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Possible Procedure for Generating a Cold (~ 0.1 K) Antihydrogen Beam CARLOS ORDONEZ, University of North Texas — A cold (~ 0.1 K) and narrow antihydrogen beam may be useful for measuring the force of gravity on antihydrogen [A. Kellerbauer et al., Nucl. Instrum. Methods B 266 (2008) 351]. A possible procedure for generating such a beam is described. The first two steps would consist of compressing a ~ 4 K antiproton plasma to ~ 0.5 mm in diameter and then expanding the plasma adiabatically by transporting it along a diverging magnetic field. Similar steps have already been reported [G. B. Andresen et al., Phys. Rev. Lett. 100 (2008) 203401], although the adiabatic expansion was done for diagnostic purposes. Next, an electrode system that produces a periodic electrostatic potential with a small spatial period would be used to extract the antiprotons from the magnetic field and to further expand and cool the antiprotons. The cold antiprotons could then be captured within a Kingdon trap, and positronium atoms could be introduced to produce a cold antihydrogen beam. Alternatively, the cold antiprotons could be merged with positrons to achieve recombination within a mixed beam, which could be captured within an electrostatic storage ring that employs a periodic potential for providing transverse confinement.

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