

The **ARCADIA** Depleted Monolithic Active Pixel: characterization and prospects for high precision tracking systems at future colliders

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Requirements and challenges for trackers at future colliders

High momentum and
spatial resolution

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Small pixel pitch

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Non perturbative
measurements

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Thin sensors

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High momentum and spatial resolution

Non perturbative measurements

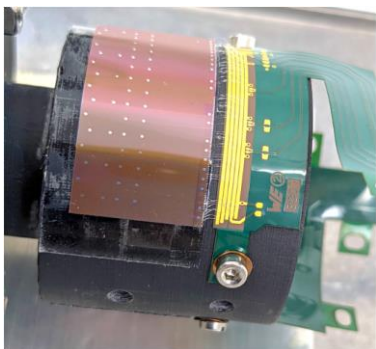
Small pixel pitch

Thin sensors

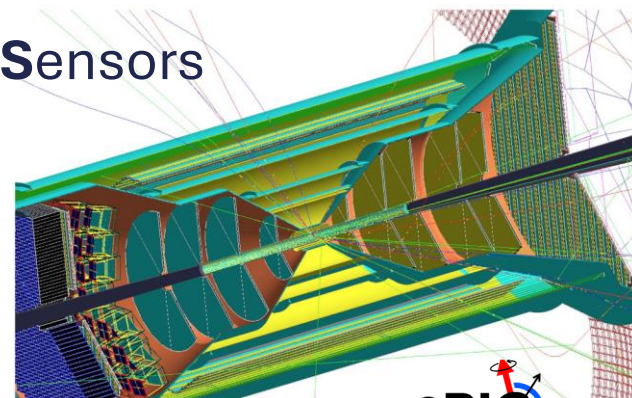


CMOS Monolithic Active Pixel Sensors

Low power
Low production costs
Low material budget
Bent sensors
Stitched sensors



[1]



ePIC

[2]

Requirements and challenges for trackers at future colliders

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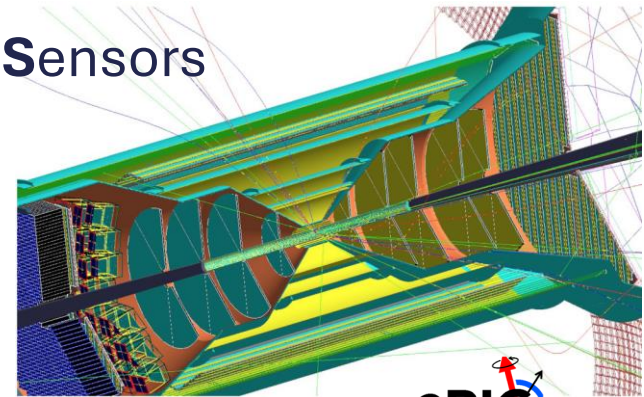
Small pixel pitch

Thin sensors



CMOS Monolithic Active Pixel Sensors

- Low power
- Low production costs
- Low material budget
- Bent sensors
- Stitched sensors
- Reduced radiation hardness
- Slow charge collection



ePIC

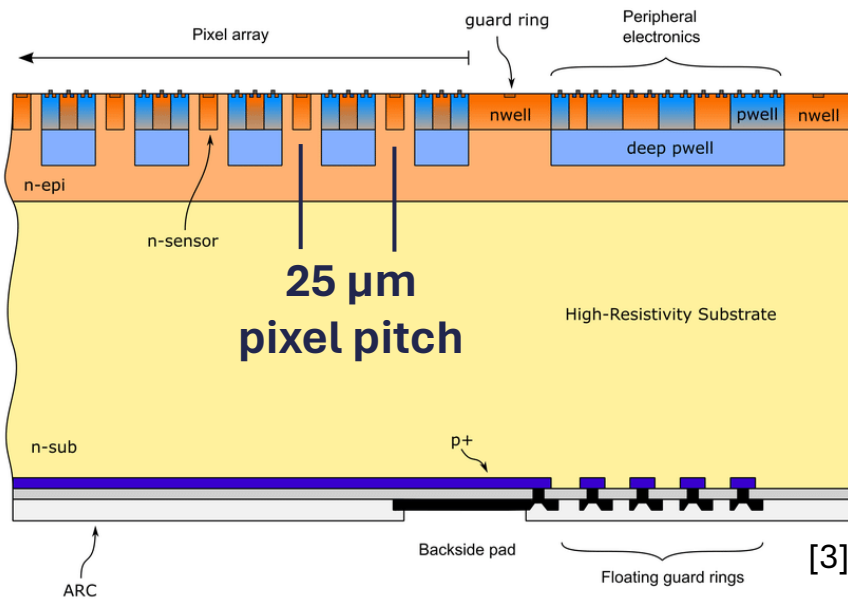
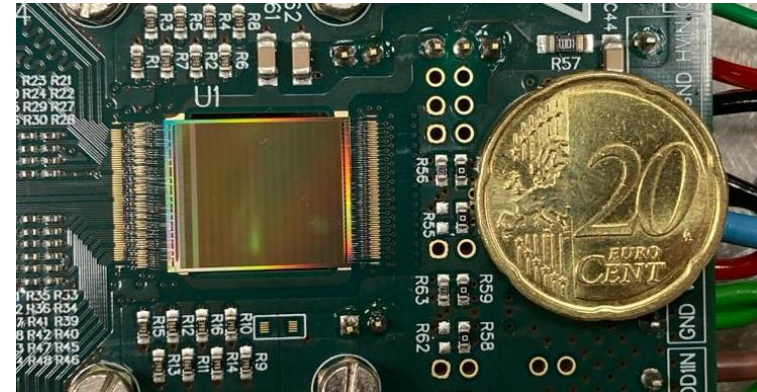
[2]

