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HIGH ENERGY ACCELERATOR RESEARCH ORGANIZATION
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Seminar

Methods and Prospects for Science Analysis of CALET Data (in English)

SPEAKER : Prof. Holger Motz (ICSEP, Waseda University)

DATE : September 1st (Thur.) 15:30 - 16:30

PLACE : Kenkyu Honkan 3F Seminar Room

The ISS based CALET (Calorimetric Electron Telescope) detector is directly measuring the energy spectrum of electron+positron cosmic rays up to 20 TeV with an expected energy resolution of 2%. With an estimated proton rejection capability of 1:105'>1:105

and an aperture of approximately 1200cm2sr'>1200cm2sr

, it will provide good statistics even well above one TeV. This precise spectrum is going to be analysed for signatures from nearby astrophysical sources such as pulsars and supernova remnants (SNR), as well as from Dark Matter annihilation and decay.

In this presentation I will give an overview of the CALET project and its current status, as well as show possible methods to analyse the data for selected physics cases.

Pulsars and Dark Matter are candidates for the postulated extra source emitting an equal amount of electrons and positrons that is regarded as the origin of the positron excess. Assuming a single pulsar is the extra source, the limits on a potential additional component from Dark Matter annihilation in the galactic halo expected to be obtained from 5 years of CALET observation are presented. It is shown that CALET could significantly improve upon current limits, especially for Dark Matter candidates with a large fraction of annihilation directly into electron+positron, such as the LKP (Lightest Kaluza-Klein particle).

As a possible case of a Dark Matter only explanation of the positron excess, Dark Matter decaying in a 3-particle leptonic mode was studied, as it is not constrained by anti-proton measurements and multiple theories predict suitable Dark Matter candidates. Based on the expected signal and background in CALET, the potential to discern the signatures of this decay from a pulsar being the extra source is shown.

Furthermore, the influence of a nearby SNR as an additional spectrum component in the TeV region and the prospects of using anisotropy information to identify cosmic rays originating from nearby astrophysical sources are discussed.

ページトップへ

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