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The GAPS experiment - Searching for Dark Matter using Cosmic-ray Antinuclei

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The General Antiparticle Spectrometer (GAPS) is a balloon-borne detector designed to search for dark matter search by measuring low-energy (<0.25 GeV/n) cosmic-ray antinuclei (antiprotons, antideuterons, antihelium). GAPS uses a novel identification technique based on exotic atom formation and decay. GAPS will provide a high-statistics antiproton spectrum in an unexplored low-energy range. In contrast, so far, no antideuteron has been detected in cosmic radiation. However, well-motivated theories beyond the standard model of particle physics predict a significant enhancement of the antideuteron flux at low energies due to the annihilation or decay of dark matter particles.
Antideuterons are an essentially background-free dark matter signature since, below 0.25 GeV/n, the astrophysical background is predicted to be at least two orders of magnitude lower than the flux predicted from viable dark matter models. GAPS will also provide leading sensitivity to cosmic antihelium-3, a particularly low-background signature of new physics. The experiment is designed to achieve its goals via a series of long-duration balloon flights at high altitude in Antarctica starting in Austral Summer 2022/2023. This presentation will review the theoretical status of antinuclei searches for dark matter, introduce the GAPS experiment, and report on the status of the GAPS instrument construction, simulation, and analysis tools.

Reference to paper (DOI or arXiv)

Your gender (free text)

Primary author(s) : MUNINI, Riccardo (INFN - Trieste); ON BEHALF OF THE GAPS COLLABORATION

Presenter(s) : MUNINI, Riccardo (INFN - Trieste)

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