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Advanced readout logic for the XGIS instrument: discriminating X-ray and gamma-ray photons from background and particles

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The X and Gamma Imager and Spectrometer (XGIS) on board THESEUS is a finely pixelized and modular instrument designed for broadband high-energy transient detection. XGIS consists of two cameras, each composed of 10 supermodules, with each supermodule further divided into 10 modules, and each module made with 64 independently readout pixels based on Silicon Drift Detectors coupled with 5x5x30 mm3 CsI scintillator bars.
An algorithm to fastly read out the signal from the 64 pixels and send them in chronological order through the Module and Super-Module logic up to the Camera logic is under development.
Furthermore, a challenge for space-based high-energy instruments is distinguishing X-/gamma-ray photons while effectively rejecting background photons and particles, including electrons, protons, and heavier cosmic rays. Unlike traditional systems that rely on anticoincidence systems, XGIS aims to achieve background rejection through an innovative readout logic that analyzes the spatial and temporal properties of energy deposits in the detector. By leveraging the finely pixelized structure, the readout system can differentiate single-photon events from charged-particle tracks based on energy deposition patterns and event topology.

Eligibility for ”Best presentation for young researcher” or ”Best poster for young researcher” prize

Yes

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