[1]

} Depleted MAPS

ARCADIA Depleted MAPS

- Array of 512 x 512 pixels
- **Digital** readout
- CIS technology 110 nm
- Low power consumption $O(10 \text{ mW/cm}^2)$
- Developed by INFN ARCADIA collaboration with LFoundry

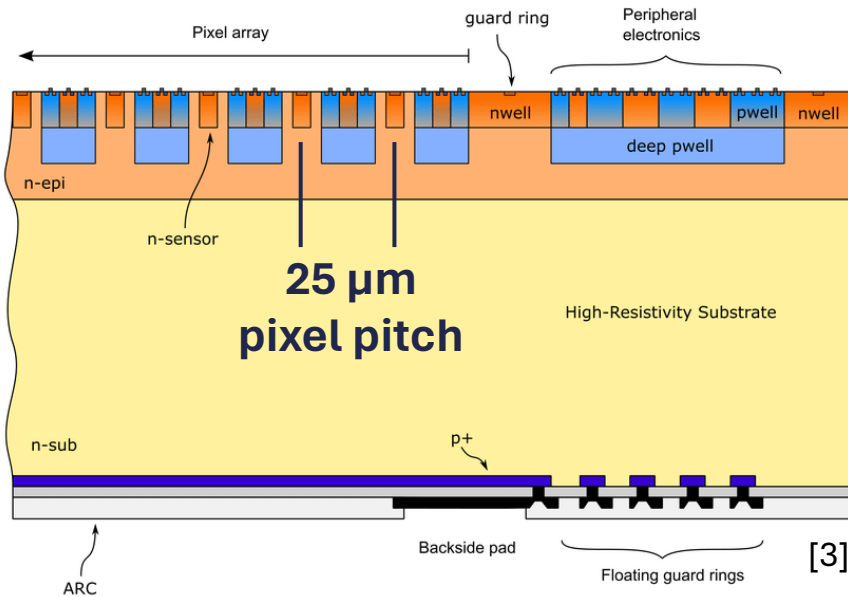
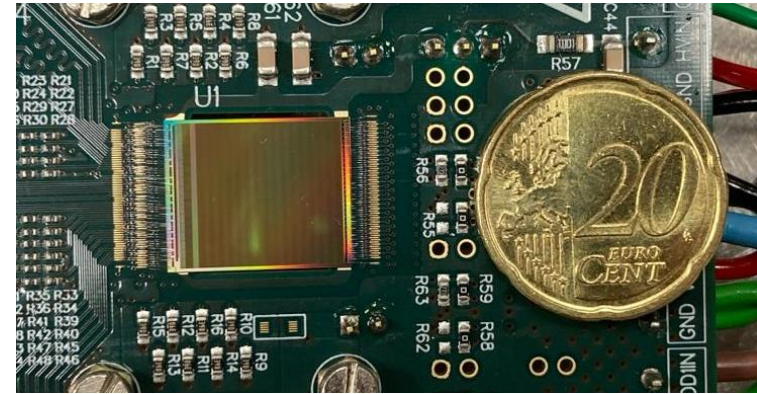


