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The Antarctic Demonstrator for Advanced Particle-astrophysics Telescope (ADAPT) Project Status

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The astrophysical community is currently focusing on the development of next-generation gamma-ray telescopes designed to detect low-energy photons in the MeV-GeV range, operating in both the Compton and pair conversion regimes. The proposed Advanced Particle-astrophysics Telescope (APT) is a MeV-TeV gamma-ray space-based planned mission aimed at providing an order of magnitude improvement in sensitivity over any current mission with a design optimized for dark-matter and multimessenger science. The APT collaboration is an international team focused now on designing and building a high-altitude balloon-borne prototype, the Antarctic Demonstrator for APT (ADAPT), which is anticipated to fly in the 2026-27 season. The current design of the ADAPT instrument includes an imaging CsI calorimeter (ICC) and a scintillating fiber tracker. An ICC module is composed of a 3 $\times$ 3 array of 150 mm $\times$ 150 mm $\times$ 5mm CsI(Na) tiles, with top and bottom surfaces covered by 2 mm wavelength-shifting (WLS) fibers, oriented orthogonally along the x- and y-axes are read out by silicon photomultipliers (SiPMs). The fiber tracker consists of 1.5 mm round scintillating f ibers, arranged in two interleaved layers for both the x- and y-coordinates. Additionally, the ADAPT design includes a Silicon Strip Detector (SSD) to enhance Compton reconstruction and cosmic ray (CR) measurements. The instrument is also equipped with an Anti-Coincidence Detector (ACD) made of plastic scintillators as outermost detector. The ACD's primary role is to discriminate gamma-rays from charged particles and provide complementary measurements for nuclei identification. The performance of each sub-detector, as well as the overall performance of ADAPT, has been extensively evaluated through simulation modeling, laboratory tests, and beam tests. In this contribution, we present an overview of the current design of the ADAPT instrument, its scientific objectives, and its ongoing performance assessment, (with a focus on event reconstruction in the Compton regime and real-time gamma-ray burst localization).

Eligibility for "Best presentation for young researcher" or "Best poster for young researcher" prize

No

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