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FPGA-BASED REAL-TIME IMAGE MANIPULATION AND ADVANCED DATA ACQUISITION FOR 2D-XRAY DETECTORS

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Scientific experiments rely on some type of measurements that provides the required data to extract aimed information or conclusions. Data production and analysis are therefore essential components at the heart of any scientific experimental application.

Traditionally, efforts on detector development for photon sources have focused on the properties and performance of the detection front-ends. In many cases, the data acquisition chain as well as data processing, are treated as a complementary component of the detector system and added at a late stage of the project. In most of the cases, data processing tasks are entrusted to CPUs; achieving thus the minimum bandwidth requirements and kept hardware relatively simple in term of functionalities. This also minimizes design effort, complexity and implementation cost.

This approach is changing in the last years as it does not fit new high performance detectors; FPGA and GPUs are now used to perform complex image manipulation tasks such as image reconstruction, image rotation, accumulation, filtering, data analysis and many others. This frees CPUs for simpler tasks.

The objective of this paper is to present both the performances of real time FPGA-based image manipulation techniques, as well as, the performance of the ESRF data acquisition platform called RASHPA, into the back-end board of the SMARTPIX photon-counting detector also developed at the ESRF.

Minioral

No

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No

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