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Measurement of heavy ions with the charge integrating hybrid pixel detector Jungfrau

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While originally developed for photon science at free electron lasers the Jungfrau hybrid pixel detector is also suitable for charged particle detection due to its high dynamic range and fast frame rate. In this work we present measurements performed at the HIMAC accelerator at the National Institute of Radiological Sciences in Chiba, Japan. Four different ion species were measured, ranging from He at 230 MeV/A to Fe at 290 MeV/A. We compare the results to Geant4 simulations to verify the detector response. The dynamic range of Jungfrau extends from single particle detection at 2 keV up to 120 MeV/pixel/frame. With the three linear gains we can employ a lab based calibration using X-rays for absolute calibration of the highest gain, and subsequently cross calibrate medium and low gains without the need for an accelerator as part of the calibration procedure. We are able to correctly measure the energy of all four ion species at 0, 45 and 75 degrees, including Fe 290 MeV/A impinging perpendicularly to the sensor which deposits 142 MeV.

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