Contribution ID: **1027** Type: **Poster**

Design and performance of the prototype Schwarzschild-Couder Telescope camera

Friday 16 July 2021 19:18 (12 minutes)

The Cherenkov Telescope Array (CTA) is the next-generation ground-based observatory for very-high-energy gamma-ray astronomy. An innovative 9.7 m aperture, dual-mirror Schwarzschild-Couder Telescope (SCT) design is a candidate design for CTA Medium-Sized Telescopes. A prototype SCT (pSCT) has been constructed at the Fred Lawrence Whipple Observatory in Arizona USA. Its camera is currently partially instrumented with 1600 pixels covering a field of view of 2.7 degrees. The small plate scale of the optical system allows densely packed silicon photomultipliers to be used, which combined with high-density trigger and waveform readout electronics enable the high-resolution camera. The camera's electronics are capable of imaging air shower development at a rate of one billion samples per second. We describe the commissioning and performance of the pSCT camera, including trigger and waveform readout performance, calibration, and absolute GPS time stamping. We also present the upgrade to the camera, which is currently underway. The upgrade will fully populate the focal plane, increasing the field of view to 8 degrees, and lower the front end electronics noise, enabling a lower trigger threshold and improved reconstruction and background rejection.

Keywords

IACT; CTA; SCT; gamma rays;

Collaboration

CTA

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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Session Classification: Discussion

Track Classification: Scientific Field: GAI | Gamma Ray Indirect