50-200 μm
fully depleted
(DMAPS)
active substrate

ARCADIA
[Logo]

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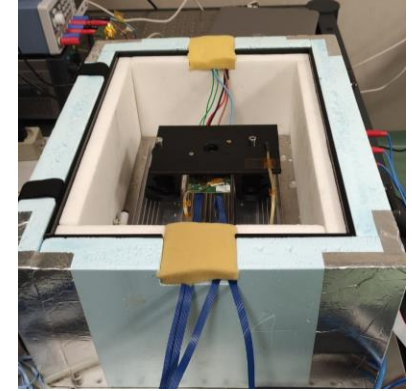


ARCADIA

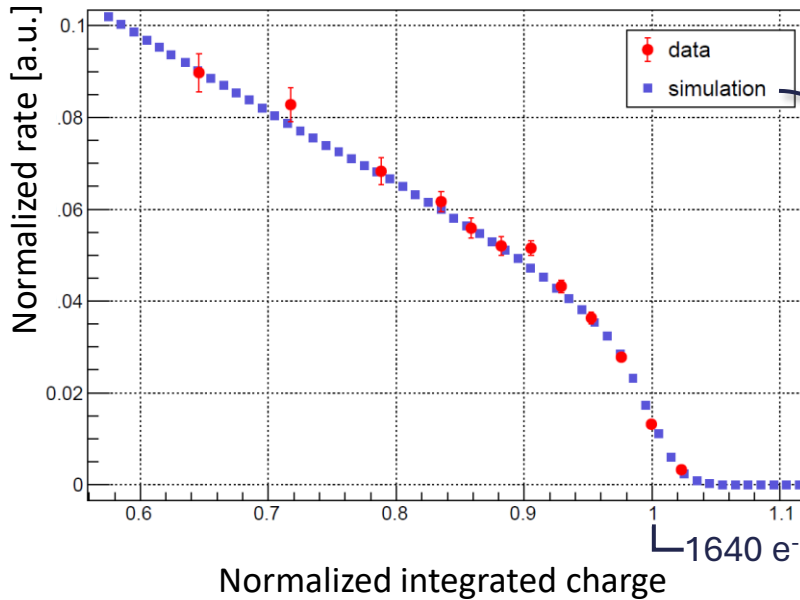
Electrons **drift** improving and speeding up the charge collection

Sensor characterization with X-rays

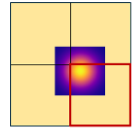
S-curve with X-Ray monochromatic source (^{55}Fe)



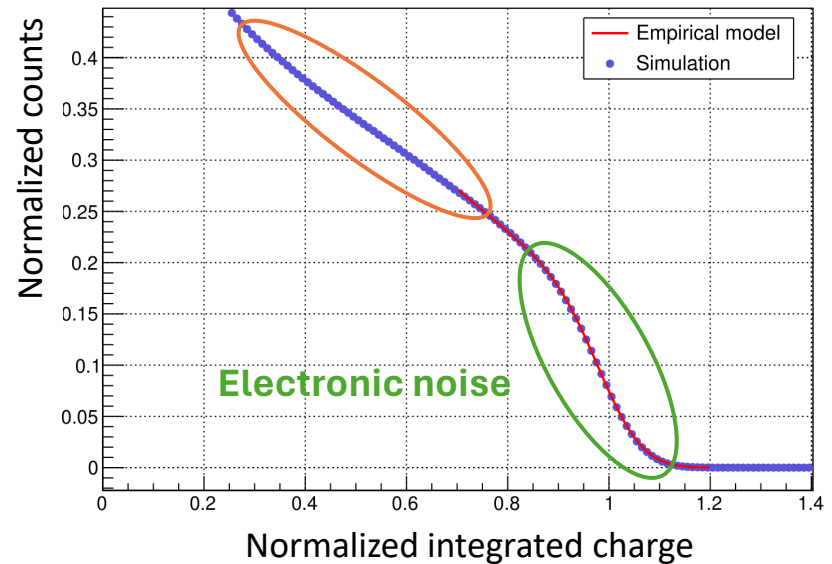
Threshold scan measurement on single pixel



