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Percival soft X-ray CMOS imager for Photon Science –status and prospects

Percival is a two-megapixel CMOS imager designed for the photon science community. It has a large, contiguous imaging area with many small pixels (4x4 cm2, 27x27 um2 pixels), high frame rate suitable for high-luminosity experiments and conventional FELs (design frame rate 300 Hz, proportionally faster in ROI operation), and dynamic range spanning single photon discrimination at 250 eV (noise floor 14e-) to 50000 photons per pixel per frame. This is achieved by a massively parallel architecture and automatic gain adjustment per pixel and frame. The sensor is backside-processed for high sensitivity to soft X-rays; imaging has been performed in the energy range 70 eV to 1keV.

First successful user experiments with the prototype sensor have been performed. The first-generation sensors still had some shortcomings, namely crosstalk hampering ADC functionality and frame rate, and non-uniformity due to bias variation over the sensor. These are addressed in a respin that was –in front-side illuminated version –delivered by the foundry in Jan 2024.

We describe the status of the project, show first glimpses of the respin improvements achieved, provide an impression from initial user experiments, and give an outlook to further development.

Speed talk:

I am unwilling/unable to present a speed talk

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