



Laboratoire LEPRINCE-RINGUET
Ecole polytechnique IN2P3/CNRS

Séminaire

Dark matter searches with cosmic rays

Since its discovery in 1933 by F. Zwicky in the Coma cluster, the presence of invisible matter within galaxies and clusters of galaxies has been pointed out via its gravitational effects. On the other hand, the observations of the Planck satellite enable to fix the Standard Model of Cosmology (Λ CDM) according to which 85% of the matter of the Universe is made of invisible matter whose nature remains unknown today. The seminar focuses on indirect dark matter searches with Galactic cosmic rays. The first part of the talk is devoted to the interpretation of the positron flux measured by the AMS-02 collaboration. These data are discussed in term of standard astrophysical scenarios as well as by the presence of dark matter particles in the Galaxy. Then, I will present a new semi-analytical method to deal with the propagation of Galactic electrons and positrons below ~ 10 GeV: the pinching method. The implications for dark matter are discussed. Taking advantage of spacecraft Voyager-I's capacity for detecting interstellar cosmic rays since it crossed the heliopause in 2012, I discuss the implications of these new data for light mass (MeV) dark matter particles. Antiprotons are among the best cosmic ray species to probe dark matter in the Galaxy since their astrophysical background is low and relatively under control. The AMS-02 antiprotons flux released at the end of 2016 present an excess of antiprotons at ~ 10 GeV with respect to the standard propagation model of Galactic cosmic rays. This excess has triggered a lot of interests since it can be explained by the annihilation of WIMP-type dark matter particles whose mass (~ 80 GeV) and annihilating cross section ($3e-26$ cm³/s) explain both the observed dark matter thermal relic density as well as the Galactic center excess observed in gamma rays. However, we have to be cautious with this interpretation since the propagation model of cosmic rays suffers from theoretical uncertainties which are nowadays larger than the experimental ones.

**Mathieu
BOUDAUD**
(LPTHE)

Salle conférence
du LLR

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seminaires@llr.in2p3.fr



Responsables séminaires

Sami Caroff
Jean-Baptiste Sauvan