

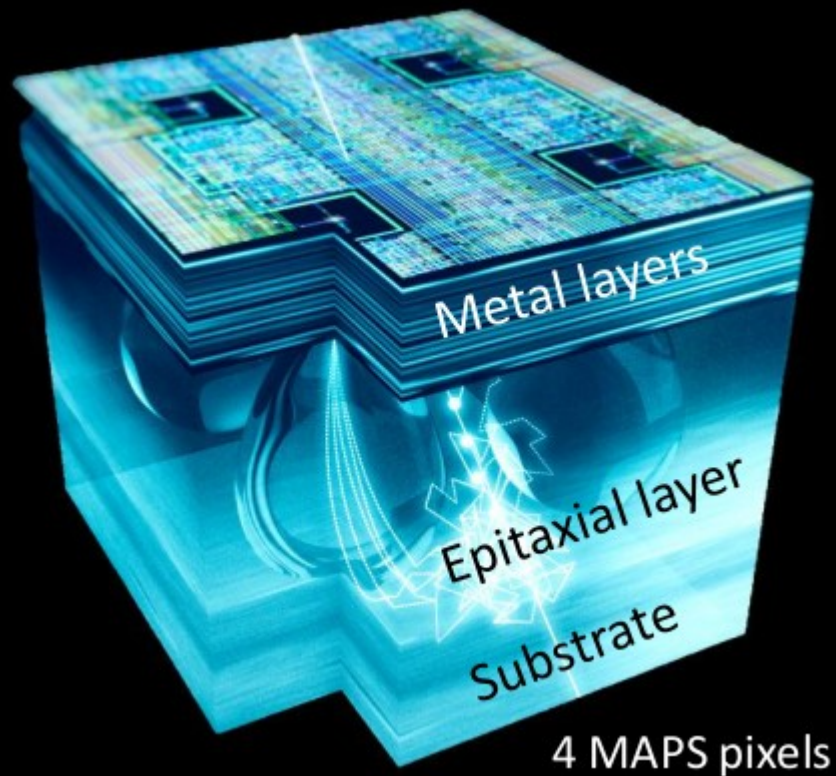
Status & Plan

Bari, 5/11/2024

People involved:

