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## Precision Antihydrogen Annihilation Reconstructions Using the ALPHA-g Detector

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The ALPHA (Antihydrogen Laser PHysics Apparatus) collaboration aims to test fundamental symmetries with matter and antimatter by testing CPT (charge conjugation, parity reversal, time reversal) theory and observing whether antimatter follows Einstein's Weak Equivalence Principle (WEP), where the acceleration due to gravity that a body experiences is independent of its structure or composition. A measurement of the gravitational mass of antimatter has never been done before, as previous experiments used charged particles, which meant the experiments were dominated by electromagnetic forces. The ALPHA-g apparatus will use electrically neutral antihydrogen atoms produced in a vertical Penning-Malmberg trap and hold the antihydrogen in a magnetic well. Once the antihydrogen is released, the position of the resulting annihilations can be reconstructed with a radial time projection chamber (rTPC) surrounding the trapping volume. Tracing the annihilation position within the rTPC is imperative to measuring the gravitational mass of antihydrogen. Simulations of antihydrogen annihilations, and how to calibrate the detector for z-positions will be discussed. This data will be used to measure the gravitational mass of antihydrogen; an important measurement in testing the fundamental symmetry of matter and antimatter. The ALPHA-g apparatus is currently being commissioned at CERN, and the first gravitational measurements of antihydrogen are underway.

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### Please select: Experiment or Theory

Experiment

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