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### **Synthesis of cold antihydrogen in a cusp trap<sup>1</sup>**

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We report here the first successful synthesis of cold antihydrogen atoms employing a cusp trap[1], which is not to trap but to extract an intensified antihydrogen beam in a field-free region for high precision microwave spectroscopy. This success opens a new path to make a stringent test of the CPT symmetry via observation of ground-state hyperfine transitions of antihydrogen atoms. The cusp trap consists of superconducting anti-Helmholtz coils and a stack of multiple ring electrodes, which provides non-uniform but axially symmetric magnetic and electric fields. Because of this axial symmetry, a large number of antiprotons and positrons are stably stored in the trap. At the same time, antihydrogen atoms in low-field-seeking states synthesized in the cusp trap can be selectively and effectively extracted along the trap axis.

[1] Y. Enomoto et al., Phys.Rev.Lett.105, 243401 (2010)

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