

Performance of MÖNCH, a 25- μm pixel pitch detector for photon science

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MÖNCH is a hybrid silicon pixel detector based on charge integration and with analog readout, featuring a pixel size of 25x25 μm^2 . Several prototypes have been commissioned, aimed at experimenting different solutions to optimize the detector performances for high and low flux applications at synchrotrons and XFELs.

With an ENC of the order of 35 electrons RMS, MÖNCH is competitive with monolithic detectors and with CCDs in the fields of high resolution imaging and soft X-ray detection below the keV level, and its kHz frame rate capability can substantially shorten the time needed for a single measurement.

Due to its extremely small pixel pitch, MÖNCH intrinsically features an elevated position resolution which, in low flux condition, can even overcome the pixel size: charge sharing between neighboring pixels can be exploited in position interpolation algorithms which can achieve a sub-micron resolution.

In order to achieve the high dynamic range required by XFEL experiments, one of the MÖNCH prototypes features a dynamic gain switching pixel architecture, which allows to adapt the pixel gain setting to the impinging photon flux.

Characterization results of different MÖNCH prototypes in terms of bump-bonding yield, linearity, dynamic range and position resolution will be shown, together with preliminary measurements. Finally, the perspective for the realization of a future low energy detector using 4x3 cm² modules will be discussed.

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