

CTA

CdS Luglio 2023

The Cherenkov Telescope Array

Low energies

20 GeV – 150 GeV

23 m diameter

4 telescopes (South)

4 telescopes (North)

LST

Medium energies

150 GeV – 5 TeV

9.5 to 12 m diameter

25 medium-size telescopes (S)

15 medium-size telescopes (N)

MST (pSCT)

High energies

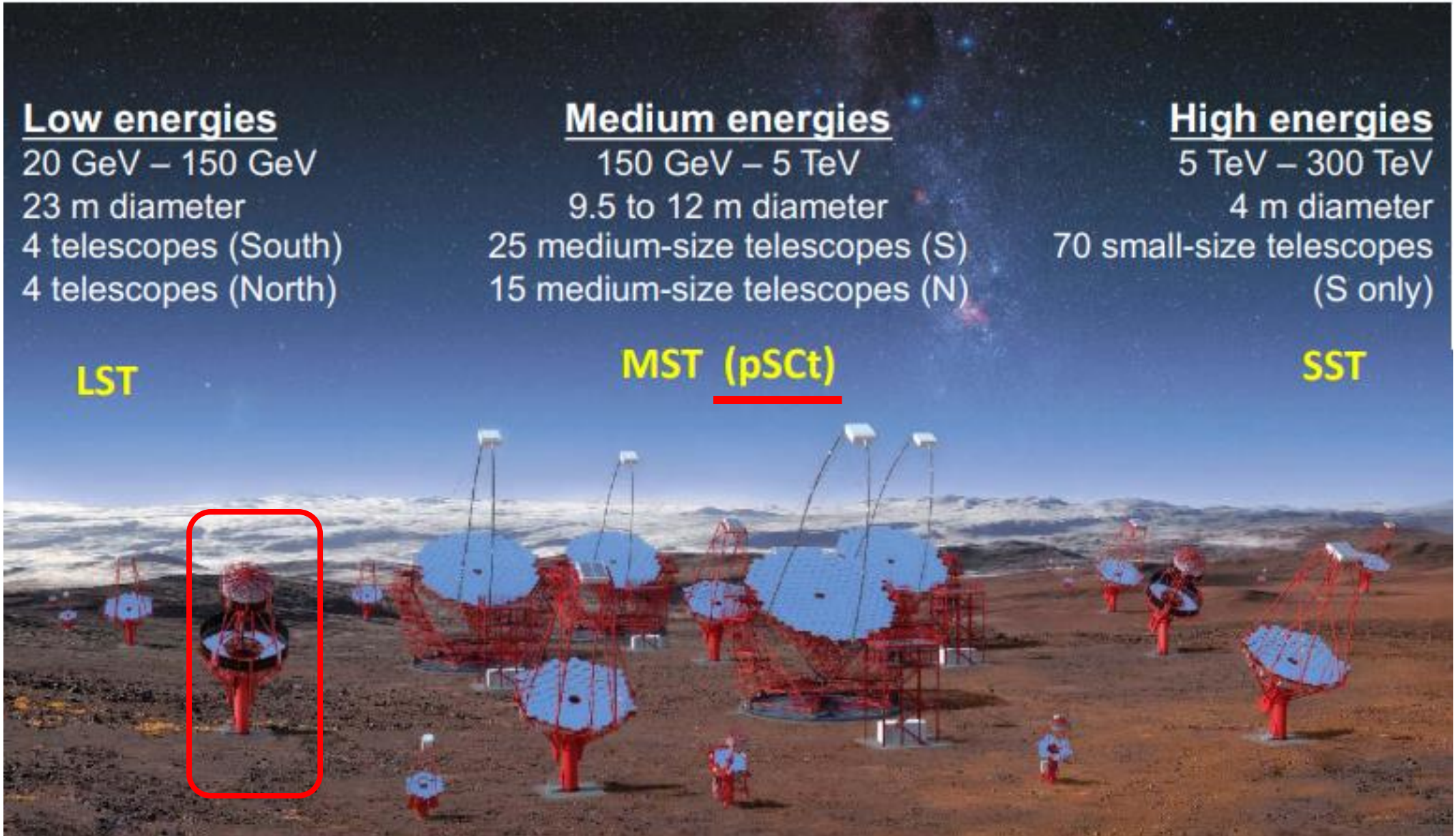
5 TeV – 300 TeV

4 m diameter

70 small-size telescopes

(S only)

