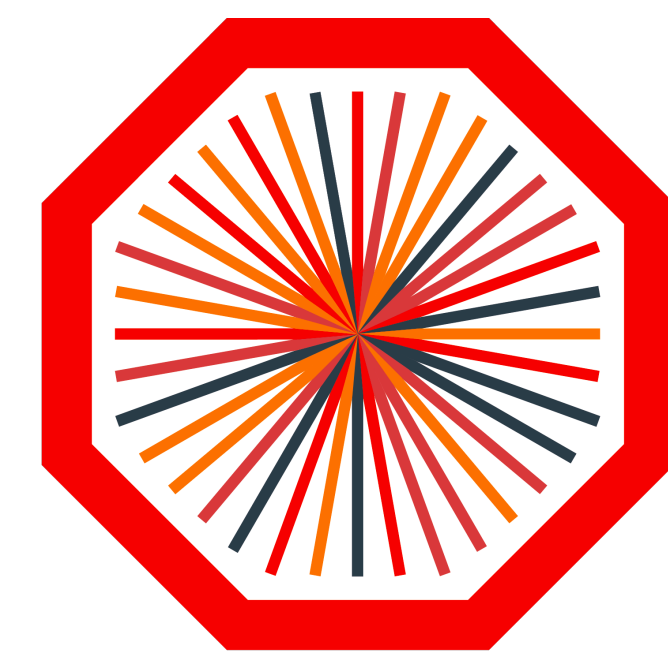
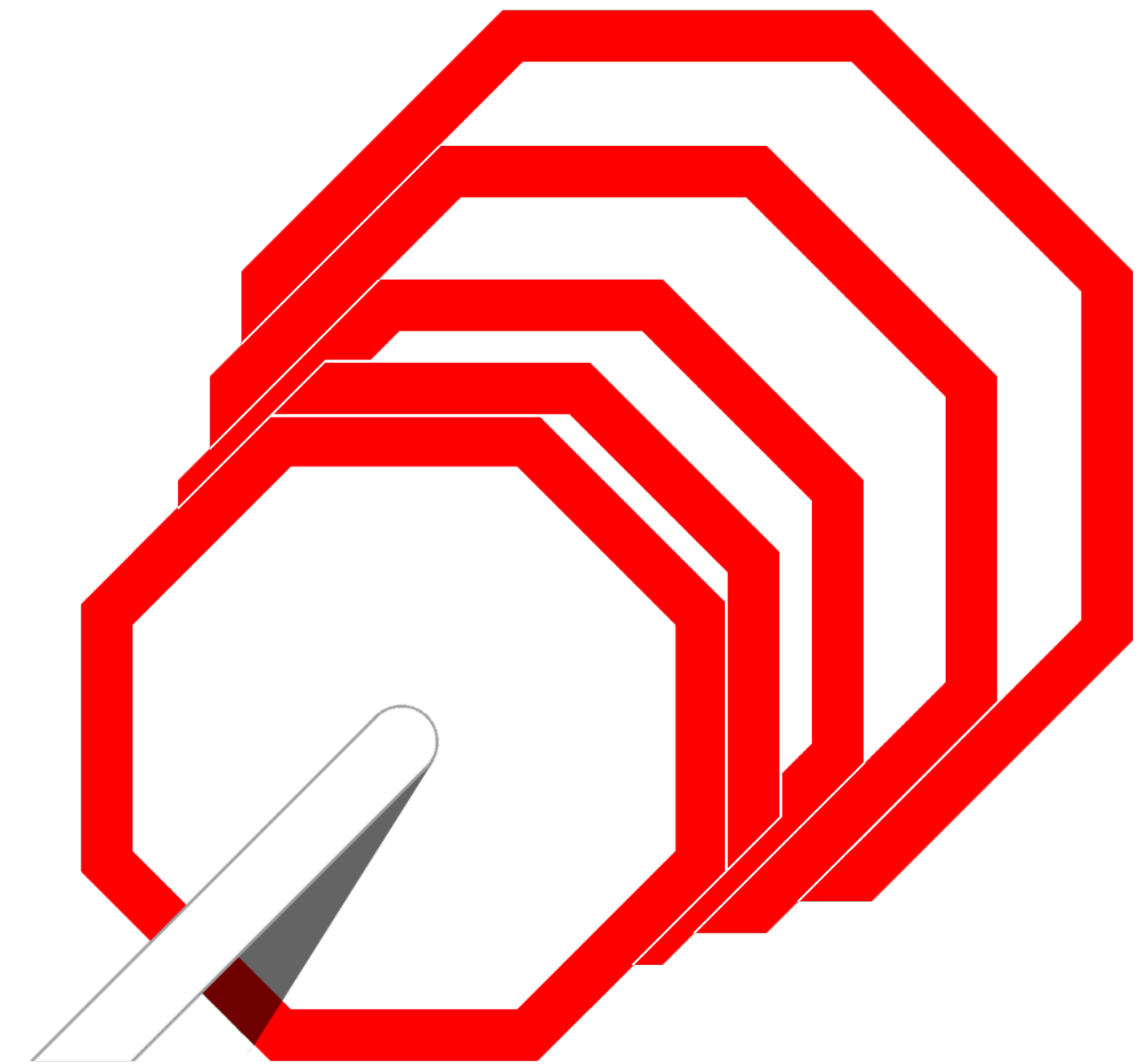


