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The cosmic antiproton puzzle

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As there are no known astrophysical sources of cosmic ray (CR) antiprotons, they represent a good channel for indirect dark matter search. The secondary antiproton background is produced in collisions between primary CRs and the interstellar medium (spallation). In the last decade, thanks to high precision measurements by AMS-02 and PAMELA, a possible tension between the observed antiproton flux and different predictive models has been highlighted, between 1 and 500 GeV in the antiproton kinetic energy.

The large uncertainties which afflict antiproton flux predictions do not allow us to confirm the presence of an exotic signal, deserving further investigations. In the 10-100 GeV range, the dominant uncertainties are the production cross section ones: the pp, p-He and He-p channels are responsible for almost all the cosmic antiprotons. In 2017 the NA61/SHINE experiment at SPS collected new data for pp collisions which were useful to study this discrepancy. In 2018 the SMOG experiment at LHCb made the very first p-He channel measurements. Additional p-He collisions data, with center-of-mass energies lower than the LHC ones, are still needed to reduce the cross section uncertainties for astroparticle physics. For this purpose, the COM-PASS++/AMBER experiment will help us with incoming data on pp and p-He collisions. The state-of-the-art of the cosmic antiproton puzzle is presented, along with antiproton flux predictions using GALPROP and future perspective.

In-person participation

Yes

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