Contribution ID: **638** Type: **Parallel**

Searching for cosmic-ray antinuclei with the GAPS experiment

Monday 7 July 2025 15:40 (17 minutes)

The General Anti-Particle Spectrometer (GAPS) is a long duration balloon experiment scheduled for its first launch from Antarctica during the austral summer of 2025-26, with a total of three planned flights. GAPS is optimized to detect cosmic-ray antinuclei at energies below 0.25 GeV per nucleon, a yet-unexplored energy regime with characteristically low astrophysical backgrounds. The experiment will measure the antiproton spectrum at lower energies and higher sensitivities than any previous detector, which will provide an interesting exploration into the potential antiproton excess. GAPS is also the first experiment sensitive to cosmic-ray antideuterons and antihelium in this energy range; antideuterons in particular are predicted by many dark matter models, but their backgrounds due to known astrophysical processes are so small that any detection would be a "smoking gun"indication of new physics.

GAPS uses a novel detection method involving exotic atom formation, de-excitation, and annihilation in order to identify antinuclei species. The innermost detector component is a silicon tracker, which acts as both the target nucleus for incoming antinuclei and an x-ray detector to measure de-excitation and annihilation products. The tracker is cooled by an oscillating heat pipe thermal system and surrounded on all sides by the time-of-flight (TOF) detector utilizing plastic scintillator material. The TOF performs precision timing measurements and provides the trigger for the experiment. The GAPS instrument is fully constructed and commissioned at NASA's long-duration ballooning facility in Antarctica and is ready for launch as early as possible during the 2025-26 Antarctic balloon season. This talk will give an overview of the instrument and discuss potential science impacts of the GAPS program on dark matter research.

Secondary track

Authors: COLLABORATION, GAPS; FELDMAN, Sydney (University of California, Los Angeles)

Session Classification: T02

Track Classification: T02 - Dark Matter