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Using reference stars to verify the end-to-end absolute calibration and for the long term monitoring of the Fluorescence Detector telescopes at the Pierre Auger Observatory

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The absolute calibration of the Fluorescence Detectors telescopes of the Pierre Auger Observatory is an important element for correctly determining the energy of primary cosmic rays producing Extensive Air Showers in the atmosphere.
In this contribute we show that signals generated by stars traversing the field of view of the Fluorescence Detectors can effectively be used as a tool to verify the absolute calibration of these telescopes without requiring any dedicated external hardware device.
After describing the details of the procedure we report on the preliminary results obtained by the analysis of signals from reference stars as observed by the FD telescopes.

Summary

Observation of reference stars is a simple and accurate procedure commonly used for the absolute calibration of optical telescopes, however, Fluorescence telescopes, that are designed to detect very short burst of light, are not able to directly measure the slowly varying night sky background flux.
It is possible, however, to overcome this limitation by the analysis of the statistical fluctuation (variance) of the signal recorded by the telescope detectors that, beeing directly proportional to the photon flux, allows to indirectly measure the star light and use it for calibration purposes. Without requiring any dedicated hardware device, and without any interference with normal telescope operations, the method developed provides an economical and simple way to verify the absolute calibration and to monitor the long-term stability of Fluorescence Telescopes.
In this contribution we describe details of the procedure, in particular on the correction of the star signals from atmospheric attenuation, and then report on results obtained by analysis of several reference stars as seen in the Fluorescence Telescopes of the Pierre Auger Observatory.

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