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The new ePix10k megapixel hard x-ray area detector at the LCLS

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The ePix10k2M is a new large area detector specifically developed for X-ray Free Electron Laser applications. The hybrid pixel detector was developed at SLAC to provide a hard X-ray area detector with a high dynamic range, running at the 120 Hz repetition rate of the Linac Coherent Light Source (LCLS). The detector has a dynamic range from single photon counting up to 10,000 photons/pixel/pulse at 8keV. The high dynamic range is achieved with 3 distinct gain settings (Low, Medium, High) as well as two autoranging modes (high-to-low and medium-to-low).

Here we evaluate the detector performance in comparison with the previously deployed CSPAD. The external dimensions of the two detectors are similar, making the upgrade from CSPAD to ePix10k straightforward for most setups at LCLS, with the sPix10k improving on experimental performance. The main detector during an experiment, such as the large area ePix10k, is used for primary signal detection. However, this detector is also often used for normalization and for diagnostics of the experimental setup, it is therefore crucial that these multi-purpose detectors are well understood and calibrated to facilitate the best scientific output of the limited XFEL beamtime.

Here we present the first measurements on this new ePix10k detector and evaluate the performance under typical XFEL conditions during an LCLS x-ray diffuse scattering experiment measuring the 9.5 keV x-ray photons scattered from a thin liquid jet.

The SLAC developed ePix cameras all utilize a similar platform and are designed to provide an upgrade path for future high repetition rate XFELs such as LCLS-II and LCLS-II-HE.

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