

The GAPS Experiment-a search for light cosmic ray antinuclei

Abstract for Poster:As many models suggest, the Universe is made of Dark Matter (DM) and the origin and nature of DM is one of unsolved topics of modern physics .Many experiments are continuously trying to solve this mystery and GAPS – General Anti-Particle Spectrometer – could offer a unique approach to tackle the search for DM candidates. This is a balloon-borne cosmic ray detector, whose primary goal is to search for light anti-nuclei in cosmic radiation at kinetic energies below 0.25 GeV/n; this specific range is of particular interest because many DM models propose annihilation and decay into matter-antimatter pairs right around these energies. The payload – currently in its last phase of integration – consists of a tracker equipped with large-area Si(Li) detectors and surrounded by a large-acceptance ToF system made of plastic scintillators. This design has been optimized to perform a novel antiparticle identification technique based on an anti-nucleus capture and the subsequent exotic atom formation and decay, allowing more active target material and a larger geometrical acceptance. The GAPS first flight is scheduled for December 2024 from McMurdo station (Antarctica), for a cumulative 31 days of duration: as a result, GAPS is expected to study the low-energy sectors of antiproton, anti-deuteron and anti-helium nuclei spectra, having the potential to significantly expand our understanding of low-energy anti-nuclei in cosmic rays.

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