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Towards high-resolution X-ray Spectral Imaging

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We present the development and initial testing of
a device that opens the way for a novel class of Hybrid Pixel
Detectors (HPDs) achieved by coupling a low-noise, event-driven
analog readout ASIC with a solid state fine-pitch pixel sensor.
Our new HPD builds upon XPOL-III, a cutting-edge 180 nm
CMOS VLSI ASIC integrating over 100,000 pixels with fully
analog, low-noise readout at 50 µm pitch on a hexagonal grid,
covering an active area of 15 × 15 mmˆ2. We developed two
versions of the hybrid device: one with 750 µm thick and
100 µm pixel pitch, Schottky-type CdTe sensor, and one with
300 µm thick and 50 µm pixel pitch silicon sensor. In this
work, we present measurements confirming that our new detector
effectively mitigates the long-standing issue of charge-sharing
that typically degrades the resolution of small-pixel HPDs.
This is achieved through precise, low-threshold measurements of
the charge collected by the pixels within the event cluster. The
assembled devices exhibit excellent spatial and energy resolution
with full single-photon sensitivity, highlighting their potential
for advanced X-ray spectral imaging applications.Measurement results open up exciting perspectives for the implementation of high-performance HPDs in various fields requiring precise X-ray imaging and spectroscopy.We will discuss the detailed performance metrics of the two devices and explore the implications of this technology for future
developments in X-ray detection systems.

Primary experiment

Author: MINUTI, Massimo (INFN Pisa)

Co-authors: BREZ, Alessandro (INFN Sezione di Pisa (INFN)); Dr PROFETI, Alessandro (INFN-Pisa); SGRO', Carmelo; SPANDRE, Gloria (INFN Sezione di Pisa (INFN)); Dr ORSINI, Leonardo (INFN-Pisa); BALDINI, Luca (INFN-Pisa); LATRONICO, Luca; Dr CECCANTI, Marco (INFN-Pisa); PESCE-ROLLINS, Melissa (INFN-Pisa); Dr PINCHERA, Michele (INFN-Pisa); BELLAZZINI, Ronaldo (INFN Pisa)

Presenter: MINUTI, Massimo (INFN Pisa)

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