SST



prototype Schwarzschild Couder Telescope (pSCT) for CTA

Constructed by CTA members (US, Germany, Italy, Japan, Mexico)

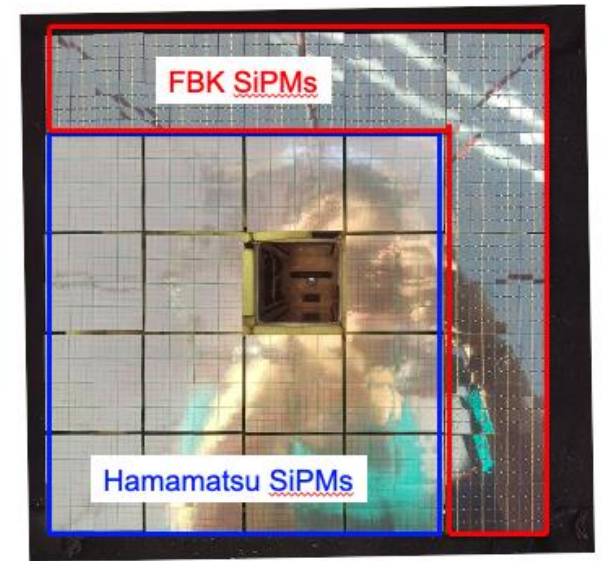
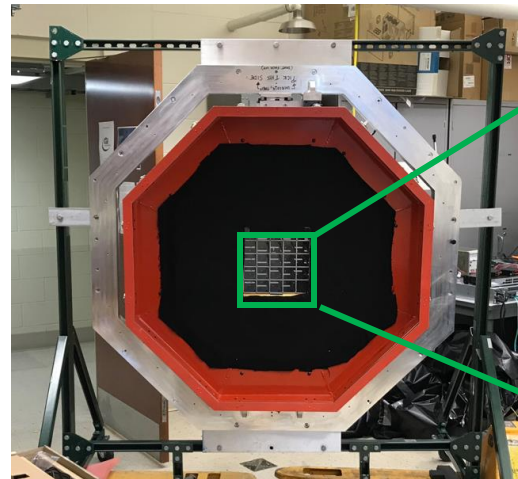
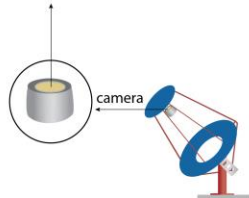
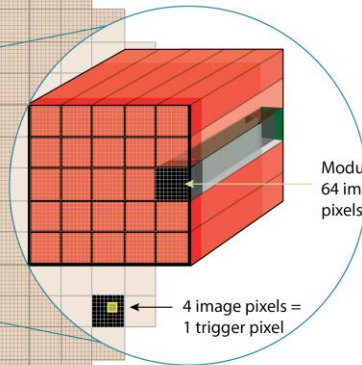
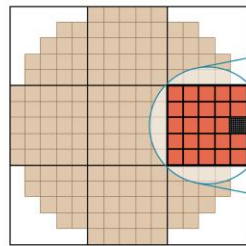
Concept: Dual mirror SC optics (improvement in angular resolution over wide FOV on MST) + SiPM and Gsa/sec waveform sampling readout electronics on compact focal plane camera

Technological goal: improved gamma-ray angular resolution and background rejection capabilities → improved sensitivity in the core energy range of CTA



