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P1.64: Calibration procedures and data correction of ePix100 detectors at the European XFEL

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The European XFEL is a research facility that delivers extremely bright and short coherent X-ray pulses of tunable energy at MHz repetition rate, providing unprecedented capabilities to conduct scientific research in multiple domains by internal and external users.

Among the suite of detectors deployed in the European XFEL, there are several ePix100 units belonging to the family of ePix detectors developed at SLAC [1], charge integrating hybrid pixel detectors capable of single photon resolution for energies above 2 keV. Additionally, they are small, easily maneuverable, vacuum compatible, have small pixels (50 μm) and show low noise. By virtue of these features, they are regularly used at two of the X-ray instruments of the European XFEL in imaging, spectroscopy and scattering experiments at low frequency rates (10 Hz).

The European XFEL commits to providing users with completely corrected detector data, to reduce their need to focus on the specifications and functioning intricacies of the detector used, and instead concentrate on the analysis of experimental data. For that purpose, calibration procedures are periodically carried out to generate calibration constants that allow converting the raw detector output into physically meaningful information through the deployment of several data correction steps.

In this work, an overview of the ePix100 calibration procedures and correction algorithms will be presented, with emphasis on particularly relevant processes for this detector, such as common mode noise suppression and reconstruction of photon events with shared charge across neighbouring pixels. Additionally, an assessment of how effectively the latter can be used to achieve sub-pixel resolution through interpolation algorithms shall be discussed.

[1] A Dragone et al., J. Phys.: Conf. Ser. 493 (2014) 012012

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