MonteCarlo simulation to study geometrical charge sharing effects



Charge sharing



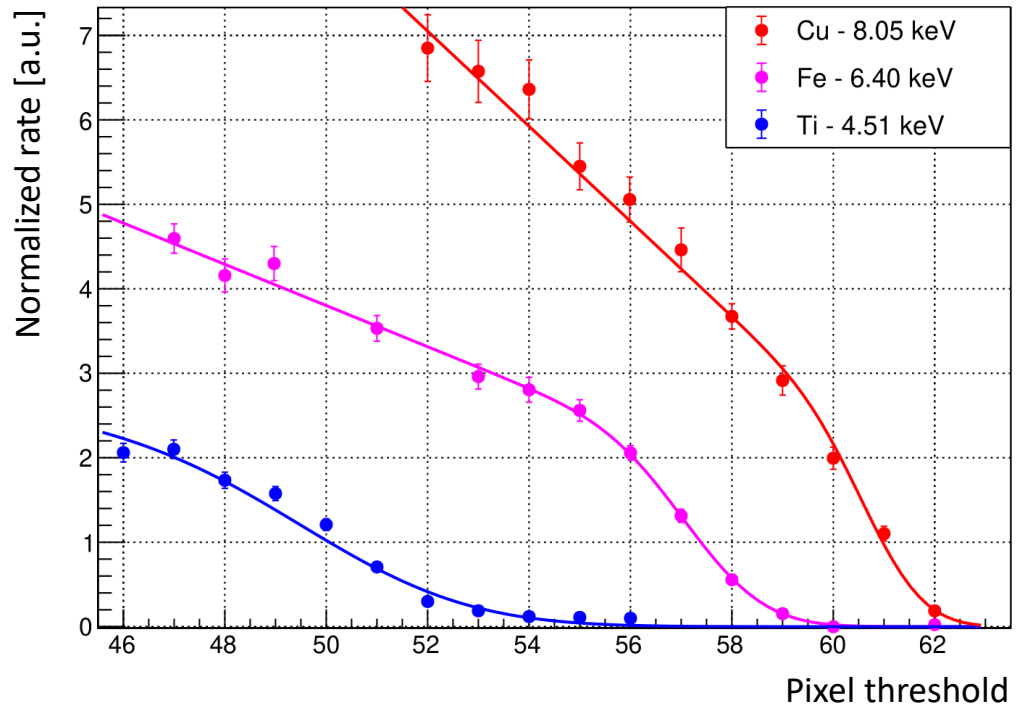
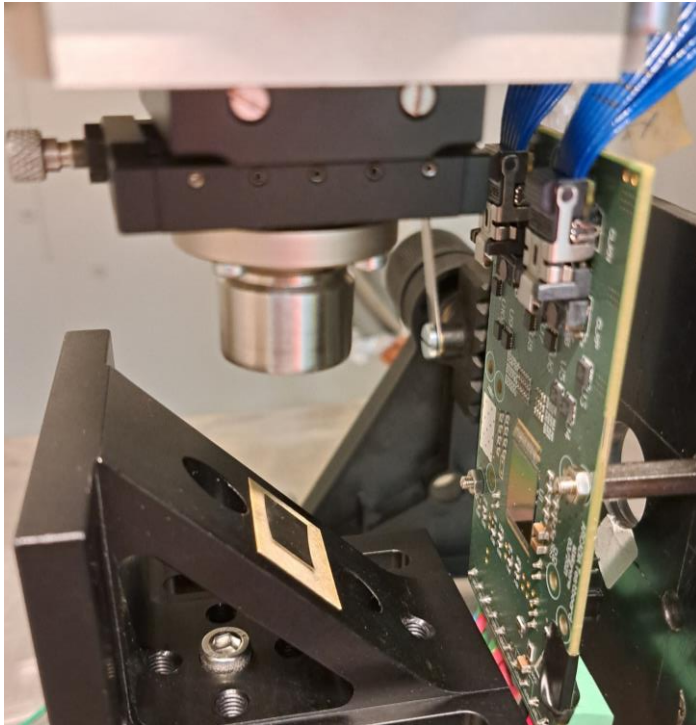
pixel threshold

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Ongoing work: preliminary results

Pixel response at different energies:

X-ray **fluorescence** in the range of energy of interest obtained using a primary beam (X-ray tube) and different material targets.



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Thank you for your attention

References:

- [1] A. Kluge, ALICE - ITS3 — A bent, wafer-scale CMOS detector, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 1041 (2022)
- [2] D. Elia, Update on Silicon Tracker, EIC_NET National Meeting (2023)
- [3] T. Corradino et Al., Design and Characterization of Backside Termination Structures for Thick Fully-Depleted MAPS, Sensors, 21 (2021)