Commissioning of the Muon Forward Tracker for ALICE upgrade

ČSSVK2020

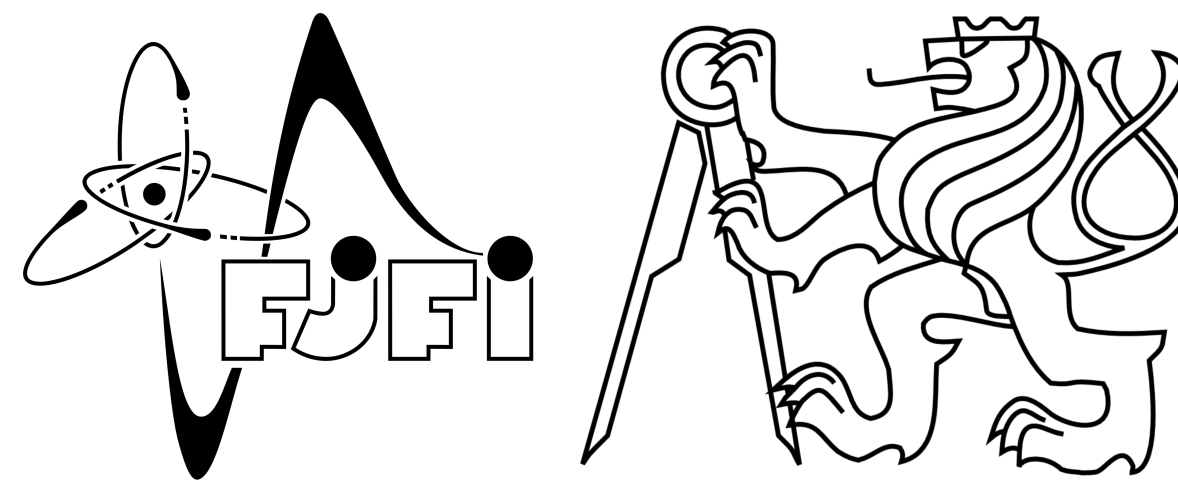


ALICE



MFT

Diana Krupova
Czech Technical University
September 18, 2020

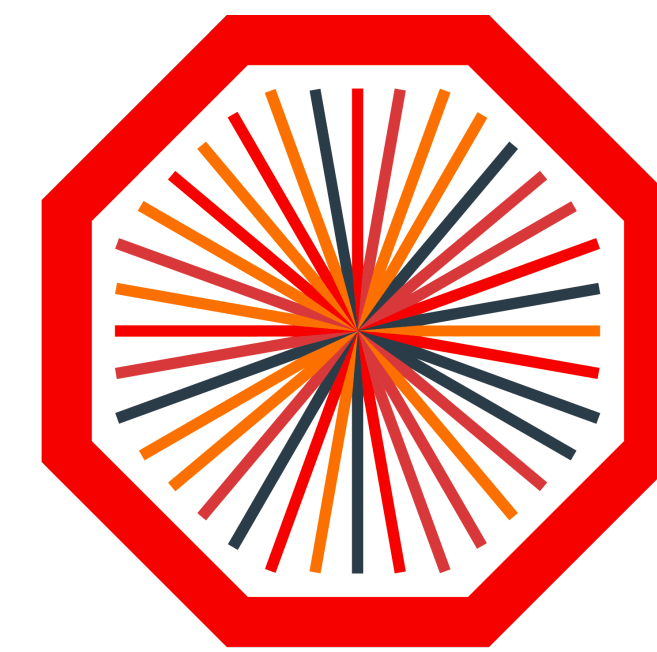


Outline

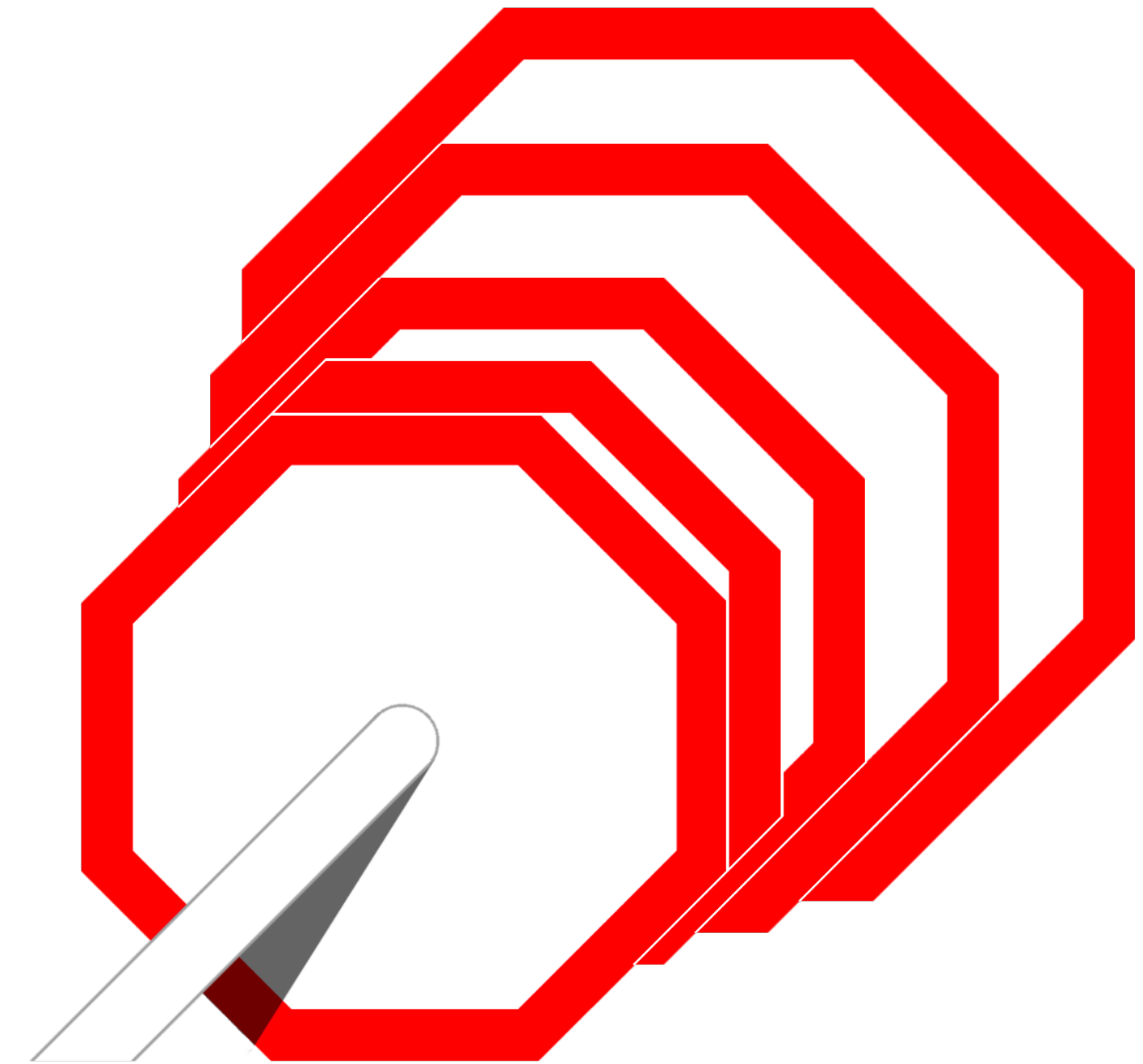
- ALICE upgrade for Run 3
- the Muon Forward Tracker and the ALPIDE pixel chips

MFT commissioning:

