

## ANTIMATTER TRANSPORT PROCESSES

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 (ALPHA COLLABORATION)

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**Abstract.** The comparison of the 1S-2S energy levels of hydrogen and antihydrogen will yield a stringent test of CPT conservation. Necessarily, the antihydrogen atoms need to be trapped to perform high precision spectroscopy measurements. Therefore, an approximately 1 T deep neutral trap, about 0.7 K for ground state (anti)hydrogen atoms, has been superimposed on a Penning-Malmberg trap in which the antiatoms are formed. The antihydrogen atoms, which are required to have a low enough kinetic energy to be trapped, are produced following a number of steps. A bunch of antiprotons from the CERN Antiproton Decelerator are caught in a Penning-Malmberg trap and subsequently sympathetically cooled down and then compressed using rotating wall electric fields. A positron plasma,

formed in a separate accumulator, is transported to the main system and also compressed. Antihydrogen atoms are then formed by mixing the antiprotons and positrons. The velocity of the antiatoms, and their binding energies, will strongly depend on the initial conditions of the constituent particles, for example their temperatures and densities, and on the details of the mixing process.

In this talk the complete lifecycle of antihydrogen atoms will be presented, starting with the production of the constituent particles and the description of the manipulations necessary to prepare positrons and antiprotons appropriately for antihydrogen formation. The latter will also be described, as will the possible fates of the antiatoms.