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Prospects to find cosmic-ray antinuclei and the impact of cross section uncertainties

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The search and measurement of cosmic-ray antimatter provides a great potential to study annihilating dark matter in our Galaxy. Previous analyzes of the antiproton spectrum determined by the AMS-02 experiment revealed a potential hint for a DM signal with a mass around 70 GeV and a thermal annihilation cross section. This putative signal is, however, affected by several systematic uncertainties such that its indisputable validation or exclusion is a non-trivial task. One important source of uncertainty is the production cross section of secondary antiprotons. I will discuss the impact of the cross section uncertainties on the search of dark matter and the potential signal. The most direct but complementary way to test the dark matter interpretation of the antiproton spectrum would be the observation of low-energy antinuclei in cosmic rays. The corresponding antideuteron signal is within GAPS and AMS-02 sensitivity, while the antihelium signal stays below AMS-02 sensitivity. If, more conservatively, the potential dark matter signal is considered as an upper limit on the annihilation cross section of DM, the corresponding antideuterons and antihelium signal indicate the highest possible fluxes compatible with the latest antiproton data. I will discuss the chances to detect the antimatter fluxes, in particular, focussing on the systematic uncertainties due to cross sections and the coalescence process.

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