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Search for Dark Matter signatures from cosmic-ray antinuclei with the GAPS experiment

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The General Antiparticle Spectrometer (GAPS) experiment is designed to perform low-energy cosmic-ray antinuclei measurements searching for indirect signatures of dark matter annihilation or decay. The unprecedented sensitivity at energies <0.25 GeV/n will allow GAPS to detect or set upper limits on the cosmic antideuterium or antihelium nuclei flux in an energy range with a very low astrophysical background. Several beyond-the-Standard Model scenarios predict antinuclei fluxes about two orders of magnitude above the astrophysical background. Furthermore, GAPS will collect the largest statistics of low-energy antiprotons to date, extending the existing measurements to unexplored low energies (< 100 MeV). The GAPS experiment will perform such measurements using long-duration balloon flights over Antarctica, beginning in 2022/23 austral summer. The experimental apparatus consists of ten tracker planes of Si(Li) detectors surrounded by a time-of-flight system made of plastic scintillators. A novel identification technique is used to detect the antinucleus, which employs the production and decay of a short-lived exotic atom. In this contribution, the status of the constructions of the different GAPS subdetectors will be reported, and the latest results of the simulations studies on the detector performance will be summarized.

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