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First user experiments of the PERCIVAL soft X-ray imager

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The PERCIVAL detector is a CMOS imager specifically designed for the soft X-ray regime. In 2020, although still in a development phase, it served its two first user experiments, at a Storage Ring (SR) and also at a Free Electron Laser (FEL). We will report some preliminary results and sketch future plans.
With its 2 Megapixels, 27 µm pixel size, and 4 x 4 cm2 active area (extendable to 8 x 8 cm2 in clover-leaf like configurations), PERCIVAL can provide images with high spatial resolution. Moreover, its fast readout was designed to reach speeds up to 300 frames per second. In fully optimised mode, the sensor's dynamic range is expected to cover a range from 16e- to 3.5 Me-. The development, jointly carried by 5 light sources (Deutsches Elektronen Synchrotron (DESY), Pohang Accelerator Laboratory (PAL), Elettra Synchrotron, Diamond Light Source (DLS) and SOLEIL Synchrotron), and the Rutherford Appleton Lab (RAL/STFC), will enable increased science yielded from today's FEL and SR sources in the soft X-ray regime.
In collaboration with groups at the Helmhotz Zentrum Berlin (HZB) and Max-Born Institute (MBI), we used the P04 XUV beamline at PETRA-III to perform holographic imaging of topological materials (in particular skyrmions) at an energy of 780eV. Together with colleagues from FLASH, we used the beamline FL24 at the FLASH2 FEL to perform ptychographic imaging of plasma treated surfaces in an energy range between 92 and 462eV. Both experiments benefited from the very large dynamic range provided by the PERCIVAL detector.
The development will go on in order to reach the nominal specification parameters. In the meantime, new user experiments with a high impact factor will be scheduled and will help us to speed up the process.

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