

A detector for in-beam measurement of the ground state hyperfine splitting of antihydrogen

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The matter - anti matter asymmetry observed in the universe today still lacks a quantitative explanation. One possibility that could contribute to the observed state could be a violation of the combined Charge-, Parity- and Timesymmetries (CPT). A possible contribution to this asymmetry could come from a violation of the CPT symmetry. A test of CPT symmetry using anti-atoms is being carried out by the ASACUSA-CUSP collaboration at the CERN Antiproton Decelerator using a low temperature beam of antihydrogen - the most simple atomic system built only of anti particles.

While hydrogen is the most abundant element in the universe, antihydrogen is produced in very small quantities in a laboratory framework. A detector for in-beam measurements of the ground state hyperfine structure of antihydrogen has to be able to detect very low signal rates within high background. To fulfil this challenging task a two layer barrel hodoscope detector was developed. It is built of plastic scintillators with double sided readout via Silicon Photo Multipliers (SiPMs). The SiPM readout is done using novel, compact and cost efficient electronics that incorporate power supply, amplifier and discriminator on a single board.

This contribution will evaluate the performance of the new detector during the ASACUSA beamtime 2014 and 2015. We will also put a spotlight on the new, self developed, readout electronics and discuss possible further applications.

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