# Highlights of detector R&D activities @TIFPA

Ester Ricci

Ester.ricci@unitn.it

Università di Trento

INFN – TIFPA

INFN-ECFA Early Career Researchers Meeting

# Timing detectors: Monolithic LGADS

- Process: customized **110nm CMOS**

- Based on **ARCADIA MAPS** with additional engineered gain layer

- Main **advantages** with respect to 3D-stacked sensors: lower system costs and material budget, mass-production readiness.

- 1 engineering run in 2023 + 1 short loop run 1 2024.

- Main driver **applications**: ALICE 3 Time Of Flight layers (**goal: 20ps timing resolution**)

- Opportunities for medical imaging, high energy physics and space applications
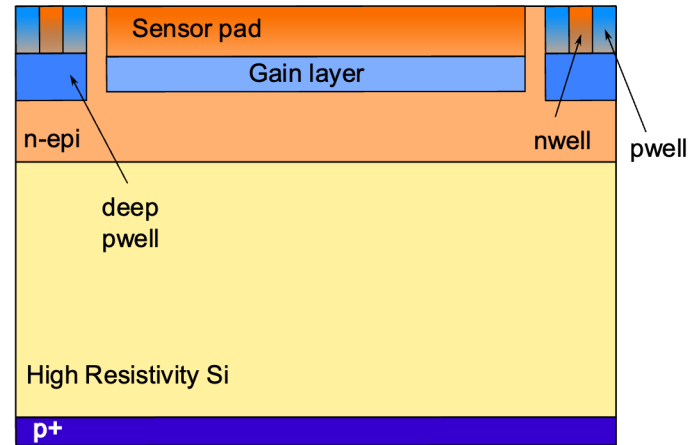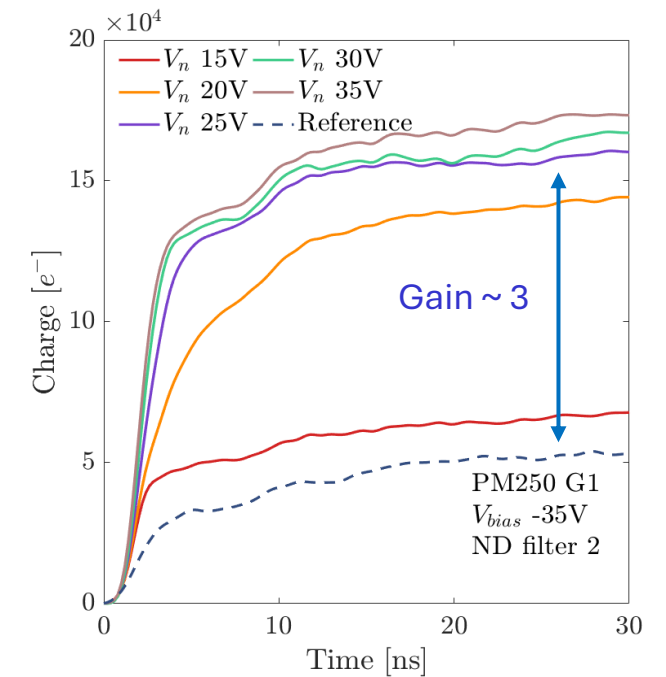


*Sensor cross-section*
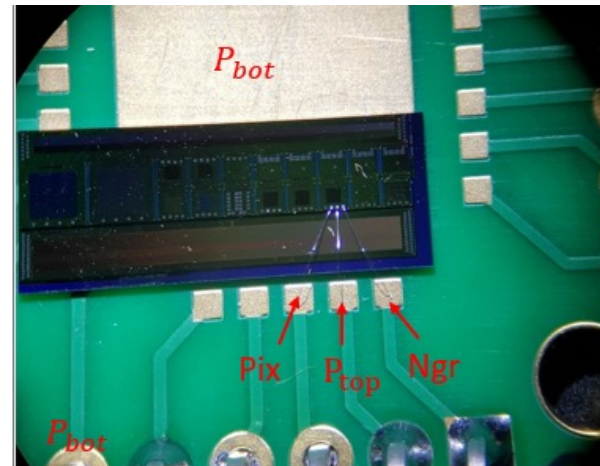


*Test structures bonded on PCB*
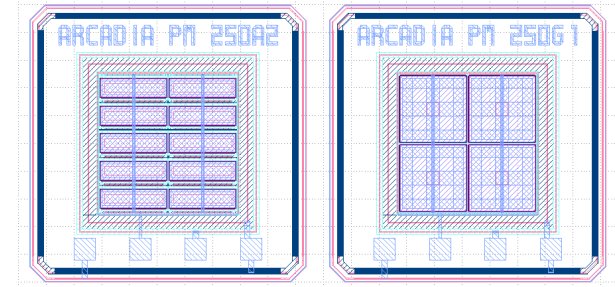


*Sensor test structures layout*



*Integrated charge measured with pulsed IR laser*

Courtesy of L. Pancheri

2

# Space qualification of MAPS

Validation of a strategy for space qualification of particle detectors using ALPIDE as a case study:

- Detector design verification
- Study of power consumption reduction strategies
-  Mechanical design and prototipation
- Mechanical tests:
    - Vibration tests
    - Thermal cycles
    - Thermal-Vacuum tests
- Performance characterisation before and after the mechanical tests
- The first MAPS based tracker will fly at the end of the year