- ladder assembly
- ladder testing
- ladder qualification analysis test

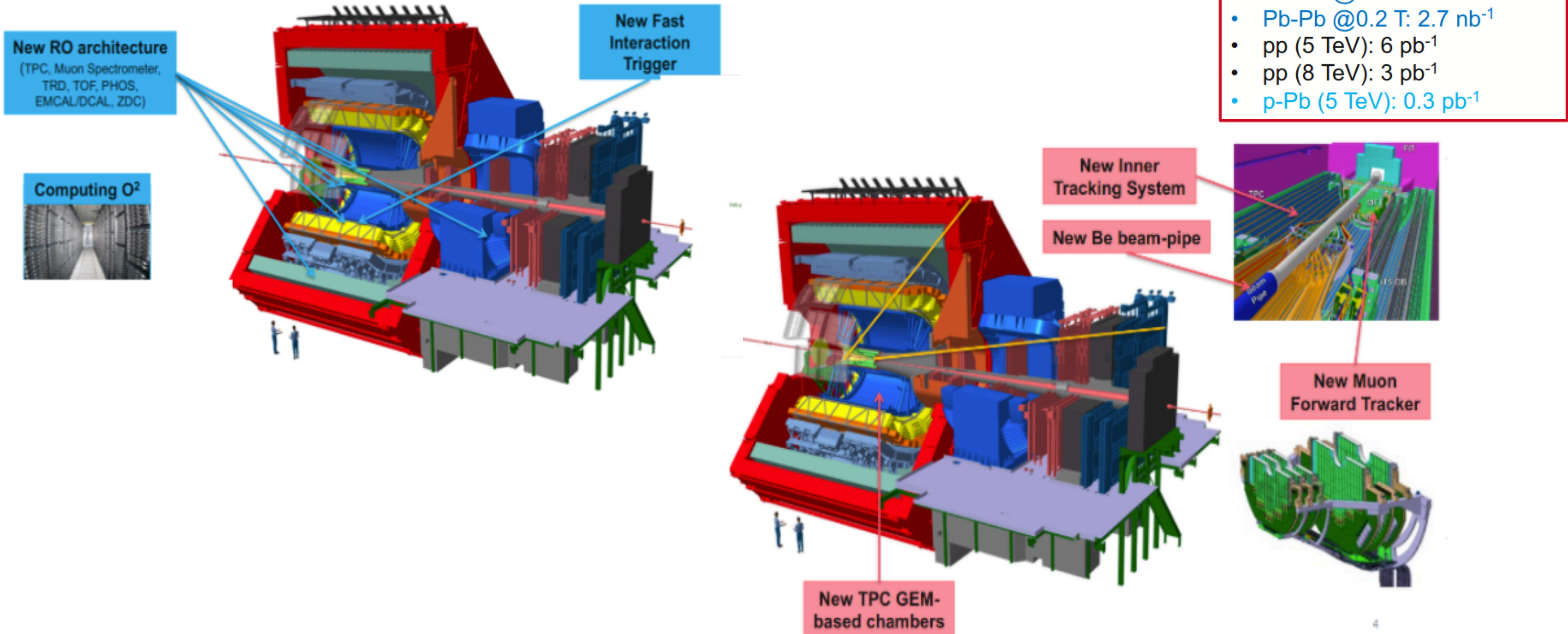


ALICE



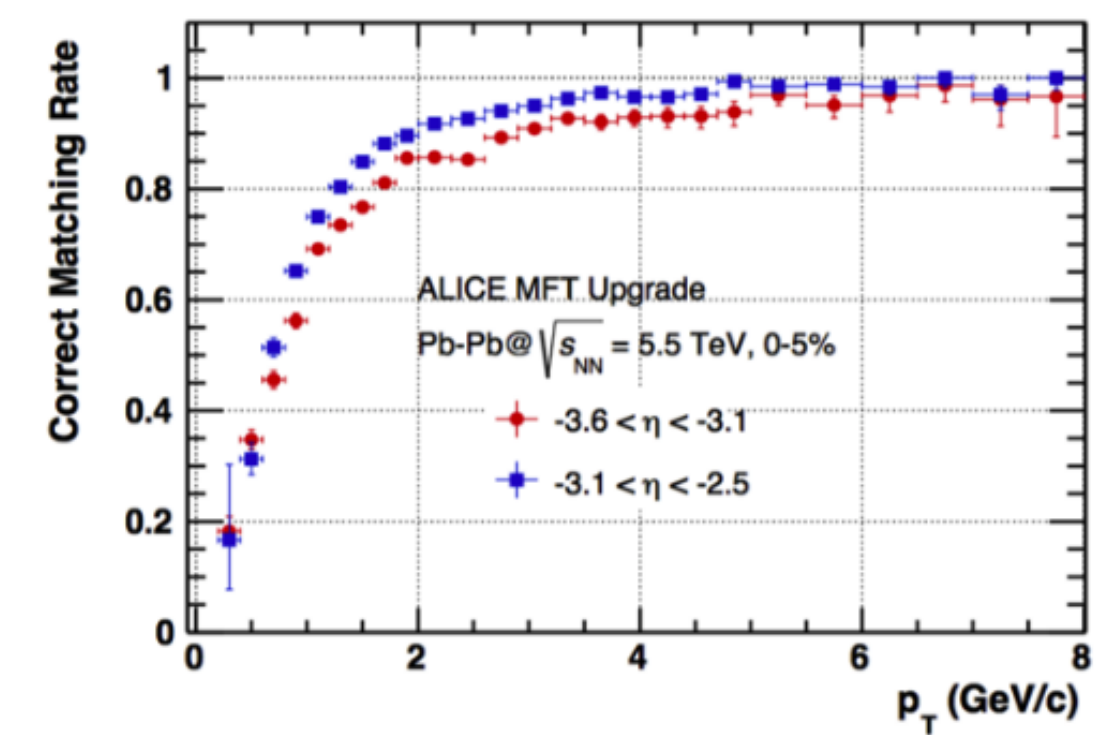
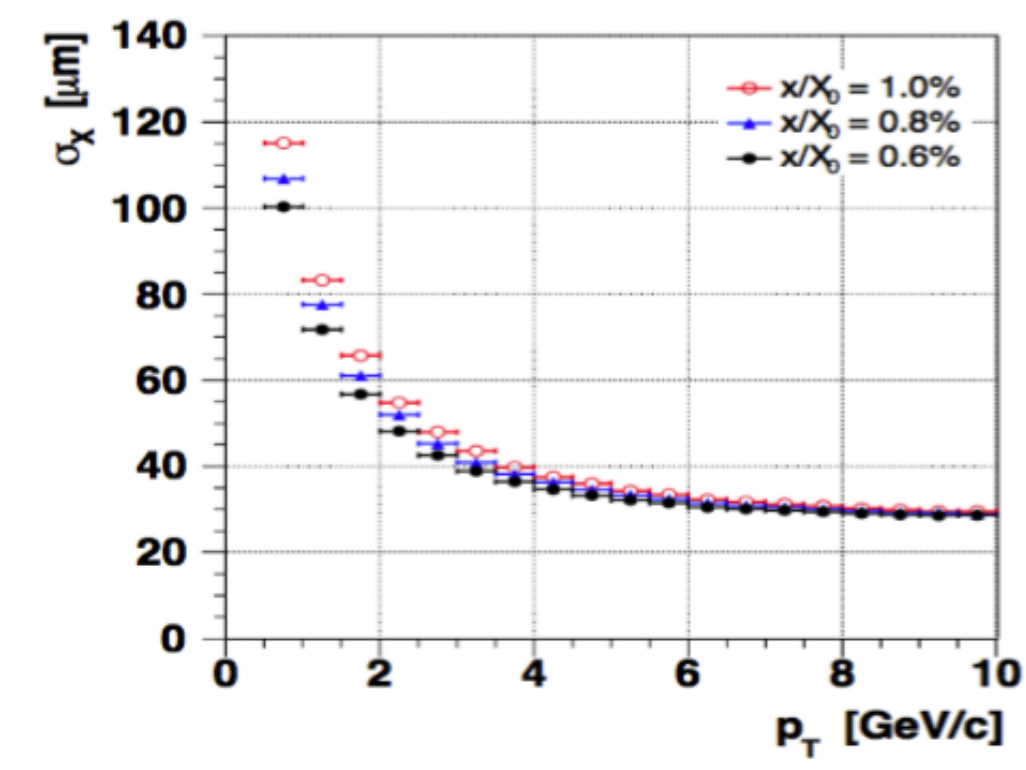
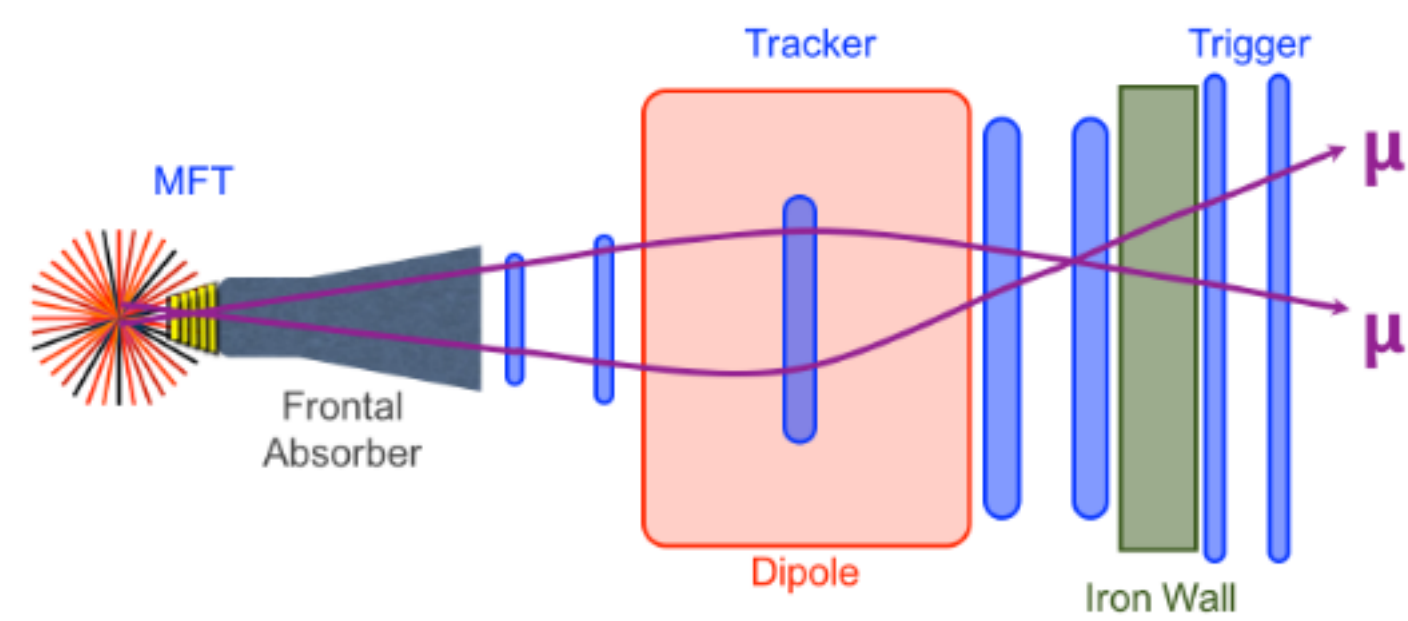
MFT

