Contribution ID: **90** Type: **Invited Oral**

The ALPHA-g antihydrogen gravity experiment

Saturday, 18 February 2023 08:45 (30 minutes)

The symmetry between matter and antimatter is one of the great unresolved questions in fundamental physics, as it underscores the discrepancies between the Standard Model and cosmological observations. Many experiments have been performed to compare the properties of antimatter to matter at great precision. However, gravitation has so far eluded these efforts due to the difficulty measuring such a tenuous force acting on energetic anti-particles. The advent of cryogenic, trapped antihydrogen atoms, first produced by the ALPHA experiment, has opened a new possibility.
The ALPHA-g experiment at CERN, which has just completed its first year of physics campaign in 2022, is designed to precisely measure the gravitational mass of antihydrogen atoms. The anti-atoms are confined in a vertical magnetic minimum trap, and released through precisely controlled openings in the field, at the trap's bottom and top. Anti-atoms preferentially escape through the opening with the lowest potential energy, which is a sum of magnetic and gravitational potentials. By observing the magnetic field at which anti-atoms escape equally through both openings, their gravitational mass can be deduced.
Precise measurement of antihydrogen gravity hinges on controlling the trap field. For a 1% precision in gravity measurement, the field need to be controlled to within 1e-5 T in a O(1 T)-deep trap. Extensive effort is therefore expended in magnet design, construction and magnetometry to achieve such precision.
This talk will give an overview of ALPHA-g's physics methodology, magnetic trap design and simulation results which predict the precision achievable in ALPHA-g.

Supervisor

Funding Agency

Supervisor Email

Your Email

Primary author: SO, Chukman (TRIUMF)

Presenter: SO, Chukman (TRIUMF)

Session Classification: February 18 Morning Session

Track Classification: Particle Physics