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The GCT Camera for the Cherenkov Telescope Array

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The Gamma Cherenkov Telescope (GCT) is one of the designs proposed for the Small Sized Telescope (SST) section of the Cherenkov Telescope Array (CTA). The GCT uses dual-mirror optics, resulting in a compact telescope with good image quality and a large field of view with a smaller, more economical, camera than is achievable with conventional single mirror solutions. The photon counting GCT camera is designed to record the flashes of atmospheric Cherenkov light from gamma and cosmic ray initiated cascades, which last only a few tens of nanoseconds.

The GCT optics require that the camera detectors follow a convex surface with a radius of curvature of 1 m and a diameter of ~ 35 cm, which is approximated by tiling the focal plane with 32 modules. The first camera prototype is equipped with multi-anode photomultipliers, each comprising an 8×8 array of 6×6 mm² pixels to provide the required angular scale, adding up to 2048 pixels in total. Detector signals are shaped, amplified and digitized by electronics based on custom ASICs that provide digitisation at 1 GSample/s. The camera is self-triggering, retaining images where the focal plane light distribution matches predefined spatial and temporal criteria. The electronics are housed in the liquid-cooled, sealed camera enclosure. LED flashers at the corners of the focal plane provide a calibration source via reflection from the secondary mirror.

The first GCT camera prototype underwent preliminary laboratory tests last year. In November 2015 the camera was installed on a prototype GCT telescope (SST-GATE) in Paris and was used to successfully record the first Cherenkov light of any CTA prototype, and the first Cherenkov light seen with such a dual-mirror optical system. A second full-camera prototype based on Silicon Photomultipliers is under construction. Up to 35 GCTs are envisaged for CTA.

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