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(Invited) Jungfrau, Mönch and Eiger: Detector Development at the Swiss Light Source

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The detector group at the Swiss Light Source (SLS) is currently involved in several detector development projects both for synchrotrons and XFELs. In the presentation we give an overview of our developments with a focus on Jungfrau, Mönch and Eiger. Eiger is a state of the art single photon counting detector whereas Jungfrau and Mönch are charge integrating systems which overcome several limitations of today's single photon counting detectors like count rate capability, pixel size or low energy limit.

Eiger is a single photon counting pixel detector with a pixel size of 75 micron and a focus on high frame rates (up to 24 kHz). We are currently working on the assembly of a 9M pixel detector, the installation at the CSAXs beamline of the SLS is foreseen for this year.

Jungfrau is a charge integrating detector with a 75x75 μm2 pixel size, dynamic gain switching, a noise of about 120 electrons and a dynamic range of 104 photons per pixel and image. The detector is developed for SwissFEL (the XFEL currently being built at the Paul Scherrer Institut). However, with a frame rate of 1-2 kHz and a data quality similar to single photon counting detectors, it is also an excellent detector for applications at synchrotrons specifically those having a high photon rate (like protein crystallography or small angle scattering). We plan various system sizes ranging from single modules, having about 500k pixels and an active area of 4 x 8 cm2, up to a 16M detector consisting of 32 modules covering an area of 32cm x 32cm.

Mönch is also a charge integrating detector with a pixel size of 25 μm. It is currently in a research state, we have first prototypes and work on defining larger systems. The current prototype chip has 160 x 160 pixels. Since the possibility of interpolating between neighboring pixels allows a micrometric resolution the main application is high resolution x-ray imaging both at synchrotrons and with x-ray tubes. It also has a very low noise of about 30 electrons allowing measurements with single photon resolution down to about 400eV.

The status of the systems, performance characteristics, first results, applications and the plans for the future will be shown.

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