ICRC 2025 - The Astroparticle Physics Conference



Contribution ID: 812

Type: Poster

Direction Reconstruction of Gamma Rays with a LACT Telescope

The Large High Altitude Air Shower Observatory (LHAASO) has discovered over 40 ultra-high-energy gammaray sources with energies exceeding 100 TeV, ushering in a new era for ultra-high-energy gamma-ray astronomy. To better understand the fine structure of gamma-ray emissions from these sources, the team proposed the Large Array of imaging atmospheric Cherenkov Telescopes (LACT) experiment, which includes 32 Cherenkov telescopes. This project, funded by Sichuan Province, is currently under construction, with the first telescope scheduled to be completed and operational in May 2025.

There is an urgent need to establish a reliable method for evaluating the performance of a single telescope. This method will be used to test the performance of the first telescope and validate and optimize the existing simulation software by analyzing the telescope's observations of the Crab Nebula, thereby enhancing the realism of the simulations. Given the high angular resolution requirements of the LACT project, particular attention is paid to the precise reconstruction of gamma-ray directions.

The current approach mainly involves the DISP method and a reconstruction scheme based on image deep learning. Building on the traditional Hillas method, this approach incorporates additional information such as the time and signal gradient features of Cherenkov images induced by gamma rays, thereby improving the precision of gamma-ray direction reconstruction for a single telescope. This method is also being extended to the LACT array to improve the OFFSET observation direction reconstruction accuracy

Collaboration(s)

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Session Classification: PO-2

Track Classification: Gamma-Ray Astrophysics