ALICE upgrade during the Long Shutdown 2



Physics motivation to build the MFT

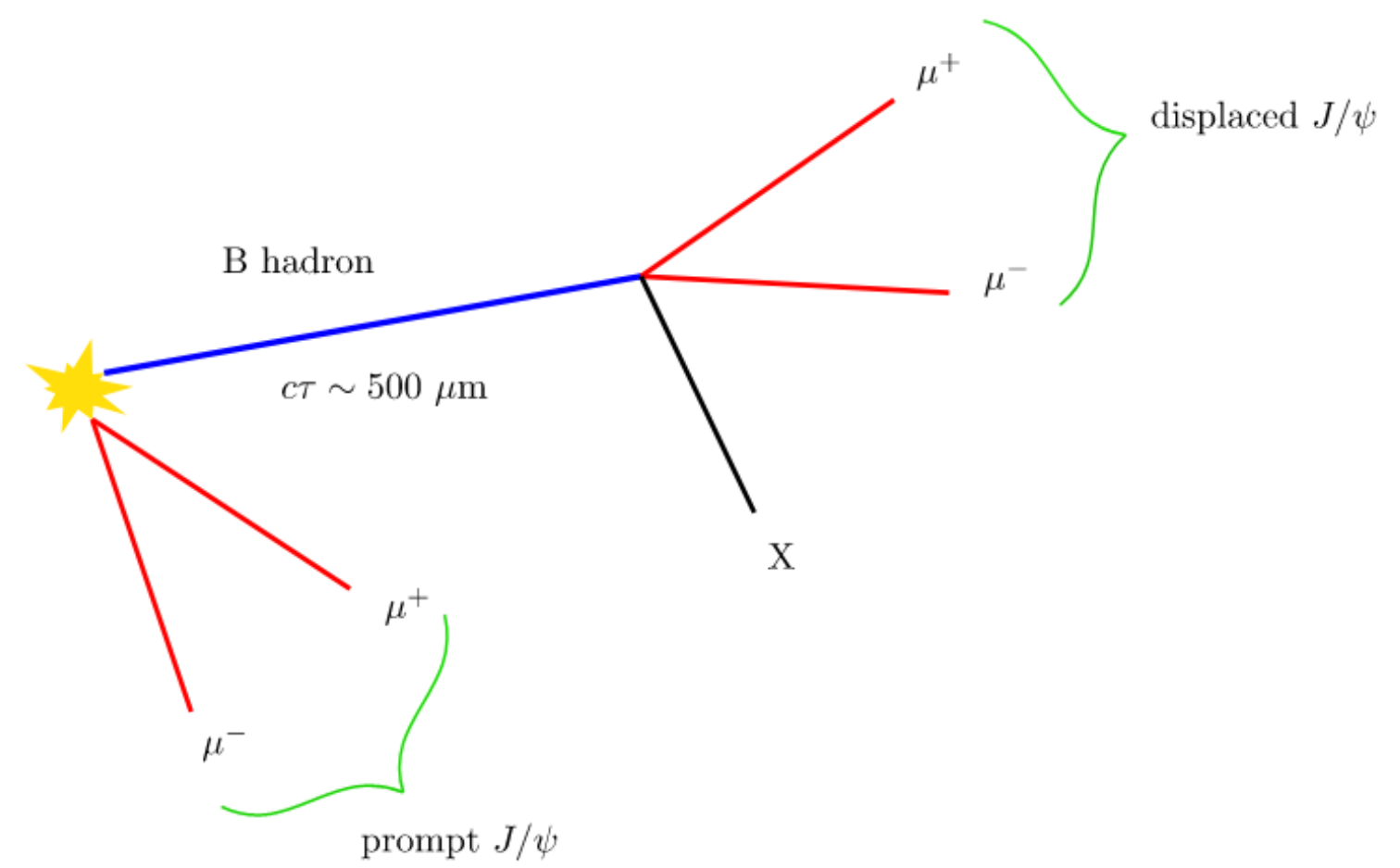
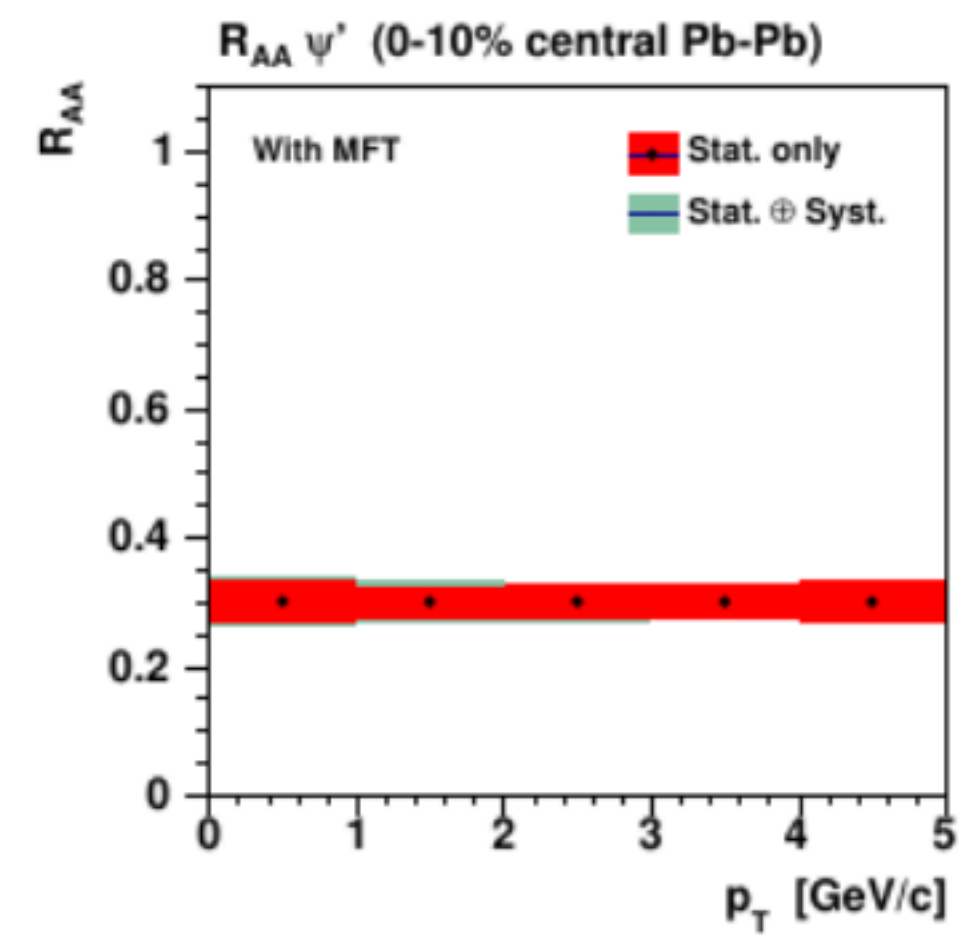
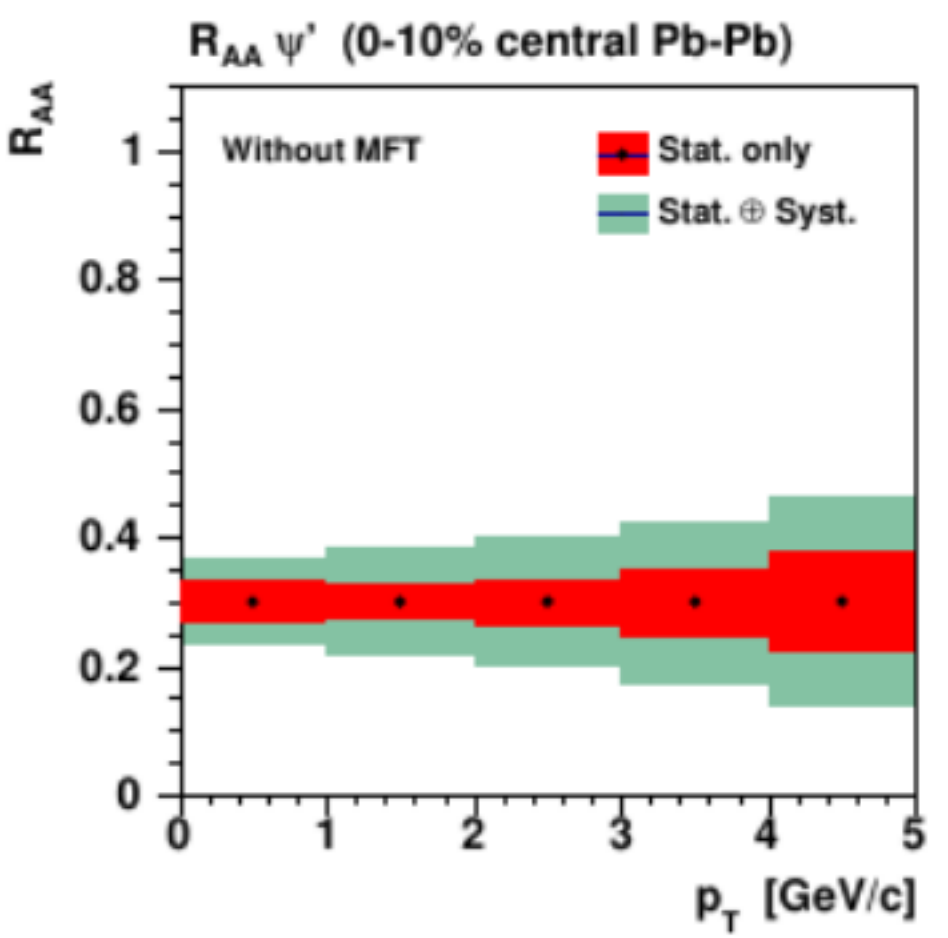
better tracking performance



