Contribution ID: **45** Type: **ORAL**

EIGER: High frame rate pixel detector for synchrotron and electron microscopy applications

Tuesday, December 11, 2018 2:35 PM (25 minutes)

The EIGER detector is since a few years the gem of single particle counting detectors for synchrotron applications. EIGER is a hybrid pixel detector featuring 75×75 μm^2 pixel size and the low noise (down to 100 e^- ENC RMS). The chip design and the complete readout system development was done at the Paul Scherrer Institut, Switzerland. A few detector systems (ranging from 0.5 to 9 Mpixels) are installed at beamlines at various synchrotrons. The detector is able to acquire data at 22000 frame/s with 4-bit counter depth, independently from the system size. This very high frame rate has opened the path to time resolved experiments at unprecedented scales: results from experiments at synchrotrons will be shown. Insights on the challenges given by the large data volume handling at this high frame will be given.

The similarities between data collection techniques at synchrotrons and with transmission electron microscopes (TEMs) have lead to the trial of EIGER as an electron detector. EIGER has been tested at electron energies 100−300 keV, typical for TEMs. The stopping power of electrons varies a lot with these electron energies and the multiple scattering can be substantial. EIGER shows good performance at 100 keV, where the size of the electron interaction is still contained in a single pixel. However, the high frame rate capability makes EIGER still suitable even at 200−300 keV, despite the large multiple scattering, for applications where a rotation method (electron crystallography) or a raster scan (scanning TEMs) require a fast detector to limit the dose on the sample.
Similarly, we have also tested the detector for lower electron energies (8−20 keV), interesting for photoemission electron microscopy. The Si sensor design has been optimized to reduce the entrance window of the sensor, where low energy electrons stop or scatter. We now want to study the detector performance at ≈1 MeV electron energy, where electrons start behaving as minimum ionizing particles.

Author: TINTI, Gemma

Co-authors: MOZZANICA, Aldo (PSI - Paul Scherrer Institut); BERGAMASCHI, Anna (PSI); SCHMITT, Bernd (Paul Scherrer Institut); MEZZA, Davide (Paul Scherrer Institut); GREIFFENBERG, Dominic (PSI - Paul Scherrer Institute); FROEJDH, Erik; ZHANG, Jiaguo (Paul Scherrer Institut); ANDRAE, Marie (Eidgenoessische Technische Hochschule Zuerich (CH)); BRÜCKNER, Martin (PSI - Paul Scherrer Institut); DINAPOLI, Roberto (Paul Scherrer Institut); CHIRIOTTI ALVAREZ, Sabina (PSI - Paul Scherrer Institut); REDFORD, Sophie (PSI - Paul Scherrer Institut); SHI, Xintian (Paul Scherrer Institute); RUDER, christian; THATTIL, dhanya; MEYER, markus; VETTER, seraphin

Presenter: TINTI, Gemma

Session Classification: X-ray system

Track Classification: Pixel for X-ray imaging