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Simulation study for the proposed wide field-of-view gamma-ray detector array ALTO

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ALTO is an all-sky field-of-view detector array for high-energy gamma-ray astronomy, proposed to be installed in the Southern Hemisphere at an altitude of ~ 5.1 km above sea level. The array will use water Cherenkov detectors, as in the HAWC observatory, to detect air showers induced by high-energy gamma rays and cosmic rays in the atmosphere, but it will be designed to attain a lower energy threshold, better energy and angular resolutions, and better sensitivity than HAWC. The array will consist of ~1250 smaller-sized detector units each of ~3.6 m wide distributed over a circular area of ~200 m in diameter. In addition to the water Cherenkov detector, each detector unit will consist of a liquid scintillation detector which will serve as a muon detector, facilitating the background rejection, and thereby improving the sensitivity. The background rejection will be further enhanced by the close-packed arrangement and the small size of the detectors which will allow a fine sampling of air shower footprints at the ground. The electronics for ALTO will make use of newly-developed ASIC Analogue Memories for low-power, GHz sampling signal read-out, and the White Rabbit technology for the signal time distribution and time tagging at sub-ns accuracy to achieve a better angular resolution.

In this contribution, I will describe the Monte-Carlo simulation of the experiment, and present the expected performance of the array in terms of reconstruction accuracies of the shower core, arrival direction and energy of the primary particle as well as preliminary estimates of the energy threshold and sensitivity for a point-like gamma-ray source.

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