

## "DECTRIS Innovations: Shaping the Future of Synchrotron Detection Technologies"

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The latest R&D at DECTRIS on detectors for photon science addresses the demanding requirements of recent synchrotron upgrades. We focus on achieving high frame rates, maintaining outstanding performance well above 10Mcts/pixel/s, and ensuring broad energy coverage from 1.6 keV to 80 keV. Our innovations aim to set new standards in detector technology, enabling groundbreaking advancements in scientific research.

Our ongoing R&D has yielded the SELUN detector, engineered for high-frame-rate applications exceeding 100 kHz, which is crucial for techniques such as ptychography, BCDI, and XPCS. The SELUN features a 192 x 192-pixel array, each 100  $\mu\text{m}$  in size, which creates a 19.2 mm x 19.2 mm active area. With advanced front-end electronics and an instant retrigger capability, it supports non-paralyzable counting at rates over 20 Mcts/pixel/s. Moreover, when configured to a 2x2 digital binning mode, SELUN can achieve frame rates surpassing 100 kHz.

Simultaneously, we have developed the PILATUS4 detector, building on the successes of the PILATUS3 series, to accommodate applications requiring larger active areas. Ideal for scanning powder XRD, XRD-CT, time-resolved XRD, scanning XRD, and SAXS, these detectors offer up to 4 million pixels with a 150  $\mu\text{m}$  pixel size covering an active area of 311x327 mm<sup>2</sup>. They can operate up to 2 kHz in 16-bit mode and 4 kHz in 8-bit mode, with minimal dead-time of 100 ns, ensuring an effective duty cycle of over 99.9%. It features four energy discriminating thresholds.

Both detectors employ versatile front-end electronics adaptable for either electron or hole collection and are compatible with Si, CdTe, CZT, or GaAs sensors. In this talk, we will present a comprehensive spectral characterization and count rate capabilities for both detectors tested in our specialized X-ray laboratory and at the SLS-PX10SA beamline at PSI in Villingen and the high-energy BAMline at BESSY II in Berlin.