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Current and future detector developments at the Swiss Light Source

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The detector group of the Swiss Light Source (SLS) at the Paul Scherrer Institut (PSI) has a long history of x-ray detector developments for synchrotrons. Initially these detectors were all single photon counting systems. In the last years the focus at PSI was moving towards charge integrating systems mainly driven by the detector needs for the upcoming XFELs. Charge integrating systems however also solve some of the problems of single photon counting systems. Charge integrating systems have an almost infinite linear count rate capability, allow systems with smallest pixel sizes and for low photon energies. In this presentation we give an overview of the detector developments at PSI and focus on Jungfrau, Mönch and Eiger. Eiger is a single photon counting system specifically developed for high frame rates. It has a 75 micron pixel size and can run at frame rates up to 24 kHz. A 9M Eiger detector will be installed in a few months at the cSAXS beamline of the SLS. Jungfrau uses the same sensor as Eiger (about 4cm x 8 cm with a pixel size of 75 microns). It has a charge integrating architecture with dynamic gain switching to achieve a dynamic range of 10^4 photons (at 12 keV). With a frame rate of up to 2 kHz Jungfrau is currently being developed for applications at both XFELs and synchrotrons. 16M Jungfrau detectors are foreseen at the SwissFEL. Mönch is currently a research project. A first prototype with 160x160 pixels and a pixel size of 25 microns was designed and is currently characterised. It offers the smallest pixel size of current hybrid pixel detectors and also has a very low noise allowing hybrid pixel detectors to be used down to about 400eV. We present measurement results for Jungfrau, Mönch and Eiger and give an outlook on future possible systems.

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