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## The ASACUSA hydrogen hyperfine structure measurement

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The ASACUSA (Atomic Spectroscopy And Collisions Using Slow Antiprotons) Collaboration of the AD-facility at CERN aims to measure the ground-state hyperfine structure of antihydrogen to test the CPT-Theorem [1]. For this purpose, a spectroscopy apparatus has been built and tested with hydrogen [2]. An upgrade of the interaction region enabled to induce two transitions between the hyperfine transition sublevels by using the same experimental setup. It was shown, that the apparatus works as expected with a relative precision of ppb [3]. Further, analysis of data acquired at lower magnetic fields ( $\sim 46$  mG to  $\sim 0.231$  G), i.e. small Zeeman splitting of the energy levels, shows a systematic shift due to interactions between the sublevels [4].

The poster will show the hydrogen beam experimental setup, the investigation of the systematic shift, the correction of the results and conclusions for the antihydrogen experiment.

### References:

- [1] Widmann, E., Diermaier, M., Juhász, B. et al. *Hyperfine Interact* 215: 1-8 (2013).
- [2] M. Diermeier et al. In-beam measurement of the hydrogen hyperne splitting and prospects for antihydrogen spectroscopy. *Nature Communications*, 8, 2017.
- [3] S. Argueda Cuendis. Measuring the hydrogen ground state hyperfine splitting through the  $\pi_1$  and  $\sigma_1$  transitions. Master's thesis, University of Vienna, 2017.
- [4] A. Lanz. Hydrogen Hyperfine Structure Measurements using the  $\sigma_1$ - and  $\pi_1$ -Transitions: Evaluation & Correction. Master's thesis, University of Vienna, 2019.

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