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CMOS – Shutterless Operation Boosts Speed and Quality

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CMOS technology based X-ray detectors offer numerous advantages compared to traditionally used CCD detectors:

- CMOS sensors are available in larger sizes with a pixel size optimized for X-ray scattering and X-ray diffraction.
- CMOS sensors have lower power consumption than CCDs and provide excellent signal-to-noise ratios even when only moderately cooled. This allows the design of air-cooled detectors. Both, low power consumption and no need for cooling-water, lead to minimized pre-installation requirements.
- While CCDs use a bucket brigade read-out, CMOS technology does allow continuous direct sensor read-out. These features make modern CMOS based X-ray detectors, such as the PHOTON 100, an excellent solution for single crystal X-ray diffraction (SC-XRD) experiments. In particular, the capability to continually read out pixels provides a new approach for data collection. While CCDs require closing the shutter for each read-out step, introducing system overhead, CMOS based detectors can be operated in shutterless mode, which not only eliminates over-head time but it also reduces mechanical jitter. We will present details on the implementation of shutterless readout in the current state-of-the-art SC-XRD instrumentation, the D8 QUEST and D8 VENTURE systems. Furthermore, the impact of shutterless read-out on data quality and data collection speed will be discussed using examples from chemical crystallography and structural biology.



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