

Characterization of Neutral Trapped Antihydrogen in the ALPHA Experiment

The Antihydrogen Laser Physics Apparatus (ALPHA) experiment at CERN is designed to carry out detailed studies of the properties of neutral antihydrogen atoms. A comparison of the properties of hydrogen and antihydrogen allows a sensitive probe of fundamental symmetries in Nature. Recent achievements have paved the way for precision measurements. Experiments are performed through the adaption of well documented methods in atomic physics to the challenging environment of neutral antimatter handling.

ALPHA has recently reached several important milestones en route to precision measurements. These include trapping of cold antihydrogens, long confinement, and the first spectroscopic measurement. Methods to study gravitational effects have been demonstrated and the charge neutrality of trapped antihydrogen has also been tested to high precision.

A unique Silicon Vertex Detector (SVD) surrounding the neutral atom trap is used for the identification of antihydrogen annihilation. The SVD provides diagnostics of the antiproton plasma time evolution and, most importantly, individual antihydrogen annihilation event vertex locations. Characteristics of the SVD and analytical methods applied to the data produced by the SVD, in different experimental setups, will be presented. In addition, an overview of the ALPHA physics goals and current progress will be reviewed.

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Track Classification: Semiconductor Detectors