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Reconstruction of extensive air shower images of the Large Size Telescope prototype of CTA using a novel likelihood technique

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Ground-based gamma-ray astronomy requires reconstructing extensive air showers initiated by gamma rays impinging on the atmosphere. Imaging atmospheric Cherenkov telescopes collect the Cherenkov light induced by secondary charged particles in extensive air showers, creating an image of the shower in a camera. This image is parametrized and used to evaluate the type, energy and arrival direction of the primary particle that initiated the shower. This contribution shows the results of a novel reconstruction method based on likelihood maximization. The method is applied to observations of the Crab Nebula acquired with the Large Size Telescope prototype (LST-1) deployed at the Northern site of the Cherenkov Telescope Array. The novelty with respect to previous likelihood reconstruction methods lies in the definition of a likelihood per single camera pixel, accounting not only for the total measured charge, but also for its development over time. It considers the waveform acquired by each pixel involved in the reconstruction of the shower. This reconstruction, which considers also the response characteristics of the sensor in the camera pixel, leads to improved reconstruction of shower images and consequently allows for the recovery of the primary particles properties with an improved accuracy.

Keywords

CTA; LST; Image reconstruction; Crab Nebula

Collaboration

CTA

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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