Contribution ID: **10** Type: **Contributed talk**

Measurement of the ground-state hyperfine splitting of antihydrogen

Tuesday, 23 March 2010 15:30 (30 minutes)

The hydrogen atom is one of the most extensively studied atomic systems, and its ground state hyperfine splitting (GS-HFS) at 1.42 GHz has been measured with an extremely high precision of 10^-12. Therefore the antimatter counterpart of hydrogen, the antihydrogen atom, consisting of an antiproton and a positron, is an ideal laboratory for studying the CPT symmetry.

The ASACUSA collaboration at CERN's Antiproton Decelerator (AD) plans to measure the antihydrogen GS-HFS in an atomic beam apparatus [1,2] similar to the ones which were used in the early days of hydrogen HFS spectroscopy. The apparatus will use antihydrogen atoms produced in a superconducting cusp trap (i.e. anti-Helmholtz coils). The inhomogeneous magnetic field of such a trap will create a partially polarized beam, which will then pass through a radiofrequency resonator to flip the spin of the antihydrogen atoms. Finally a sextupole magnet analyses the spin orientation of the atoms. This atomic beam method has the advantage that antihydrogen atoms of temperatures up to 150 K can be used. Simulations showed that such an experiment is feasible if appr. 100 antihydrogen atoms per second can be produced in the ground state, and that an accuracy of appr. 10^-7 can be reached within reasonable measuring times [2].

After the first measurements at CERN, the experiments can continue at the Facility for Low-Energy Antiproton and Ion Research (FLAIR) of FAIR, possibly with improved techniques, e.g. using Ramsey's separated oscillatory field method [3].

[1] ASACUSA collaboration, Proposal CERN-SPSC 2005-002, SPSC P-307 Add. 1, 2005.
[2] B. Juhasz, E. Widmann, Hyp. Int. 193 (2009) 305.
[3] N.F. Ramsey, Nobel Lecture (1989).

Primary authors: Dr JUHASZ, Bertalan (Stefan Meyer Institute for Subatomic Physics, Vienna, Austria); Prof. WIDMANN, Eberhard (Stefan Meyer Institute for Subatomic Physics, Vienna, Austria)

Presenter: Dr JUHASZ, Bertalan (Stefan Meyer Institute for Subatomic Physics, Vienna, Austria)

Session Classification: Atomic Physics

Track Classification: Atomic Physics