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Spin polarized atomic hydrogen beam source

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The ASACUSA collaboration aims to measure the ground state hyperfine splitting of anti hydrogen with a Rabi like experiment. In the experimental setup a beam of partially polarized anti hydrogen atoms enter a microwave cavity which induces a spin flip. After that a superconducting sextupole magnet is used to analyze the spins of the particles. Finally our anti hydrogen detector identifies the antimatter atoms.

Since the properties of the cavity and the sextupole magnet have to be crosschecked, we want to measure the very well known ground state hyperfine splitting of the hydrogen atom with this equipment.

In this work we present an apparatus that we use to produce a spin polarized beam consisting of atomic hydrogen atoms, which we detect with a quadrupole mass spectrometer (QMS).

Hydrogen molecules are dissociated by a microwave induced discharge. The particles enter a differentially pumped vacuum system consisting of four chambers. With the help of a skimmer and apertures a beam is formed. This beam is polarized with permanent sextupole magnets. For the detection of the formed hydrogen we use a cross beam QMS with a lock in amplifier.

With this apparatus the experiment described before will be performed this summer at CERN.

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