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P1.52: Per pixel calibration of the MÖNCH0.3 hybrid pixel detector

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Charge sharing can be used to improve the spatial resolution of hybrid pixel detectors [1] with small pixels through interpolation. However, it also complicates the calibration process due to the distortion of the measured spectrum.

In this paper we present lab based per pixel calibration method for MÖNCH0.3 [2], a charge integrating hybrid pixel detector with $25 \times 25 \mu\text{m}^2$ pixels, bump bonded to a $320 \mu\text{m}$ thick silicon sensor. MÖNCH0.3 features 8 static gains selected depending on the required dynamic range. For short exposure times in the highest gain setting the noise is ~ 35 e- RMS.

We used X-ray fluorescence above 15 keV since the shallow absorption in combination with charge sharing means that the peak is not visible for lower energies. The data was processed online, including pedestal subtraction and histogramming, using an application written in Python and C++ that reduces the otherwise prohibitive data volumes resulting from the low photopeak efficiency with up to a factor of 105. Finally, the measurement results were compared to simulations to validate the method.

[1] S. Cartier et. al. JSR. (2016). 23, 1462-1473

[2] M. Ramilli et al., JINST 12 (2017) C01071

[3] A. Bergamaschi et. al. JINST 10 (2015) C01033

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