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Detector developments at PSI

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Developments of cutting-edge X-ray detectors are largely driven by experiments at large photon science facilities, i.e. the synchrotron radiation sources and free-electron lasers (FELs) which enable a wealth of investigations in different subjects. At PSI, we develop hybrid X-ray detectors for these facilities as well as for the next-generation radiation sources, namely diffraction-limited storage-rings and high repetition rate FELs. Their applications include but are not limited to scattering and diffraction imaging experiments for pixel detectors and XES, XRD, ED-XAS and XPD for strip detectors. Using different sensors, i.e. the Low Gain Avalanche Diodes (LGADs) and high-Z sensors, the hybrid X-ray detectors are able to cover a large energy range from hundreds of eV to hundreds of keV.

In this talk, I will introduce the detector developments at PSI and their broad applications in various scenarios. In particular, I will present Gotthard-II, a silicon microstrip detector capable of imaging up to 2720 frames at 4.5 MHz frame rate and 400 kHz continuously in beam diagnostic applications. Examples include their usage in the High Resolution hard X-ray single-shot spectrometer (HIREX) for temporal energy resolution diagnostic and in the Photon Arrival time Monitor (PAM) for X-ray pulses arrival time jitter measurement. Finally, the new possibilities of Gotthard-II and the other hybrid detectors in combination with LGAD sensors for measurements in the soft and tender X-ray energy range, as well as the prospects for the next generation high-speed continuous imaging Gotthard-III with a frame rate greater than 1 MHz will be discussed.

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yes

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