Adding vertexing capabilities (with good pointing resolution)



Keeping high tracking efficiency

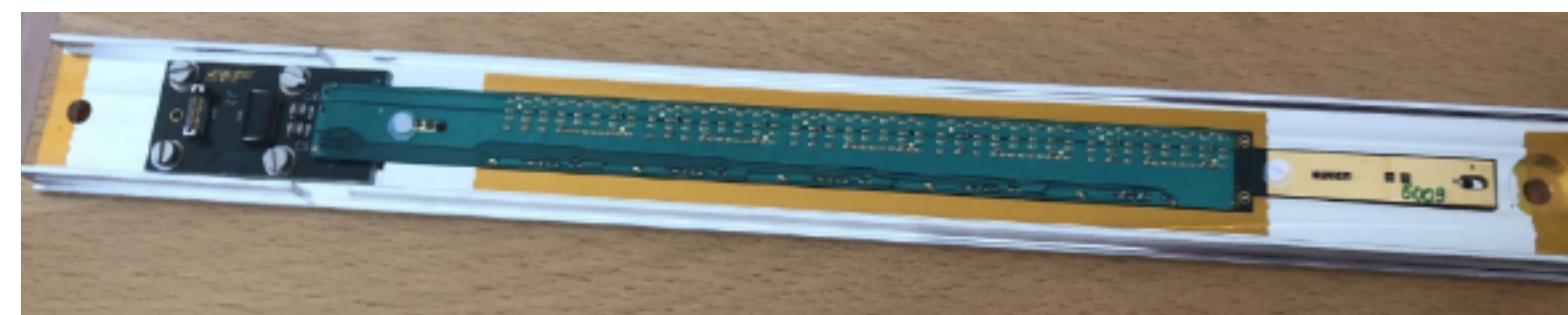


significantly reduced uncertainties of R_{AA} of the ψ'

separation of prompt and displaced J/ψ

Muon Forward Tracker (MFT)

adds precise vertexing capabilities to muon tracking at forward rapidities

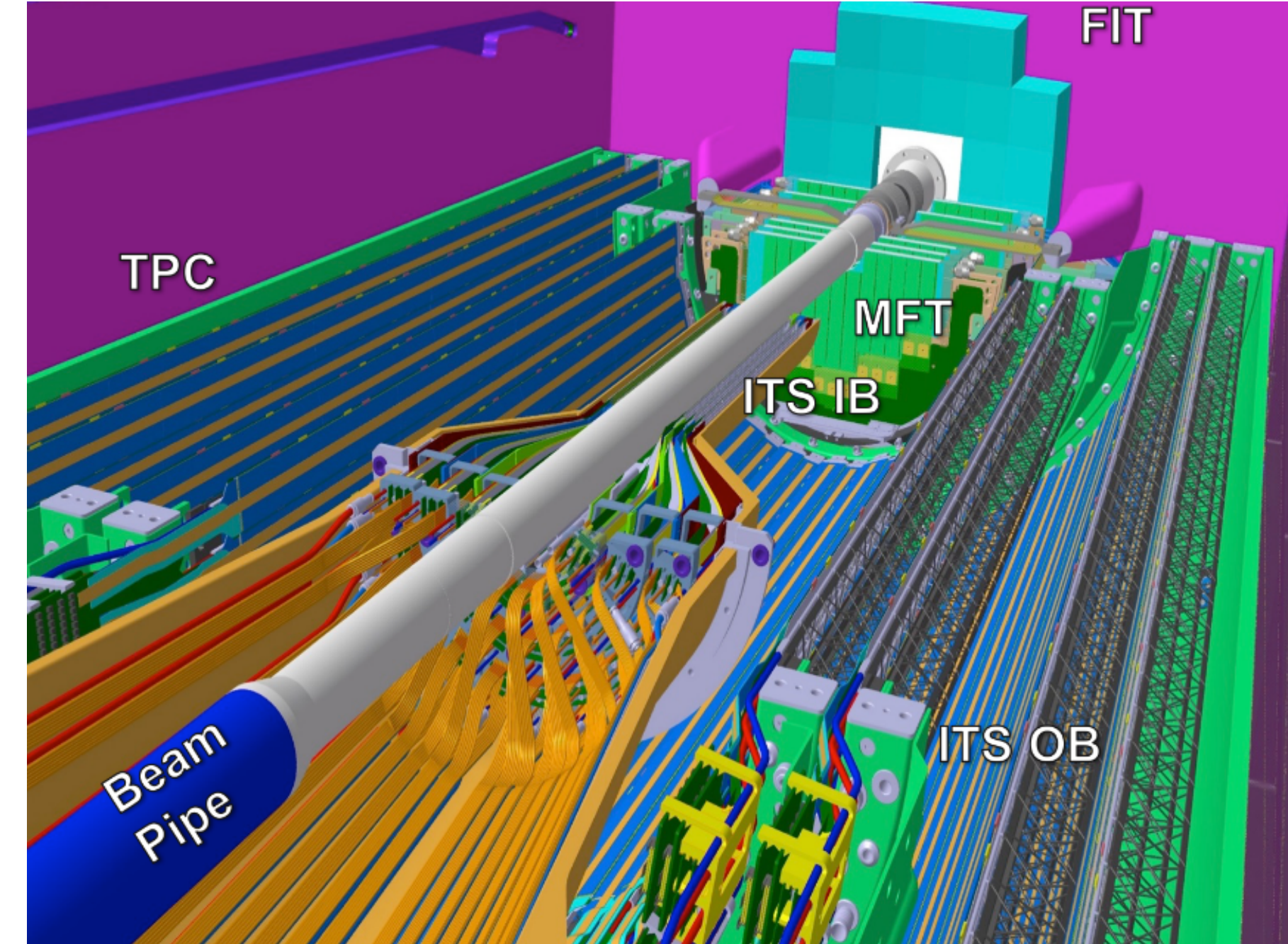
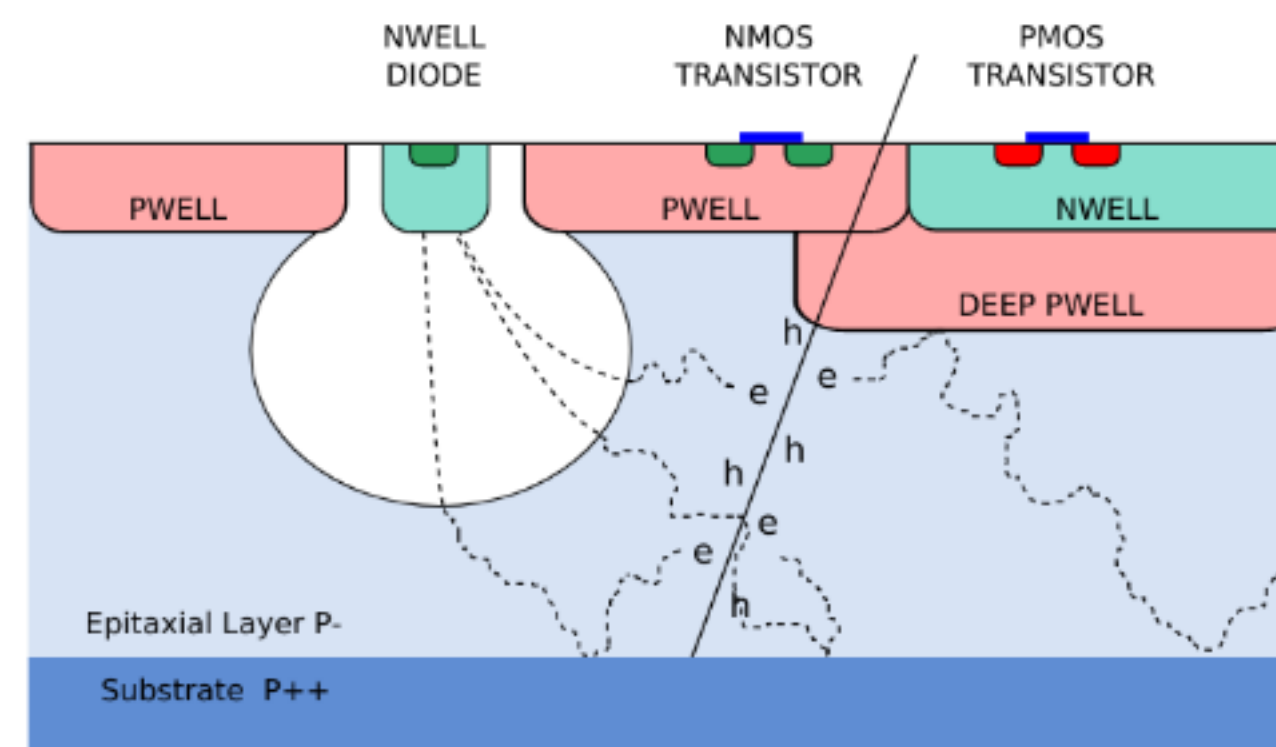
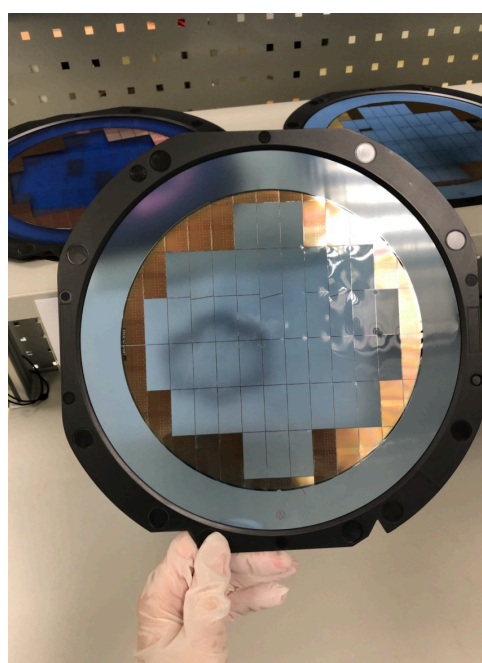


