

Workshop on a wide field-of-view Southern Hemisphere TeV gamma ray observatory

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ALTO concept and design choices

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ALTO is a concept/project in the exploratory phase since ~2013, named by the Astroparticle Group at Linnaeus University (LnU) for a project to build a wide-field Very-High-Energy (VHE) gamma-ray observatory at very high altitude in the Southern hemisphere. This will explore the sky in the central region of our Galaxy at very-high-energies, with also the possibility to act as a trigger or source monitor for the smaller-field CTA (Cherenkov Telescope Array) Imaging Atmospheric Cherenkov Telescopes (IACT).

To go beyond the performance of HAWC, we consider several key possible improvements. These concern the following points. (1) Increasing the altitude, to allow a lower threshold especially for following variable Extragalactic sources, such as AGNs but including GRB, Gravitational Wave, or Neutrino alerts. (2) Finer grain of the array, using smaller Water Cherenkov Detector (WCD) tanks, for better characterization of the particle distribution on the ground, but also greater simplicity of operation. (4) Addition of a muon-detector component below each water-Cherenkov tank consisting of liquid scintillator tanks (the scintillator layer detector, SLD), to provide a better rejection criterion against the Cosmic-ray showers. (3) Advanced electronics, using analogue memories (such as NECTAR) to measure the waveform of the detector pulses and White Rabbit timing for propagating a precise clock to the Front End detectors, which can then be placed close to clusters of tanks, avoiding degradation of the signal which happens with transmission over long cables, which might also be vulnerable to noise and lightning.

Here, the current design choices will be described, along with their evolution in discussion with our partners in LANL, CPPM, and IRFU/CEA, and the implementation possibilities. The following talk will describe the results for Monte Carlo simulations for this ALTO detector.

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