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Cosmic ray antihelium in the Galaxy

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The creation of anti-nuclei in the Galaxy has been discussed as a possible signal of exotic production mechanisms such as primordial black hole evaporation or dark matter decay/annihilation in addition to the more conventional production from cosmic-ray interactions. Tentative observations of cosmic-ray antideuteron and antihelium by the AMS-02 collaboration have re-energized the quest to use antinuclei to search for physics beyond the standard model.

In this talk, we show state-of-art predictions of the antinuclei flux from both cosmic-ray interactions with the interstellar medium and standard dark matter annihilation models from combined fits to high-precision antiproton data as well as cosmic-ray nuclei measurements. Astrophysical mechanisms can explain the amount of antideuteron events detected by AMS-02, while their antihelium production lies far below the sensitivity of this experiment. In turn, standard dark matter models could potentially produce the detected antideuteron and antihelium-3 events, but the production of any detectable antihelium-4 flux would require exotic physics. We also present prospects for detection of these antinuclei by future detectors, such as GAPs and ALADInO.

Collaboration(s)

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