Angelo Colelli, Rajendra Nath Patra, Shyam Kumar, Triloki Triloki & Francesco

The 65 nm CMOS technology

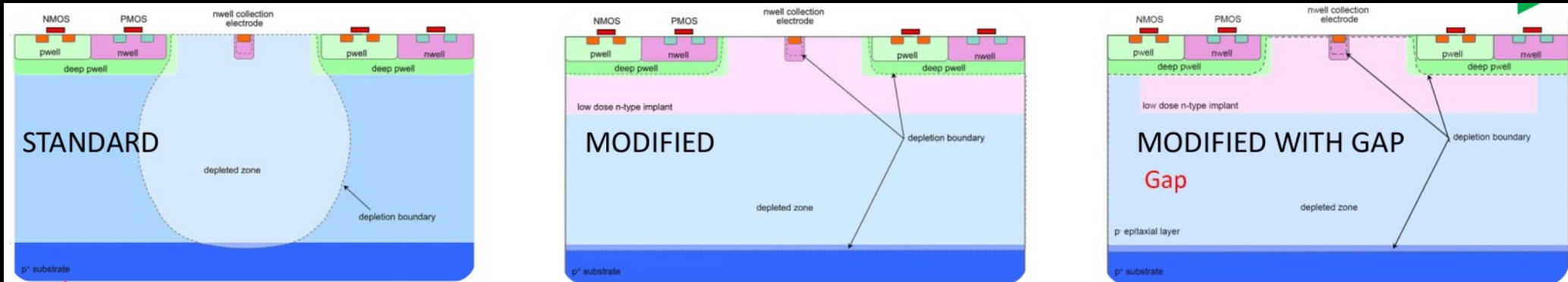


APTS: Analog Pixel Test Structure

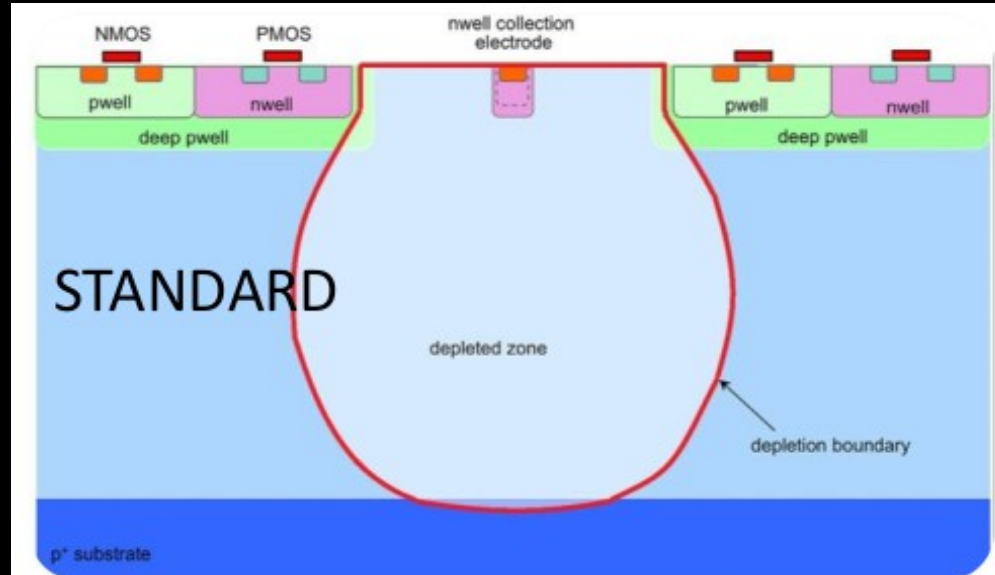
1.5 mm

- 6×6 pixel matrix
- Pitch: 10, 15, 20, 25 μm
- Analogue readout of central 4×4 submatrix
- Output buffer in two versions: Source Follower (SF) and Op Amp (OA)
- **Goal:** explore pixel designs