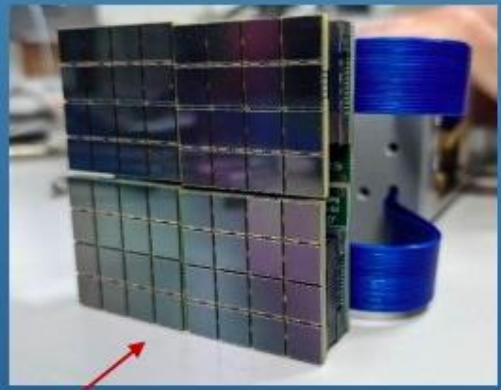
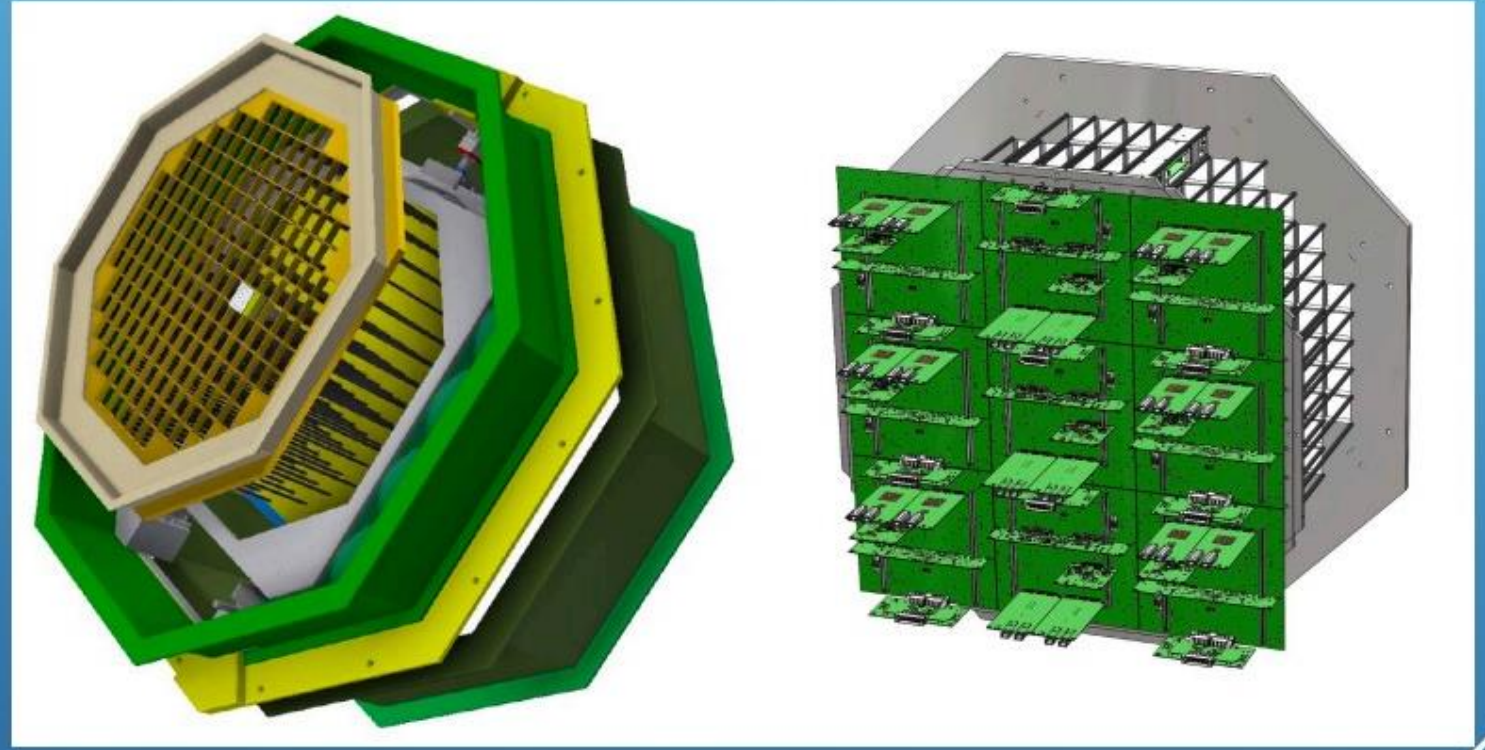
Central sector of pSCT camera equipped with Hamamatsu SiPMs (original camera design) and with FBK SiPMs

Full camera = 9 sub-fields
177 modules
11,328 image pixels



Some numbers for a single camera:
177 modules, 708 matrices, 11.328 SiPM

Camera design

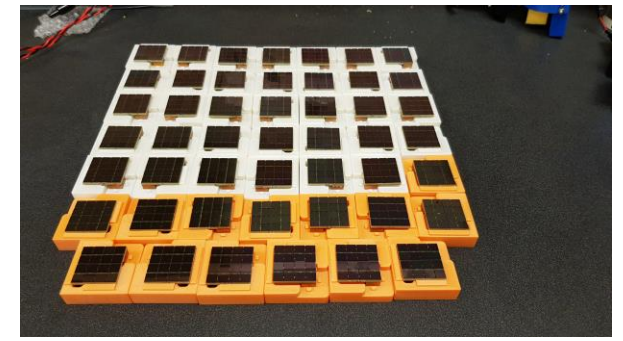


Module of CTA_SIPM INFN



2018

- **12** Wafers of 6 x 6 mm² – NUV-HD5 Low CT SiPM with 30 μm cell produced by FBK
- **100** Assembled and tested @INFN Perugia



