^6 antiprotons ($\bar{}$p) and 3x10^8 positrons (e+) are held in a nested well potential structure. Cs*atoms, produced via laser excitation within the cryogenic Penning trap, travel radially across the trap and through the e+ plasma to produce Ps.* The Ps* atoms are produced isotropically, with some atoms moving along the axis of the Penning trap and interacting with the cold $\bar{}$p via a second charge exchange to form potentially very cold $\bar{}$H. $\bar{}$H formation is detected by comparing the $\bar{}$p annihilation counts with Cs excited to the Rydberg state to those obtained when the Cs remains in the ground state.

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