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ALADInO: an Antimatter Large Acceptance Detector In Orbit

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A next-generation magnetic spectrometer in space will open the opportunity to investigate frontiers in direct high-energy cosmic ray measurements and to accurately measure the amount of the rare antimatter component in cosmic rays beyond the scope of current missions. We propose the concept of an Antimatter Large Acceptance Detector In Orbit (ALADInO), designed to take up the legacy of direct cosmic ray measurements in space by PAMELA and AMS-02. ALADInO presents technological solutions designed to overcome the current limitations of magnetic spectrometers in space with a layout that provides an acceptance larger than 10m^2 sr. A high-temperature superconducting toroidal magnet is coupled with precision tracking and time-of-flight systems to provide the required matter-antimatter separation capabilities and rigidity measurement resolution with a maximum detectable rigidity better than 20 TV. The inner 3D-imaging deep calorimeter designed to maximise isotropic particle acceptance allows cosmic rays to be measured up to PeV energies with accurate energy resolution. ALADInO is planned to operate at the Sun-Earth L2 Lagrangian point for at least 5 years. It would enable unique observations with groundbreaking discovery potential in the field of astroparticle physics through precise measurements of electrons, positrons and antiprotons up to 10 TeV and of nuclear cosmic rays up to PeV energies, and through the possible unambiguous detection and measurement of low-energy components of antideuterons and antihelium in cosmic rays.

Collaboration

ALADInO collaboration

Primary author: Prof. BERTUCCI, Bruna (INFN and Università di Perugia)

Presenter: DURANTI, Matteo (Istituto Nazionale di Fisica Nucleare)

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