A slow beam of antihydrogen atoms

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on behalf of the ASACUSA Cusp collaboration

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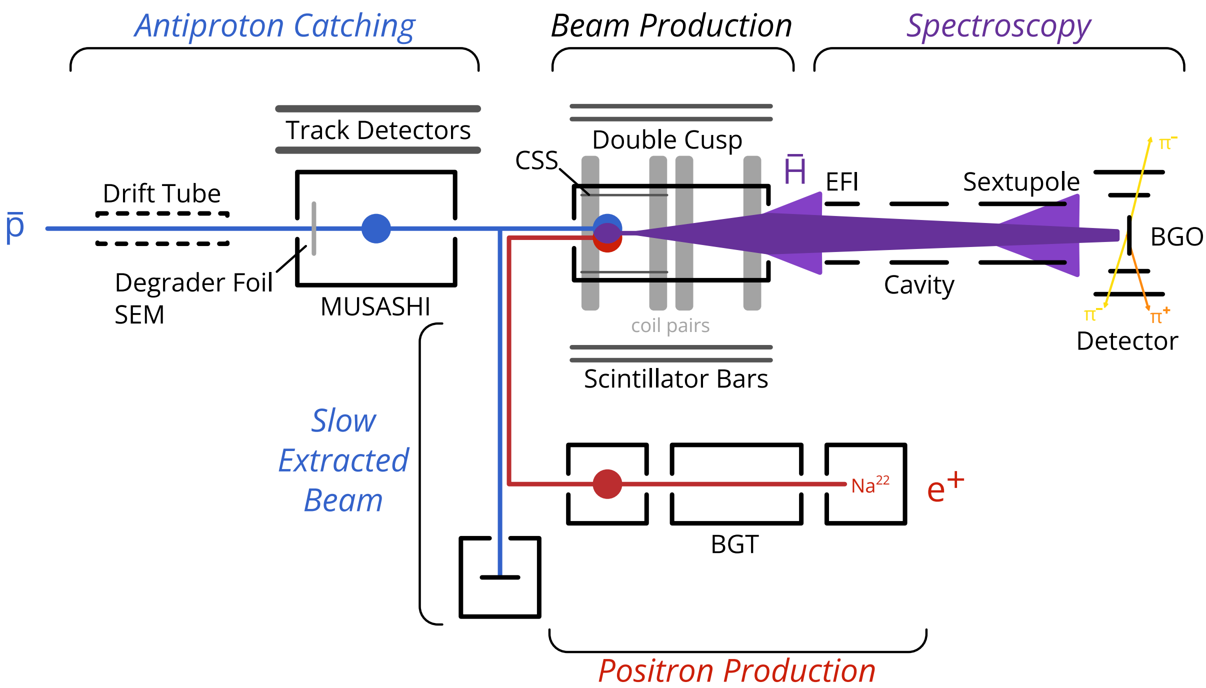

Figure 1: Schematic diagram of the ASACUSA-Cusp experiment. Positron and antiproton plasmas (red and blue circles) are combined in the Double Cusp to form an antihydrogen beam (purple).

The ASACUSA-Cusp experiment aims to measure the ground-state hyperfine structure of antihydrogen in a low magnetic field region using Rabi spectroscopy [1, 2]. A schematic diagram of the apparatus is shown in Figure 1. To perform this measurement, a spin-polarised beam of antihydrogen atoms is required. These atoms are produced in the Double Cusp trap [4, 3]. The beam passes through a microwave cavity, where the spectroscopy is performed, followed by a sextupole magnet for spin-selective focusing onto the antihydrogen detector.

ASACUSA produces antihydrogen by slowly combining large quantities of positron and antiproton plasma. The antiprotons are "mixed" with the positrons for 60 seconds, during which approximately 100 antihydrogen atoms leave the trap as a beam. These atoms are mostly in Rydberg states (principal quantum number $n > 20$) and can be ionised by a strong electric field. We study the binding energy of the atoms by varying the strength of this field, and we measure their time of flight by pulsing the field to chop the beam.

This presentation will cover our most recent measurements, as well as progress toward producing a slower beam with a higher fraction of ground-state atoms. Such a beam will enable us to achieve our aim of measuring the ground-state hyperfine splitting of antihydrogen in a low magnetic field with ppm precision.

References

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