Contribution ID: **36** Type: **Contributed Oral**

Laser Calibration Studies Using the ALPHA-g Detector

Saturday, 18 February 2023 09:15 (15 minutes)

ALPHA-g has completed a successful run in 2022 in the pursuit of measuring the gravitational mass of antihydrogen. This apparatus was designed to test 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 uses electrically neutral antihydrogen atoms produced in a vertical Penning-Malmberg trap and trapped in a magnetic minimum trap. By measuring the antihydrogen annihilation positions after a controlled magnetic release of the atoms the gravitational mass of antihydrogen can be determined. Annihilation positions are reconstructed with a radial time projection chamber (rTPC) surrounding the trapping volume.

To accurately determine vertical annihilation positions, precise detector calibrations are needed. A laser calibration system was developed and used to gather drift time data in the rTPC, which results in vertical position information, and can be used to monitor changes in pressure, temperature, and magnetic field. In particular, we can calculate the Lorentz angle using the drift time, which is then used in reconstruction to accurately determine the annihilation positions. This results in precise measurements for the gravitational mass of antihydrogen.

In this talk I will discuss the laser calibration system for the rTPC and the results of the drift time data taken over the course of the 2022 run period. I will further discuss how these results are used in the reconstruction of antihydrogen annihilations.

Supervisor

Timothy Friesen

Funding Agency

NSERC, CFI

Supervisor Email

timothy.friesen@ucalgary.ca

Your Email

pooja.woosaree@ucalgary.ca

Primary author: WOOSAREE, Pooja (University of Calgary)

Presenter: WOOSAREE, Pooja (University of Calgary)

Session Classification: February 18 Morning Session

Track Classification: Particle Physics