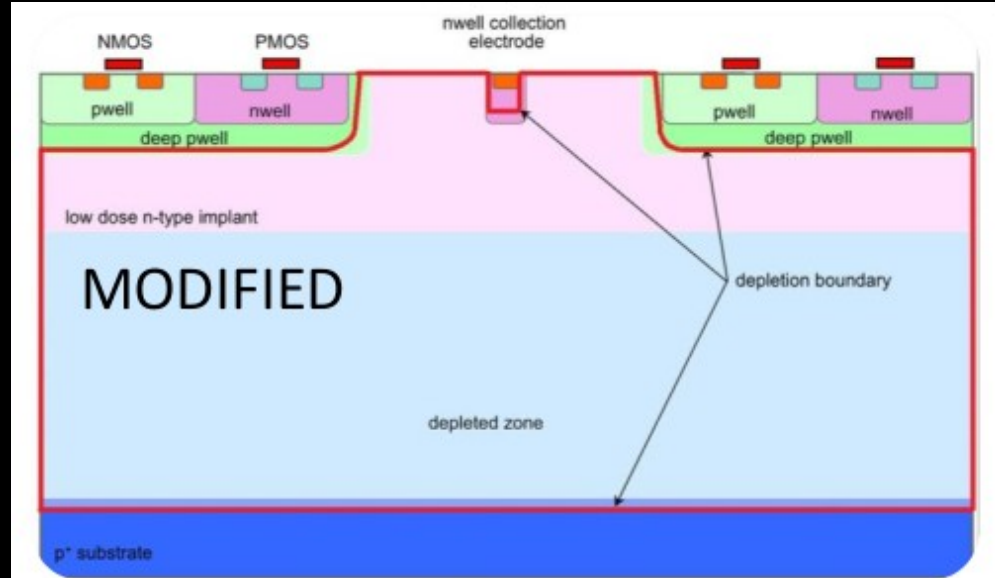
The 65 nm CMOS technology



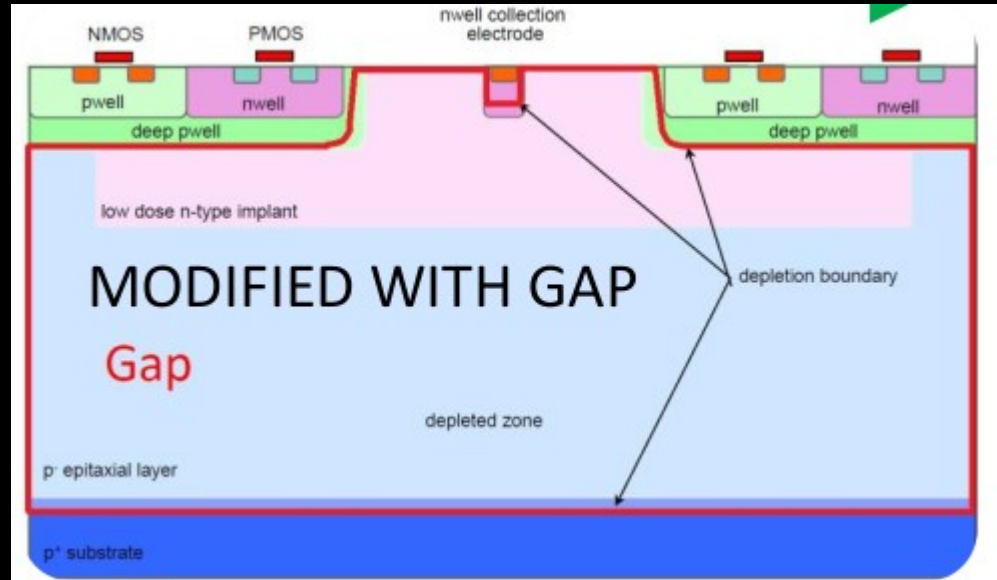
The 65 nm CMOS technology



The 65 nm CMOS technology



The 65 nm CMOS technology



Test Beam @ SPS (Sept-Oct 2024)



Time schedule plan



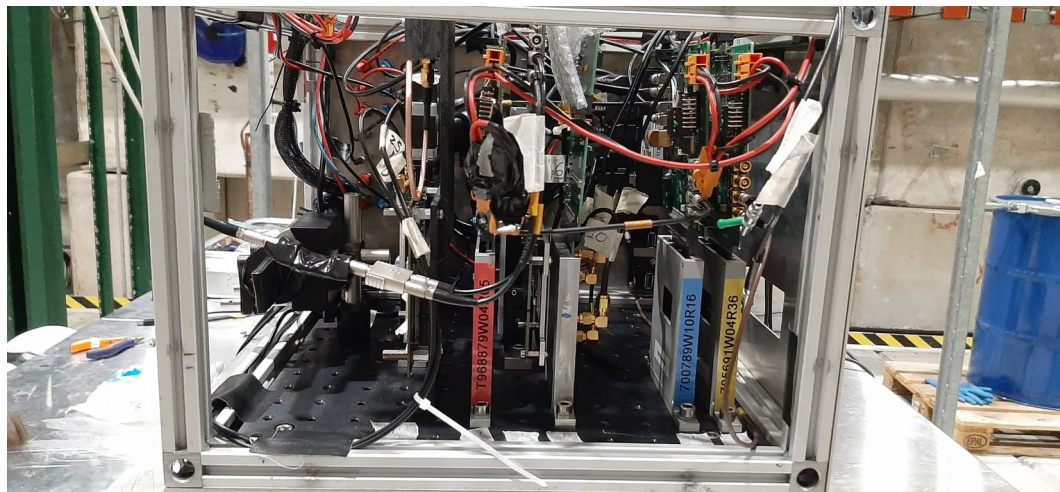
- **Monday 23** → traveling to CERN
- **From Monday 23 to Wednesday 25 September** → mounting the telescope in bld 23 [ADAMS] + dosimeter
- **Wednesday 25 September** → moving to SPS (through the tunnel [ADAMS])

- **Wednesday 25 September** → **AO10P 1E15** → 6pm alignment and night start data taking
- **Thursday 26 September** → **AO10P 1E15** → data taking
- **Friday 27 September** → **AO10P 1E14** → 9am DUT substitution and alignment and 1pm start data taking
- **Saturday 28 September** → **AO10P 1E13** → 9am DUT substitution and alignment and 1pm start data taking
- **Sunday 29 September** → **AO10AP** → 9am DUT substitution and alignment and 1pm start data taking
- **Monday 30 September** → **AO10AP** → data taking
- **Tuesday 1 October** → change DUT (?)

