

Development and Characterisation of the HEXITEC 2X6 Detector System for the NXCT

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The HEXITEC 2×6 Instrument has been developed for the National X-ray CT (NXCT) Centre's Colour X-ray bay at the University of Manchester. A single HEXITEC ASIC is typically bonded to a 2×2cm CdZnTe, CdTe or other High-Z material and readout by the HEXITEC GigE system. However, with an increasing demand for large area high energy detectors we have employed the use of tiled arrays of 2×6 ASICs. The HEXITEC 2×6 is made of twelve 2mm thick High Flux CdZnTe sensors supplied by Redlen Technologies Inc. mounted in a 2×6 array resulting in 76.8k fully spectroscopic pixels, operating from 3-180keV with 1keV FWHM energy resolution and a 48cm² active area. Each individual sensor consists of 80×80 pixels on a 250um pixel pitch.

The HEXITEC 2×6 has been designed as a compact system allowing it to be used flexibly for a large range of experimental setups in the dark or bright field, with the entire system measuring 1750×2400×950 mm. HEXITEC runs at 9kHz with readout performed row by row in four parallel blocks of 20×80 pixels per ASIC. Modular readout boards digitise ASIC outputs into 16-bit values which are received by an FPGA board. Incoming data streams are converted into 160×480 pixel frames and 10G ethernet packets. 2 × 10G SFP interfaced data lanes send odd and even frames to the control PC with a total raw data rate of 15Gbps. The control and data receiving and processing is conducted using ODIN, which can be integrated with the EPICS software used at many large science facilities.

In this paper we will present the technical design and operation of the camera followed by a characterisation of the overall performance under X-rays. Additionally, we will discuss results from the CdZnTe with a focus on spectral performance and spatial uniformity.

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