Contribution ID: **171** Type: **Poster**

Exploring the limits of hybrid pixel detectors with MÖNCH

Monday, 25 May 2015 16:07 (0 minutes)

TMÖNCH is a novel hybrid silicon pixel detector based on charge integration and analog readout featuring a challengingly small pixel size of 25x25 μm2, aimed at exploring the limits of current hybrid silicon detector technology.
Two prototypes have been designed and produced in UMC 110nm technology. MOENCH02 is a fully functional prototype of 4x4mm2, containing an array of 160x160 pixels. This array is subdivided in five sub blocks, each featuring a different pixel architecture. The first block targets high resolution, low flux synchrotron applications, as RIXS (resonant inelastic X-ray scattering) or X-ray tomography with X-ray tubes. In this case the charge sharing effect between pixels, together with the signal analog readout, can be exploited to interpolate the hit position with a precision that can reach the sub-μm resolution.
MÖNCH03 has an active area of 10x10mm2 and it contains an array of 400x400 identical pixels, based on the first block of MÖNCH02. It will be read out with a frame rate of ~8 kHz.
The high bump-bonding yield and the extremely good noise performance of ~35 e- make hybrid detectors competitive with monolithic detectors and with CCDs in the fields of high resolution imaging and soft X-ray detection (several hundreds of eV).
Characterization results in terms of bump-bonding yield, linearity, dynamic range, noise and energy resolution will be shown.The development of large area systems based on MÖNCH targeted to specific applications will also be discussed.

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Session Classification: Photo Detectors and PID - Poster Session

Track Classification: S2 - Photon Detector and PID