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The performance of the half density ALPACA

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Andes Large area PArticle detector for Cosmic ray physics and Astronomy (ALPACA) is an air shower array experiment aiming to observe cosmic rays and gamma-rays in the southern hemisphere. The array will cover an 83,000m^2 surface area with 400 scintillating plastic counters at the plateau (4,740m a.s.l.) of the Chacaltaya mountain in Bolivia. Underground muon detectors covering 3,700 m2 in the area allow a clear identification of muon components in air showers, enabling us to discriminate between hadronic and electromagnetic showers. Construction of half density ALPACA, which covers the same area but with 200 counters, is scheduled for 2023.

In the southern sky, the Galactic Center is a possible candidate for PeV particle accelerators, PeVatrons. Observations of sub-PeV gamma rays are essential to test the existence of PeVatrons, but so far, the energy spectrum is measured up to a few tens of TeV. The half density ALPACA is designed to have a sufficient sensitivity to test the gamma-ray emission from the Galactic Center in this energy range.

In this contribution, the performance of the half density ALPACA to a hypothetical gamma-ray source with the same trajectory and energy spectrum as the Galactic Center is reported. In addition to the effective area, the angular and energy resolutions in the gamma-ray observations and the differential flux sensitivity after the cosmic-ray background rejection are presented. If the spectrum is extended up to the 100 TeV region from the TeV measurements keeping the power-law function, more than 5 sigma detection at 100 TeV is expected during two-year observation.

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