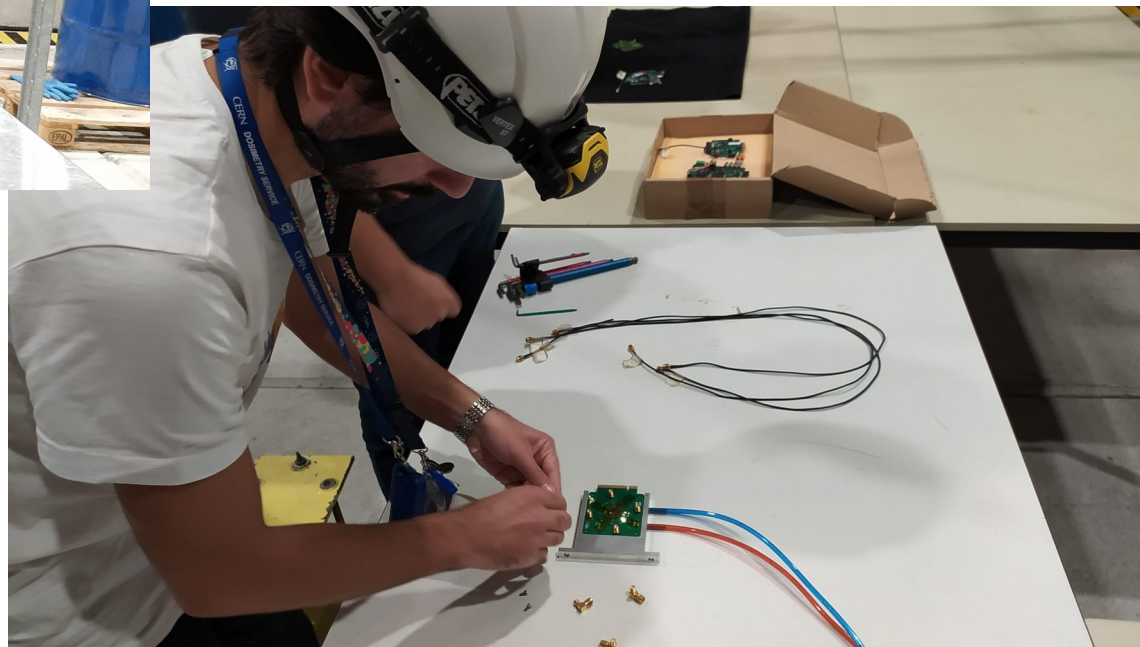
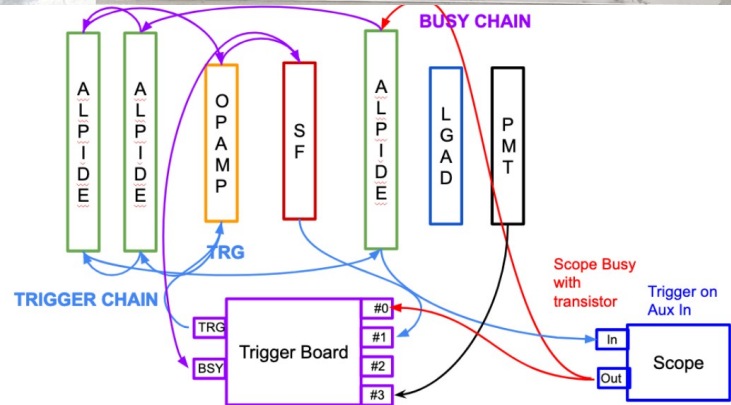
- **Wednesday 2 October** → leaving SPS
- **Thursday 3 October** → leaving CERN



Test Beam @ SPS (Sept-Oct 2024)



- “Our” sensor (i.e. APTS-OPAMP 65 nm AC coupled chip) during the test beam



Test Beam @ SPS (Sept-Oct 2024): goal/timeline

- **Main goals**

- Publication within June 2025

- **Milestones**

- 31 October 2024 → Corryvreckan analysis until clusterization and time analysis until track association
- 30 November 2024 → completing 55Fe measurements → updating all K_alpha database
- 31 December 2020 → completing the Corryvreckan and time analysis
- 31 January 2025 → first draft of the manuscript



Test Beam @ SPS (Sept-Oct 2024): goal/timeline



Roles



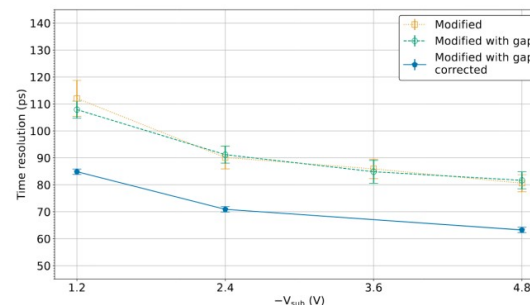
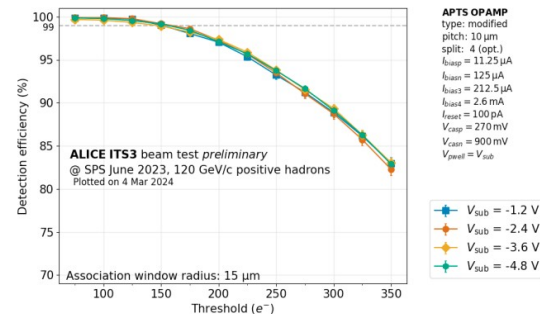
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Sharing the analysis

