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Imaging and spectroscopic performance studies of pixellated CdTe Timepix detector with synchrotron radiation

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In this work the results on imaging and spectroscopic performances of 1 mm thick 110x110 and 55x55 um pixellated CdTe detectors bump-bonded to a Timepix single photon counting chip are presented. The performance of the 110x110 um pixel detector was evaluated at the extreme conditions beam-line I15 of the Diamond Light Source. The energy of X-rays was set between 25 and 77 keV. The beam was collimated through the edge slits to 10 um FWHM. The spatial response of the detector was recorded for horizontal and vertical positions along several pixels at various energies below and above the K-edges of Cd and Te. This allowed measurement of the point spread function (PSF) of the detector with a resolution better than the pixel pitch. Quantitative analysis of variation of spatial resolution is performed for various energies. The detector was operated in the time-over-threshold mode, allowing direct energy measurement. This was used to calculate energy resolution of the detector for energies between 25 and 77 keV. Charge sharing effects were also quantified.
Comparative imaging and energy resolution studies were also carried out between 55x55 and 110x110 um pixel detectors with fluorescence target X-ray tube. Energy as well as spatial resolutions were compared between two pixel pitches and quantitative and qualitative analysis was given.

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