ALPIDE pixel sensor

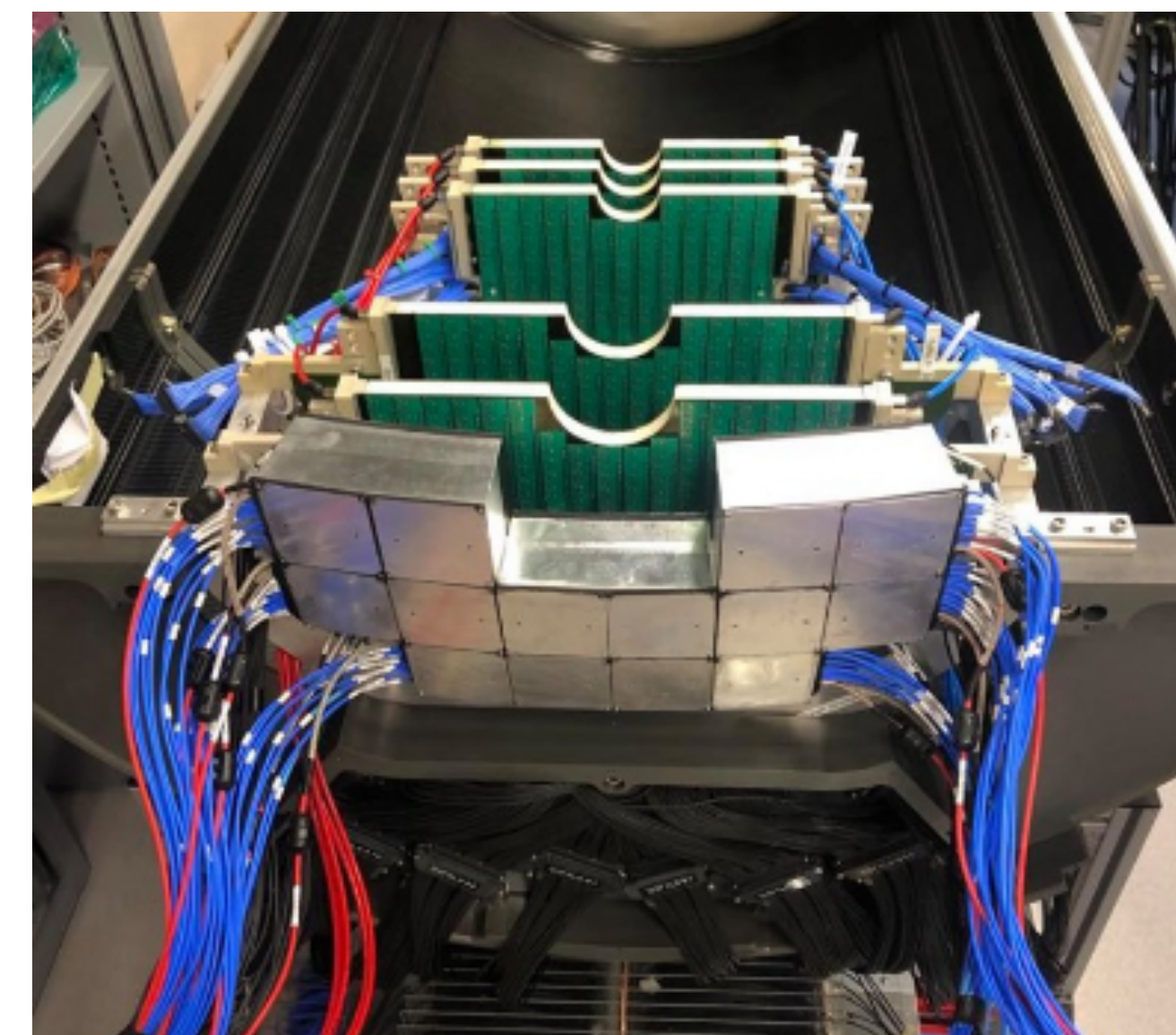
920 silicon pixel sensors (0.4 m^2) on 280 ladders of 2 to 5 sensors each

CMOS Monolithic Active Sensor (MAPS), TowerJazz 180 nm technology

- developed for the ITS and the MFT
- thickness $50 \mu\text{m}$
- $130\,000 \text{ pixels/m}^2$
- event-time resolution: $<4 \mu\text{s}$
- space resolution: $5 \mu\text{m}$

