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Rejecting the Cosmic Ray Background in the ALPHA-g Anti-hydrogen Gravity Experiment

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The ALPHA project is a cornerstone of the effort to verify symmetries between matter and antimatter, with implications for understanding the baryon asymmetry and the evolution of our universe. The new ALPHA-g experiment aims to perform the first precision measurement the acceleration of anti-hydrogen atoms at rest in a gravitational field, a key piece of this puzzle.

This measurement requires the release of trapped anti-hydrogen atoms via a controlled relaxation of the confining magnetic fields; the anticipated time scale for this process is of the order of tens of seconds. Since the number of anti-atoms trapped is expected to be small, it becomes imperative to have a highly efficient system for identifying and rejecting events caused by the dominant background –cosmic rays.

To this end, a detector system called the Barrel Veto was constructed and installed, which uses the time-of-flight principle to reject externally incident particles. This requires resolving the time-of-flight of incoming particles to within a few hundred picoseconds, a feat which has been achieved through a number of precise calibrations. Although a detailed background rejection scheme is yet to be implemented, the detector was operated successfully in the 2021 commissioning run, and the initial results –presented here –look promising.

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Please select: Experiment or Theory

Experiment

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