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Hyperfine spectroscopy setup for antihydrogen and first results with a hydrogen beam

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The ASACUSA collaboration aims to measure the ground state hyperfine splitting of the antihydrogen atom, since this is a system where the CPT symmetry can be investigated with extremely high sensitivity. The principal idea is described in [1,2].
During the CERN LS1 shut down, antiprotons were not available. Therefore, a source of cold, polarized, and modulated atomic hydrogen has been constructed to enable comprehensive testing of the Rabi-like experimental setup consisting of a microwave spin flip cavity and superconducting sextupole magnet [3].

After shortly discussing the main components of the atomic hydrogen source and detector as well as the spectroscopy beamline I will present the latest experimental data, which allowed for a characterization of the focusing effect of the superconducting sextupole magnet and the resonance line shape of the spin flip cavity. Furthermore, a confirmation of the proposed measurement principle for the hyperfine splitting of antihydrogen was achieved by the determination of the ground state hyperfine splitting of atomic hydrogen with a precision on the 10 ppb level.

References
[1] E. Widmann et al., Hyperfine Interactions, 215, 1-8 (2013)
[2] N. Kuroda et al., Nature Communications, 2089, 5 (2014)
[3] C. Malbrunot et al., Hyperfine Interactions, (2014) DOI: 10.1007/s10751-014-1013-z

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