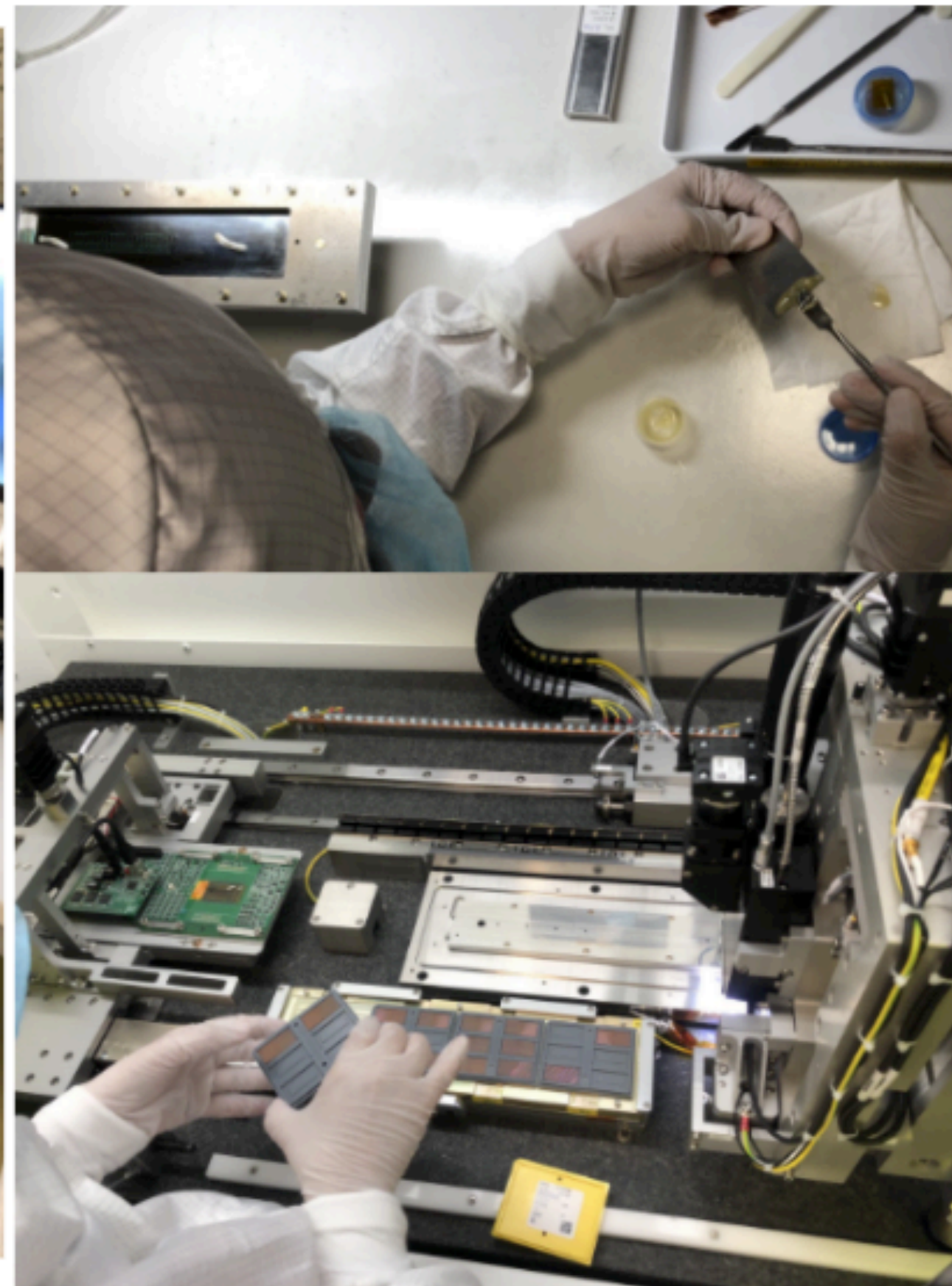


10 half-disks, 2 detection planes each



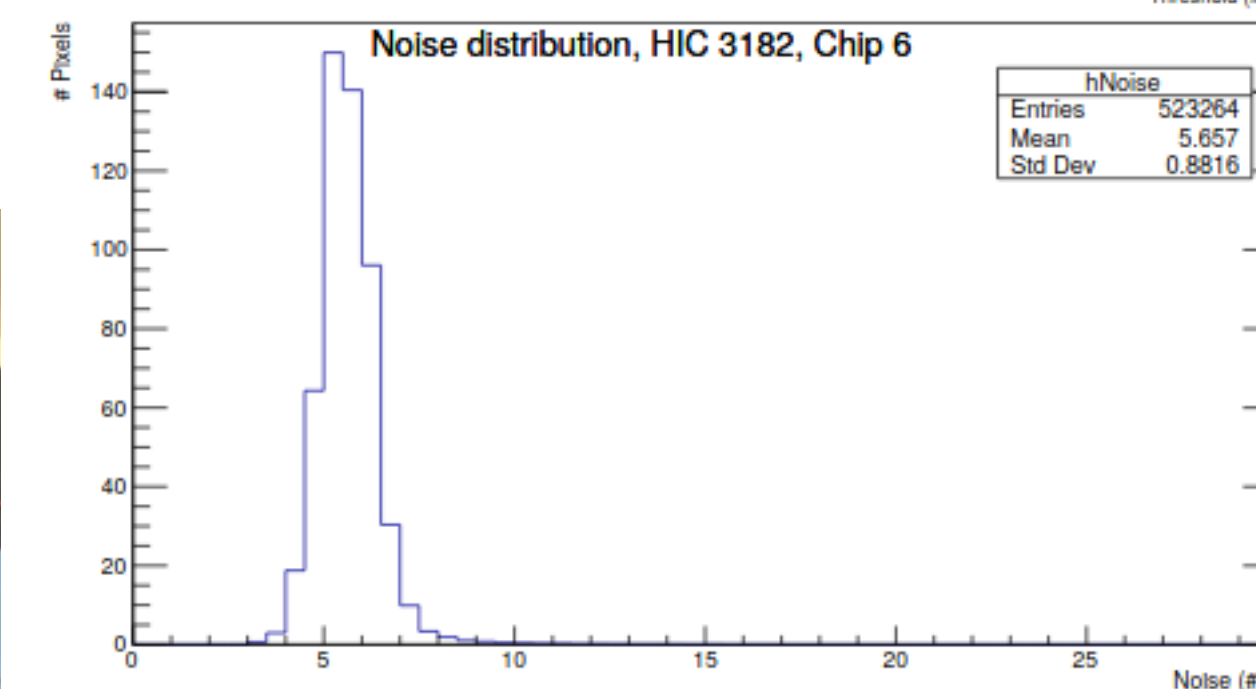
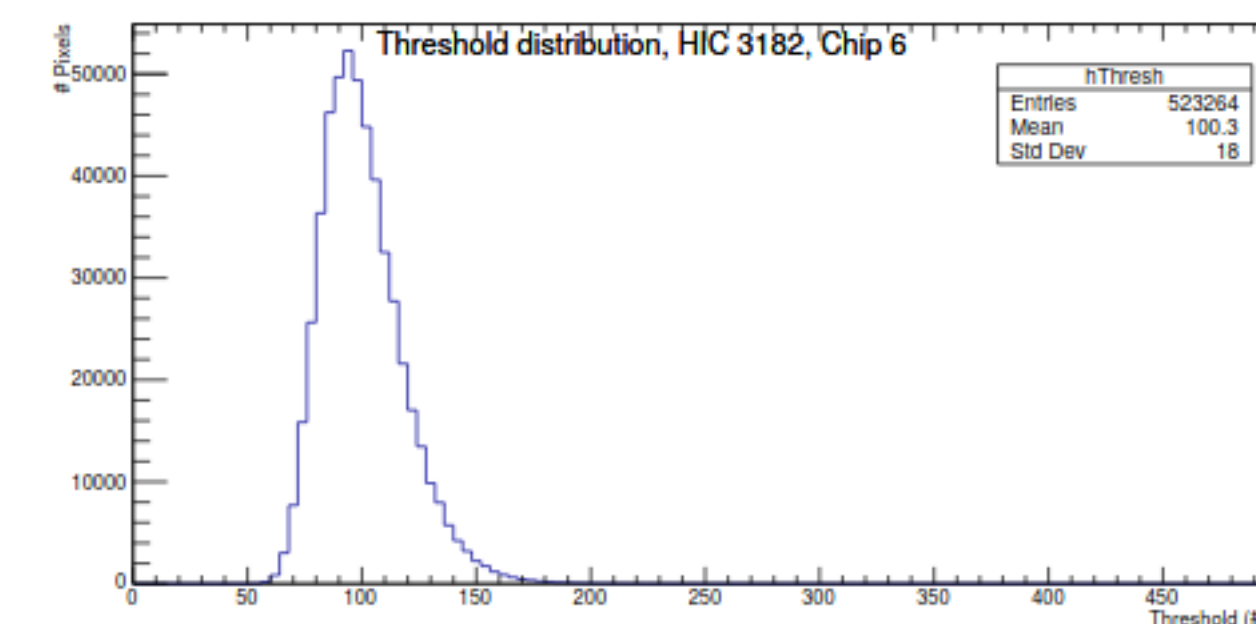
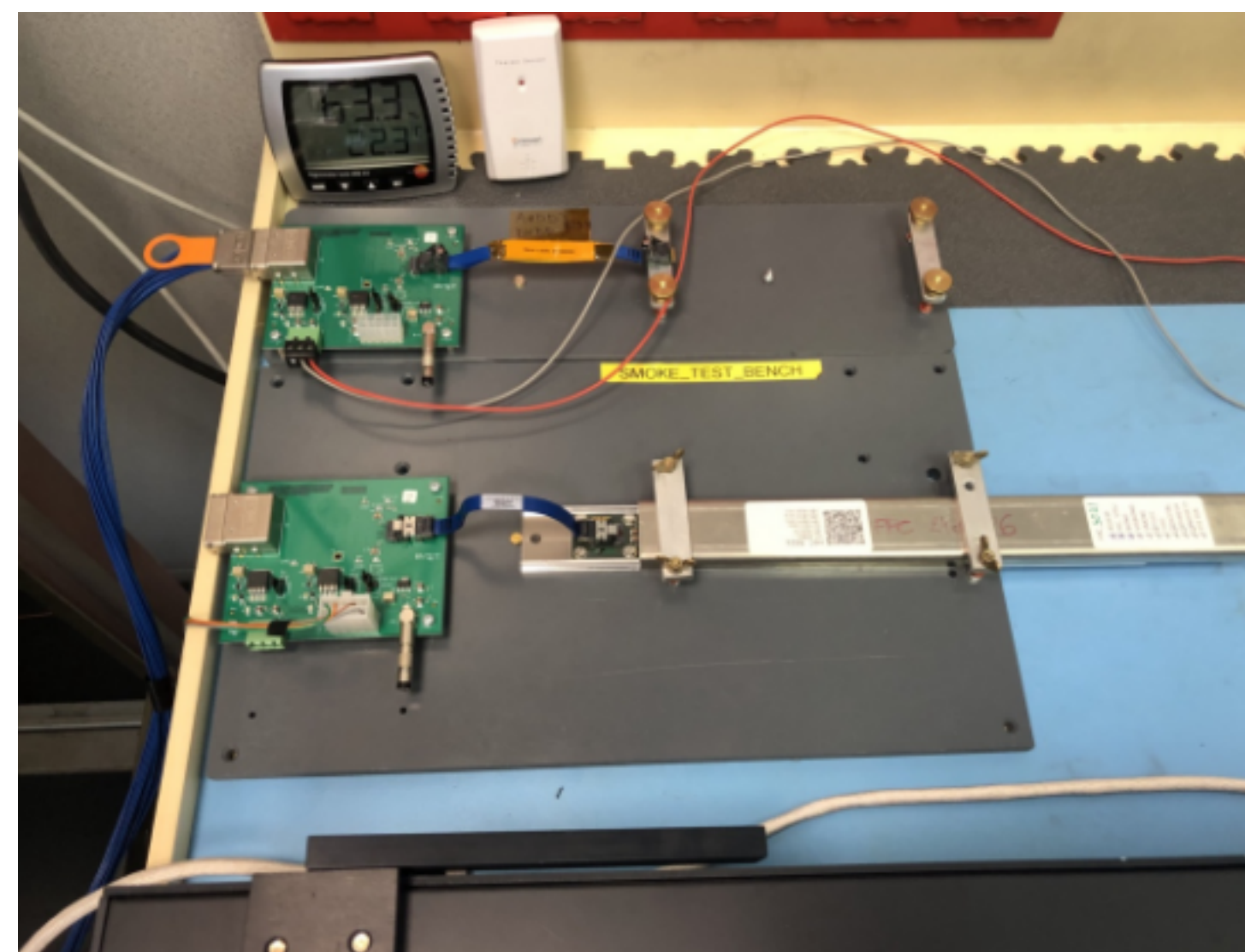
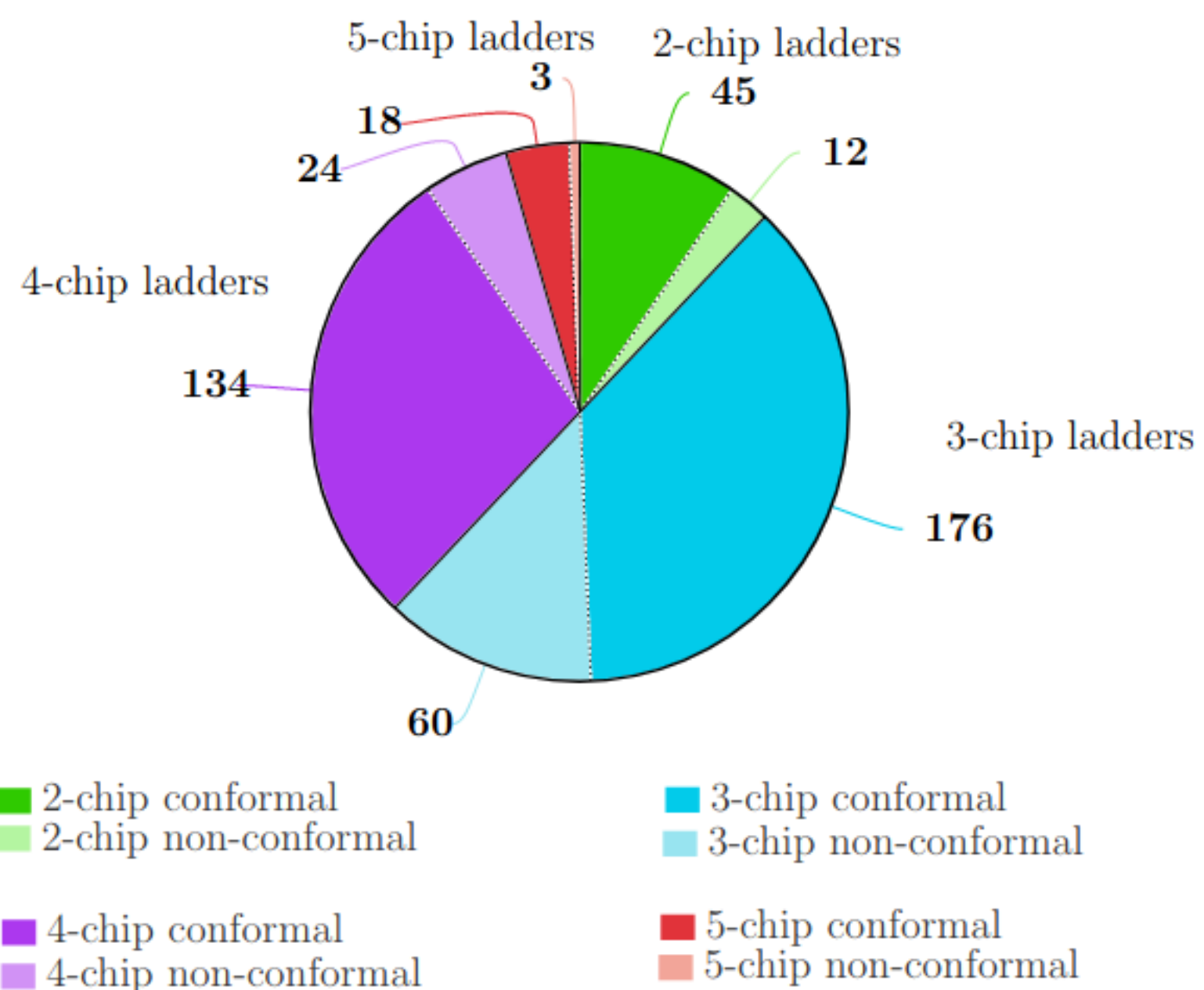
Commissioning

