

# Development and first tests of the Arc-detector: a Schottky CdTe Medipix3RX photon-counting detector for X-rays.

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This work will present the development and first tests of the Arc-detector. The Arc-detector is a multichip CdTe-Medipix3RX [1] detector system developed to bring the advantages of photon-counting detectors to applications in the hard X-ray range of energies. The detector head consists of 24 modules arranged in an ARC shape, covering a scattering angle of  $100^\circ$ . Each module consists of a monolithic CdTe Schottky electron collection sensor of  $14.2 \text{ mm} \times 42.6 \text{ mm}$  area and one mm thickness bump-bonded to 3 MedipixRX ASICs. The readout electronics at the front-end is programmed via a Xilinx Artix-7 module. A total of 12 fibre-optic links provide the data channel from the detector head to the back-end data acquisition electronics, performed by two FEM-II FPGA cards based around a Xilinx Virtex7-690 FPGA. Schottky CdTe sensors undergo polarization, which increases with temperature, flux and the longer the HV is applied. To minimize polarization, the detector was water cooled and periodically the HV bias was refreshed. Results of the laboratory module characterization describing the optimization of these parameters will be presented. The Arc-detector is now deployed on beam line I15 at Diamond Light Source, and first tests with high flux hard X-ray beam have been performed. Results on how the detector performs under these conditions will be discussed. In addition, the detector was developed to perform X-ray Pair Distribution Function experiments. Examples of the performance of the detector from real applications using this technique will be included and evaluated.

## Collaboration

## Role of Submitter

I am the presenter

**Primary author:** GIMENEZ, Eva (Diamond Light Source)

**Presenter:** GIMENEZ, Eva (Diamond Light Source)

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