- Bari → AC-coupled chips -- W22AO10AP -- full analysis
- Nikhef → irradiated chips -- 1E14 and 1E15 -- full analysis
- Torino → complete support on analysis tools

Outcomes

- efficiency at different clusterization thresholds
- timing trend for each configuration
- Landau trend for each configuration
- timing correction (for high statistics samples)
- timing in pixel (for high statistics samples)



Test Beam @ SPS (Sept-Oct 2024): goal/timeline



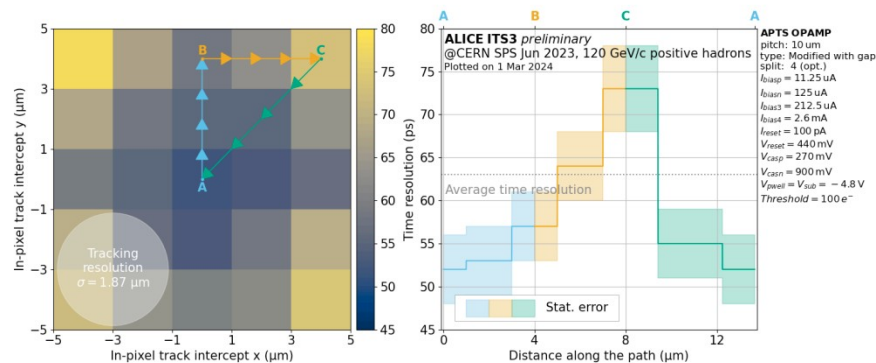
Statistics



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DUT	V _{sub} /HV (V)	Coincidences
W22AO10Pi1 (irradiated 1e14)	-4.8	37000
	-3.6	3000
	-2.4	3000
	-1.2	3000
W22AO10Pi1 (irradiated 1e15)	-4.8	34000
	-3.6	3000
	-2.4	3000
	-1.2	32000

DUT	V _{sub} /HV (V)	Coincidences
W22AO10APb44 (AC coupled)	4.8	10000
	7.2	11000
	10.8	17000
	14.4	11000
	18.0	3500



- NIM A

Time performance of Analog Pixel Test Structures with in-chip operational amplifier implemented in 65 nm CMOS imaging process

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MC simulation: investigation E field

Technology Computer-Aided Design

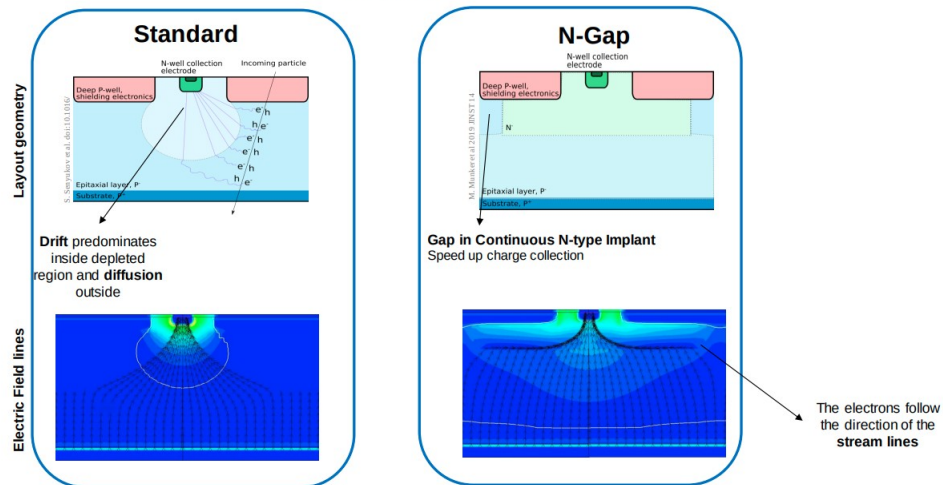
SYNOPSYS[®]
Silicon to Software™



Allpix Squared: a Monte Carlo simulation framework for semiconductor detectors

Electric field in thin silicon sensors

Designs



francesco.barile@uniba.it

New Fe-55 source (x2) - 37 MBq each

