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Antihydrogen production and beam formation for hyperfine spectroscopy at low magnetic field

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The ground state hyperfine splitting was recently measured to 0.4 ppb for a beam of hydrogen in the ASACUSA spectrometry line (Nowak 2024). We plan to repeat the experiment using an antihydrogen beam. So far (Kuroda 2014, Kolbinger 2021), the beam intensity is too low (<1 ground state atom per cycle) to distinguish signal from background. In an upgraded mixing trap, we cool up to 4x10⁷7 particles to T²⁵ K (Amsler 2022)– five times lower than before. Using a positron-antiproton mixing scheme similar to ALPHA's (Ahmadi 2017), we produce 4x10⁵ antihydrogen atoms—seven times more than previously reported—all of which annihilate without forming a beam. A new method of mixing (Jonsell 2019) will soon be applied to increase the beam-like fraction. First results may be available by the time of this conference.

References

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