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Progress towards in-beam hyperfine spectroscopy of antihydrogen

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Antihydrogen is the simplest atom consisting purely of antimatter. Its matter counterpart, hydrogen, is one of the best studied atomic systems in physics. Thus comparing the spectra of hydrogen and antihydrogen offers some of the most sensitive tests of matter-antimatter symmetry. The ASACUSA collaboration is pursuing an experiment to measure the ground-state hyperfine splitting of antihydrogen in a polarized beam [1,2], a quantity which was measured in hydrogen in a beam to a relative precision of 4×10^{-8} [3] and in a maser to better than 10^{-12} [5,6] .

After recently reporting the first observation of a beam of antihydrogen atoms 2.7 m downstream of the formation region in a field-free environment [4], the atomic resonance beam apparatus to perform a hyperfine measurement was completed. During the shutdown of CERN, a source of cold polarized hydrogen atoms was built and experiments were performed to characterize the apparatus with a hydrogen beam of similar properties as compared to the expected antihydrogen beam. Scans of the hyperfine structure of hydrogen showing encouraging results for the achievable precision for a measurement with antihydrogen will be reported.

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