



Contribution ID: 34

Type: Oral

HEXITEC-MHz: A Spectroscopic X-ray Imaging Camera System with 1 MHz Frame Rate Continuous Readout

Wednesday, 15 March 2023 11:55 (20 minutes)

The $\text{HEXITEC}_{\text{MHz}}$ detector system is the latest generation of the STFC's HEXITEC spectroscopic X-ray imaging detector systems. When coupled to Cd(Zn)Te sensor material the original HEXITEC system was capable of delivering high resolution X-ray spectroscopy (50 electrons RMS) per $250 \mu\text{m}$ pitch pixel for hard X-rays with energies 2 - 200 keV. The major limitation of this technology is that the combination of a 10 kHz frame rate and the need to identify charge sharing events limits its application to photon fluxes of $\sim 10^4 \text{ ph s}^{-1} \text{ mm}^{-2}$. With many photon light sources currently undergoing major upgrades to diffraction limited storage rings, these expected increases in flux have motivated the development of the next generation of the HEXITEC technology.

The $\text{HEXITEC}_{\text{MHz}}$ system is targeted at delivering the same high-resolution spectroscopy as the original ASIC but targeting much higher photon fluxes. While the ASIC maintains the same $250 \mu\text{m}$ pixel pitch, the new integrating architecture delivers a 1 MHz frame rate meaning it is possible to operate the system at $\sim 10^6 \text{ ph s}^{-1} \text{ mm}^{-2}$ for spectroscopic X-ray imaging applications at synchrotron light sources. At pulsed sources, a maximum of $30 \times 10 \text{ keV}$ photons (dynamic range = 300 keV) can be measured in each frame and these are readout at the continuous 1 MHz frame rate. In this paper the first results of Cd(Zn)Te sensors bonded to the ASIC will be presented including an evaluation of the energy resolution of these devices and their linearity at high flux.

Primary authors: Dr VEALE, Matthew (UKRI Science & Technology Facilities Council); Mr CLINE, Ben (UKRI Science & Technology Facilities Council); Mr CHURCH, Ivan (UKRI Science & Technology Facilities Council); Mr CROSS, Simon (UKRI Science & Technology Facilities Council); Mr DAY, Chris (UKRI Science & Technology Facilities Council); Mr FRENCH, Marcus (UKRI Science & Technology Facilities Council); Mr GARDINER, Thomas (UKRI Science & Technology Facilities Council); Mr HOLDEN, John (UKRI Science & Technology Facilities Council); Mr LIPP, John (UKRI Science & Technology Facilities Council); Dr NICHOLLS, Tim (UKRI Science & Technology Facilities Council); Mr PRYDDERCH, Mark (UKRI Science & Technology Facilities Council); Mr NOBES, Joseph (UKRI Science & Technology Facilities Council); Mr ROBERTS, Matt (UKRI Science & Technology Facilities Council); Dr SCHNIEDER, Andreas (UKRI Science & Technology Facilities Council); Mr SELLER, Paul (UKRI Science & Technology Facilities Council); Mr SOLE, David (UKRI Science & Technology Facilities Council); Mr WILSON, Matt (UKRI Science & Technology Facilities Council); JONES, Lawrence

Presenter: Mr CLINE, Ben (UKRI Science & Technology Facilities Council)

Session Classification: Imaging

Track Classification: Imaging