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Particle detectors for precision atomic experiments in ALPHA

The aim of the ALPHA experiment at CERN is to trap cold atomic antihydrogen, study its properties, and ultimately to perform precision comparison between the hydrogen and antihydrogen atomic spectra. Recently the collaboration has reached important milestones, from demonstrating the ability to trap and confine neutral cold antihydrogen, to performing precision spectroscopic measurements with antihydrogen.

The principal tool for antihydrogen detection in the ALPHA experiment is a particle track detector: the Silicon Vertex Detector (SVD) built using 72 double-sided silicon strip hybrid modules and designed to surround the neutral atom trap.

The SVD is used to image single annihilation events, reconstructing spatial and timing data of antiproton annihilation. With the aid of machine learning, the detector can be utilised in various modes, application modes include low background counting experiments, accurate vertex reconstruction and collective plasma behaviour studies. Experimental methodology, recent progress with analytical methods and experimental results will be presented

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