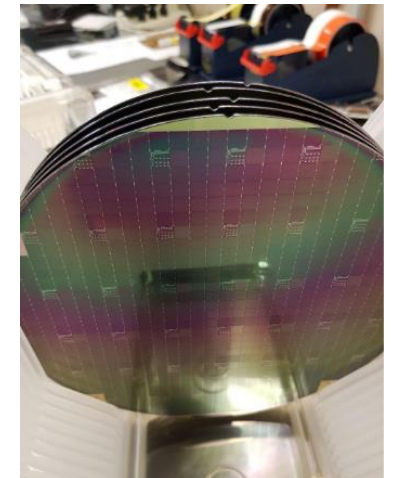
2019-2021

- **18** Wafers 6x6 mm² NUV-HD6 Low CT SiPM with 40 μm cell
- **150** Assembled and Tested @INFN Perugia and Terni, functional tests@INFN
- Accordo Quadro INFN – Lfoundry for the production of semicond. det., Tech. Transfer from FBK to Lfoundry for NUV-HD Low CT

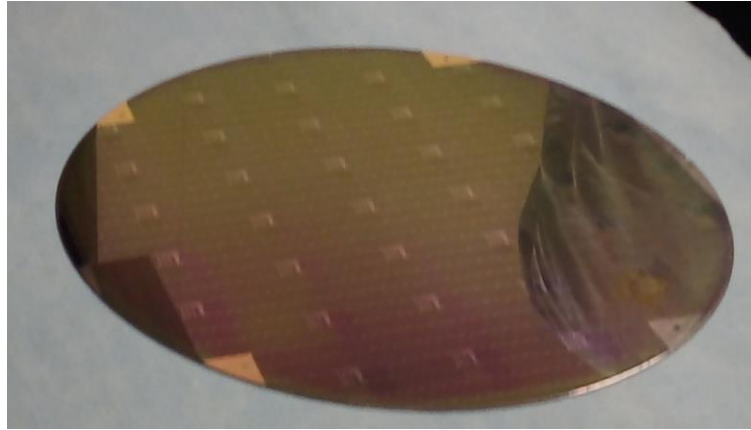


2022-2023

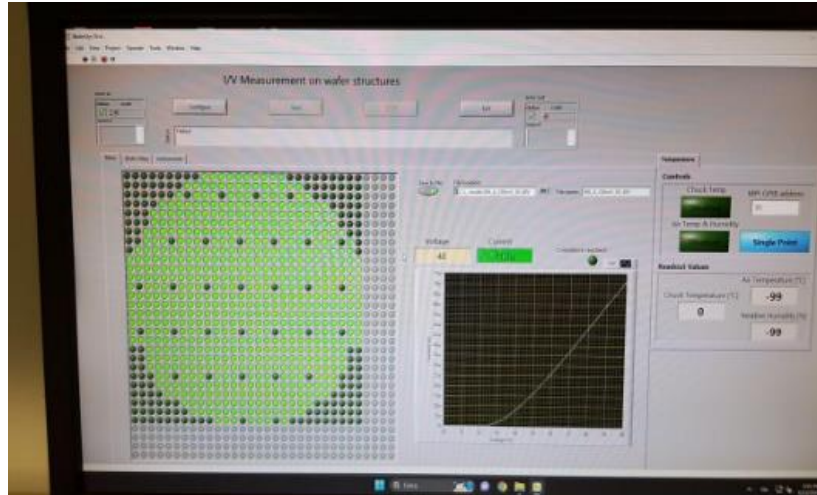
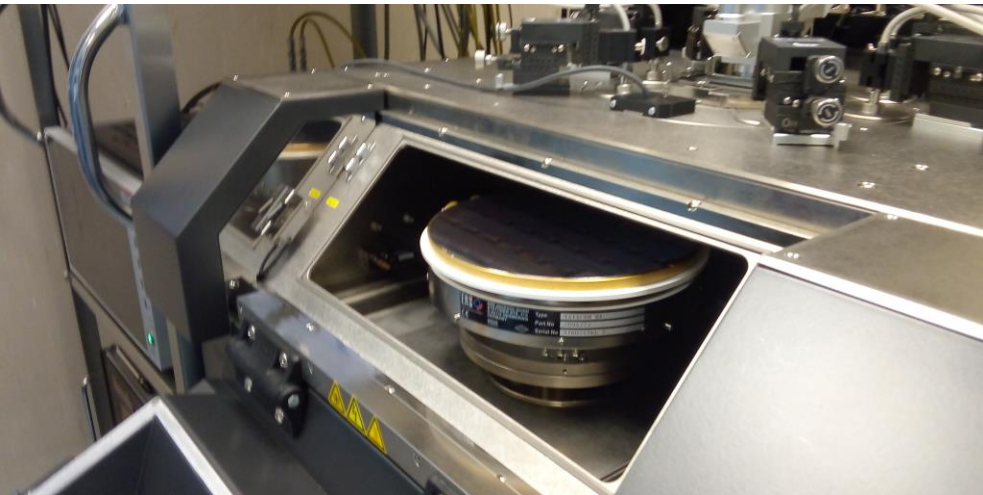
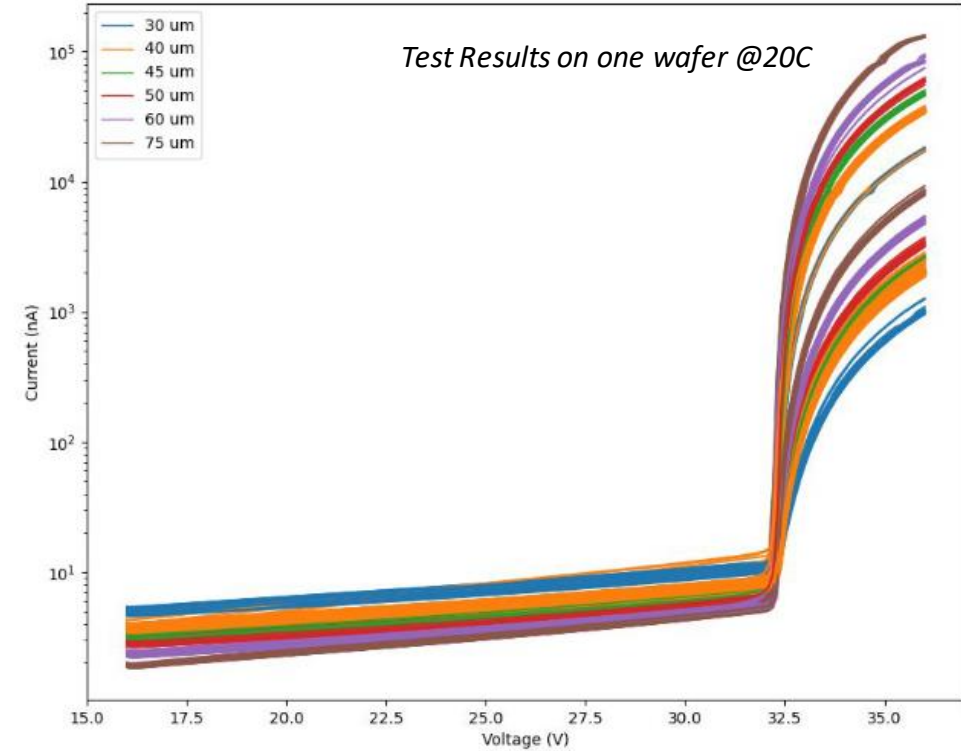
- **48** Wafers fabricated by LFoundry, 6x6 mm² NUV-HD Low CT SiPM with main cells of 40 μm. Arrived @INFNPg
- Electrical characterization of SiPM on the Wafers @INFN Perugia
- Looking for industrial solution for the matrices assembly



Main activities in 2023 – Electrical characterization on wafer



Test done on MPI PA200 Test Station in the Clean Room. Thanks to CMS group: A. Rossi, F. Moscatelli



- **39/48** wafers **test completed**
- **9/48** wafers **to be measured**
- Data **under analysis** by CTA-INFN Collaboration team (INFN Bari and Palermo)
 - **~400** good SiPM per wafer, we expect 19k SiPM, enough to fully equip the camera + spare parts

