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The charge calibration of LHAASO-WCDA

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Water Cherenkov detector array (WCDA), one of major parts of LHAASO project, has been partly operated since April 2019. Each detector cell of the first pool (WCDA-1) has one 8" PMT and one 1.5" PMT. 20" PMT and 3" PMT are hung in each cell of WCDA-2 and WCDA-3. In order to achieve an optimal energy reconstruction, and cosmic ray background suppression for the air showers, we develop an off-line method to calibrate number of photoelectron (NPE) of signals. By matching signals caught by different kinds of PMT, we bridge their linear measurement range to obtain equivalent NPE of signals up to 200000PEs. Besides, detector monitoring and various measurements show the PMT among cells are slightly different in quantum efficiency and collection efficiency, and the light attenuation and depth of water in the pool are also varying with time, especially in the very beginning of the operation. Above inhomogeneity and instability influences the detection efficiency of cells on secondary air shower particles. Based on previous research, the single particle peak mainly formed by muon signals are used to calibrate the detection efficiency difference as well as long term variation of all the detector cells. A possibly more flexible efficiency calibration method of Constant Rate Scaling (CRS) is also under study. The analysis method and the calibration results as well as its long term stability of the first two pools are presented in this talk.

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LHAASO-WCDA, charge calibration

Collaboration

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Subcategory

Experimental Methods & Instrumentation

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