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Design and characterization of the Flat-Field Calibration of the NectarCAM Camera

The flat-field flasher is a calibration device designed for NectarCAM, the camera that will equip the Medium-Sized Telescopes (MSTs) of the northern site of the Cherenkov Telescope Array Observatory (CTAO). Positioned in the centre of MST dish, 16 meters in front of the camera, the flasher emits short ($\text{FWHM} < 5\text{ ns}$), uniform (2-4%) light pulses to illuminate the entire focal plane.

Accurate calibration is crucial for the optimal operation of NectarCAM, ensuring precise gain computation and mitigating differences in light-collection efficiency of the pixels of the camera. Using the flat-field flasher, two informations are obtained : the pixel gain and the relative efficiency between pixels. In addition, the flasher is used to probe the dynamic range over which the camera operates effectively.

In this study, we report on the performance characterisation of the flat-field flasher using a dedicated test bench. We report on the results of tests conducted on 12 flasher units, evaluating their reliability. Furthermore we describe how the flat-field coefficients are applied within the camera to ensure uniformity of response of few percent level across all 1855 pixels.

As the deployment of the first MST at the CTAO northern site is scheduled for early 2026, this work represents a significant contribution to the collaboration's efforts to finalize camera calibration systems.

Collaboration(s)

CTAO, NectarCAM

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