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Advancements in assembly and integration of new DSSC detector systems at the European XFEL

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The DSSC camera was developed for photon science applications in the 0.25-6 keV energy range at the European XFEL in Germany. The first 1-Megapixel DSSC camera, equipped with Miniaturized Silicon Drift Detector (MiniSDD), is available and is successfully used for scientific experiments at the "Spectroscopy and Coherent Scattering"(SCS) and the "Small Quantum System"instruments of the European XFEL. A second camera, based on DEPFET active pixel sensors, is in the final stages of integration. The DEPFET technology camera has significantly improved performance as it offers an order of magnitude larger dynamic range due to its unique signal compression feature at the sensor level. It also offers much lower noise (<10 el. rms) with respect to the MiniSDD version at Megaframe rate.

This work describes recent activities in the assembly, characterization, and integration of the second camera at the European XFEL facility. These steps include focal-plane modules (FPM) inspection and assembly with its electronics onto cooling blocks and into the final detector vessel, followed by Karabo, PLC, DAQ, timing and online data preview integrations and continued by rigorous in situ testing under real-working conditions using the European XFEL infrastructure. Part of the calibration and characterization are conducted in the Detector group laboratory at the European XFEL and finalized at the final instrument location.
Moreover, there is increasing interest in compact systems based on DSSC single modules at the European XFEL. Recent endeavors have led to the creation of a novel mechanics and cooling system tailored for a single module DSSC detector, planned for deployment at the SCS instrument of the European XFEL. This module, comprising 128x512 pixels, represents a fraction (1/16) of the active area covered by the 1-Megapixel camera. The new mechanics and cooling system prioritize enhancing versatility, flexibility, and installation convenience of these single modules. Such enhancements aim to streamline potential exchanges, both within and between instruments, thereby facilitating seamless instrument operations.

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