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Towards a spin polarized antihydrogen beam

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The ASACUSA collaboration has been making a path to realize high precision microwave spectroscopy of ground-state hyperfine splitting of antihydrogen atom in flight for a stringent test of the CPT symmetry. For our physics goal, an efficient extraction of a spin polarized antihydrogen beam is essential.
In 2010, we have succeeded in synthesizing our first cold antihydrogen atoms employing a CUSP trap consisting of a superconducting anti-Helmholtz coil and a stack of multiple ring electrodes[1]. This was achieved with our antiproton accumulator, MUSASHI, and a positron accumulator. However the rate of antihydrogen synthesis was limited by a low accumulation efficiency of positrons. In addition, the total number of synthesized antihydrogen was found to be suppressed[1]. To proceed the next step, we made improvements, like for example a modified positron source for rapid experimental cycle and a new mixing scheme to prolong the reaction period.
An antihydrogen beam detector has also been developed. It was comprised of an inorganic single-crystal scintillator and surrounding plastic scintillator plates.
We report the recent results of antihydrogen synthesis and attempts of an anti-atomic beam production.

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

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