

## **Research programs to advance in the frontiers of astroparticle physics in space**

Measuring the properties of cosmic rays, or astroparticles, in space provides a unique window to investigate the frontiers and open questions of fundamental physics in an approach that is synergic, yet complementary, to that pursued by the research at ground facilities and at particle accelerators.

In the last 30 years, the international astroparticle physics community, including Universities, research centers, space agencies, and collaborations with ground-based collider experimental activities, has developed a widespread scientific and technological expertise that has paved and consolidated the way to the current era of precision particle physics in space. The data and results that are being obtained by the operations of state-of-the-art cosmic ray detectors in space, such as DAMPE, CALET, AMS-02 and others, are providing unprecedented information on the mechanisms of cosmic ray origin, acceleration and propagation that were not expected by the established models, highlighting new limits and frontiers to be tackled in order to advance in our understanding of the Cosmos and of the fundamental laws of Nature.

The Italian Space Agency offers the possibility to leverage on previous and ongoing space and R&D programs to propose and run research projects to advance in the technological and scientific state-of-the-art towards the development, construction, optimization and modeling of next-generation instrumentation and detectors for astroparticle measurements in space.

Proposals may include additional investigations in ongoing researches or novel research programs. Research approaches may cover instrument and space mission analyses and optimizations, R&D of novel technologies to open new observational techniques or opportunities, new approaches for data handling and processing in space, and modeling and simulations useful for the assessment of detector properties and space mission scientific perspectives.

The results of these research programs will provide original inputs and information to optimize and consolidate the design of next-generation astroparticle detectors in space, drive the proposals of original space mission concepts to advance in the field of astroparticle physics, and possibly identify synergic applications in complementary research fields.