Contribution ID: **422** Type: **Poster**

JUNGFRAU –A hybrid pixel detector for high-performance photon science

Monday, 23 May 2022 15:42 (1 minute)

X-ray photon science at free-electron lasers (FEL) and synchrotron light sources supports diverse research spanning from medicine to solid-state physics. Detectors that are able to cope with the brilliance, repetition rate, and pulse duration of these X-ray sources are in high demand. The hybrid silicon pixel detector JUNGFRAU provides low noise and, simultaneously, high dynamic range, fast readout, and high position resolution. It is optimized for a photon energy range between 2 keV and 16 keV and can resolve single photons down to ~ 1.5 keV with a dynamic range of 10^4 photons at 12 keV. For this purpose, JUNGFRAU combines a charge-integrating architecture and three linear, dynamically switching gains per pixel. JUNGFRAU systems of various sizes (i.e. up to 16 megapixels to date) are operated at FEL and synchrotron facilities worldwide. The success of these systems promotes ongoing research to further improve the JUNGFRAU detector and make it applicable for photon science at the low and high-energy ends of the X-ray spectrum. For instance, the combination of the low-noise JUNGFRAU readout ASIC with inverse LGAD (iLGAD) sensors with thin entrance windows is expected to extend the sensitive range of the system down to 250 eV.

In this contribution, we present the state of the art of current JUNGFRAU systems and discuss recent improvements. We cover measurement results of prototypes for low-energy X-ray detection and present an outlook on possible combinations of JUNGFRAU with high-Z sensor materials to facilitate experiments with high-energy X-rays.

Collaboration

Primary authors: HINGER, Viktoria (Paul Scherrer Institute); MOZZANICA, Aldo (Paul Scherrer Institut); LOPEZ-CUENCA, Carlos (Paul Scherrer Institut); BERGAMASCHI, Anna (Paul Scherrer Institut); CARULLA ARESTE, Maria del mar (Paul Scherrer Institut); GREIFFENBERG, Dominic (Paul Scherrer Institut); SCHMITT, Bernd (Paul Scherrer Institut); ZHANG, Jiaguo (Paul Scherrer Institut)

Co-authors: DINAPOLI, Roberto (Paul Scherrer Institut); FRÖJDH, Erik (Paul Scherrer Institut); HEYMES, Julien (Paul Scherrer Institut); MEZZA, Davide (Paul Scherrer Institute); MOUSTAKAS, Konstantinos (University of Bonn (DE))

Presenter: HINGER, Viktoria (Paul Scherrer Institute)

Session Classification: Photo Detectors and Particle ID - Poster session