

Searching for cosmic antihelium nuclei with the GAPS experiment

What is this contribution about?

GAPS (General Antiparticle Spectrometer) is planned to be launched from McMurdo Station in the austral summer of 2022/23. It has unique capabilities to search for heavier antinuclei in the upper atmosphere. This contribution presents the current status of our efforts to identify antihelium nuclei and will report current sensitivity estimates.

Why is this relevant?

Heavier [than antiproton] cosmic antinuclei can provide a smoking gun signature for Dark Matter or exotic physics. While AMS-02 has observed several event candidates, our current understanding would imply a corresponding antideuteron flux, which has not yet been observed. Cross-validation of the observation in a lower energy range with a different instrumental technique might help to uncover the mystery about the origin of the AMS-02 events.

What have we done?

We performed extensive, detailed simulations of the GAPS instrument and developed a reconstruction technique to estimate the GAPS antihelium-3 capabilities and derive a projected sensitivity.

What is the expected result?

We were able to show that the GAPS experiment will be able to achieve a sensitivity which might allow setting constraints on current dark matter models in an energy region inaccessible to AMS-02, thus providing a cross-validation of the AMS-02 antihelium event candidates.