Main activities in 2023 – Assembly

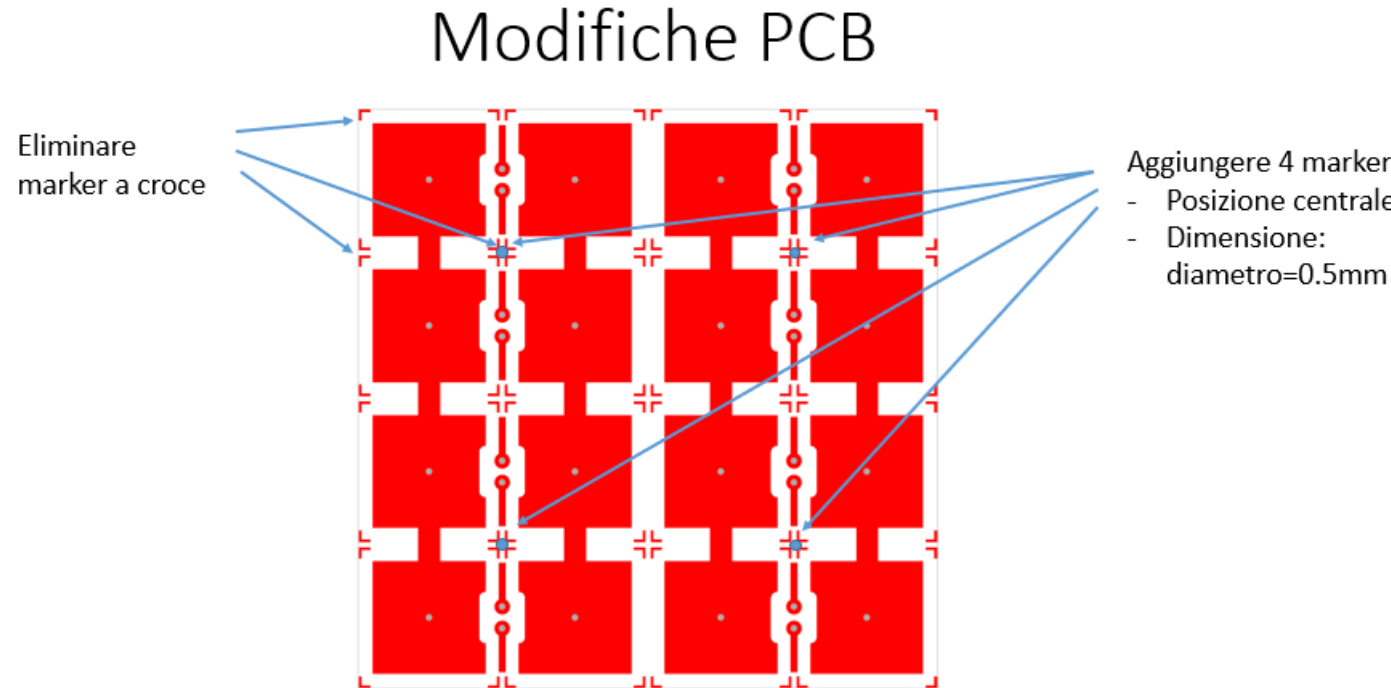
1. Contattato e interagito con la ditta SIAE Microelectronics, Milano per la costruzione matrici

- test di fattibilità fatto → OK
- valutazione prezzo 100euro/matrice

2. Modifica layout PCB per die-gluing automatico e da avviare produzione PCB

3. Da avviare la produzione scatole di storage/trasporto/assemblaggio per ogni singola matrice

3. Stessa proposte ad altre ditte: FBK, NOA...



2023 main activities

- Production of ~48 wafers SiPM @ Lfoundry → **DONE**
- Test & Dicing (ongoing)
- PCB production (>800 pcs) (@ARTEL srl) → to be done
- To Assembly of > 800 matrices

assigned budget 25k€

2024 main activities

- **Quality Control** and **Acceptance Tests** to be done on matrices assembled externally
- **Integration** of matrices in Modules for the Camera

financial requests t.b.d.

People (FTE)

- Bertucci B. 0.5
- Fiandrini E. 0.5
- Germani S.0.5
- Ionica M. 0.3
- Tosti G. 0.5

Tot 2.3

