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Calibration procedures for the ASTRI Mini-Array Cherenkov cameras

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The ASTRI Mini-Array is an international project led by the Italian National Institute for Astrophysics (INAF) to deploy an array of nine Imaging Atmospheric Cherenkov Telescopes at the Teide Observatory in Tenerife. The system will study astronomical sources emitting in the very high-energy band above 1 TeV up to 200 TeV. The telescope array is an improved version of the ASTRI-Horn telescope (Mt. Etna, Italy), a 4 m diameter small-sized telescope (SST) prototype, developed by INAF in the initial phase of the ASTRI Project in the CTA context.

The Cherenkov camera for the Mini-Array, based on Silicon Photo-Multiplier (SiPM) detectors, is an evolution of the ASTRI-Horn telescope camera. The camera focal plane is equipped with 2368 SiPM pixels with dimensions of 7mm x 7mm arranged in tiles of 8 x 8 pixels. Each tile together with two CITIROC-1a ASICs and the FPGA board constitutes a Photon Detection Module (PDM). 37 PDMs are arranged to match the spherical focal surface. Camera electronics, based on a peak detection circuit, is designed to perform self-trigger of the whole focal plane in order to detect Cherenkov signal while ensuring a small amount of data transfer.

In this contribution we present the camera calibration strategy and tools developed thanks to the lessons learned with the ASTRI-Horn telescope. These calibration procedures are essential tasks to extract SiPMs calibration coefficients, which are needed for the Cherenkov data analysis, as well as camera configuration parameters, that ensure system stability and a uniform trigger efficiency over the whole focal plane. Moreover, thanks to the internal calibration system, these procedures allow system performance and camera health to be monitored during regular data taking.

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