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A new air shower array in the Southern Hemisphere looking for the origins of Cosmic rays: the ALPACA experiment

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In 2019 the Tibet ASγ collaboration reported the detection of sub-PeV γ-rays coming from the Crab nebula using a novel technique with a hybrid Surface Array and underground water Cherenkov muon detector to discriminate against hadrons. Using this technique, we are now building a new experiment to explore the gamma-ray sky in the Southern Hemisphere looking for the origins of cosmic rays in our Galaxy. The name of this new project is the Andes Large area PArticle detector for Cosmic ray physics and Astronomy (ALPACA).

Installed at an altitude of 4740 m in the Chacaltaya plateau, ALPACA will cover an area of 83 000 m^2 with 401 scintillation counters and 4 underground muon detectors of 900 m^2 each. A prototype array called ALPAQUITA, having 1/4 of the total area of the full ALPACA, started observations in September 2022. The first MD is expected to start operations this year.

In this presentation we will introduce the current status of ALPAQUITA and the plans to extend the array to reach the full operation of the experiment. We will also report the results of the analysis of the initial data, including the observation of the moon shadow in cosmic rays and search for bright gamma-ray sources.

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