Ladders assembly

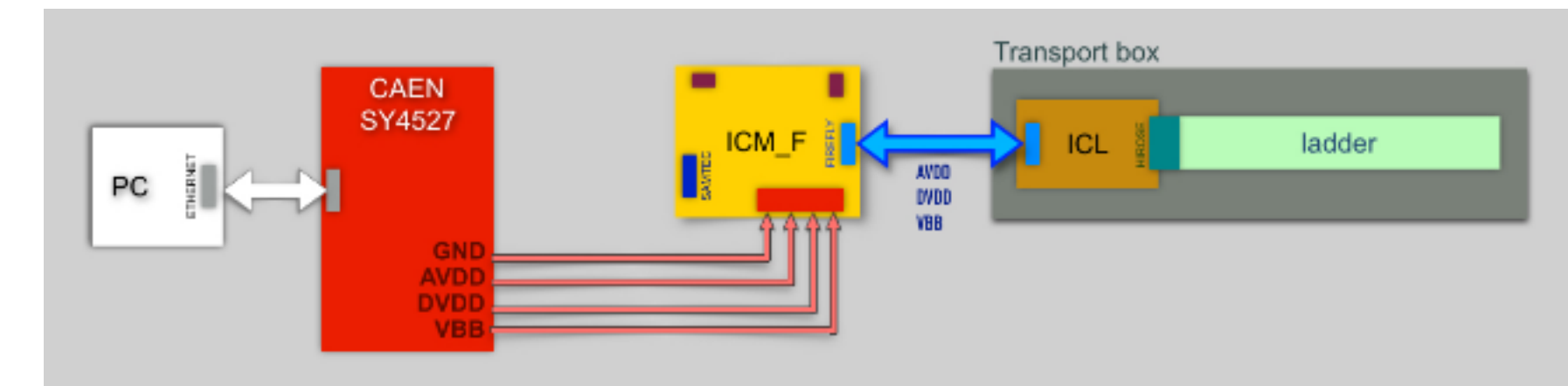
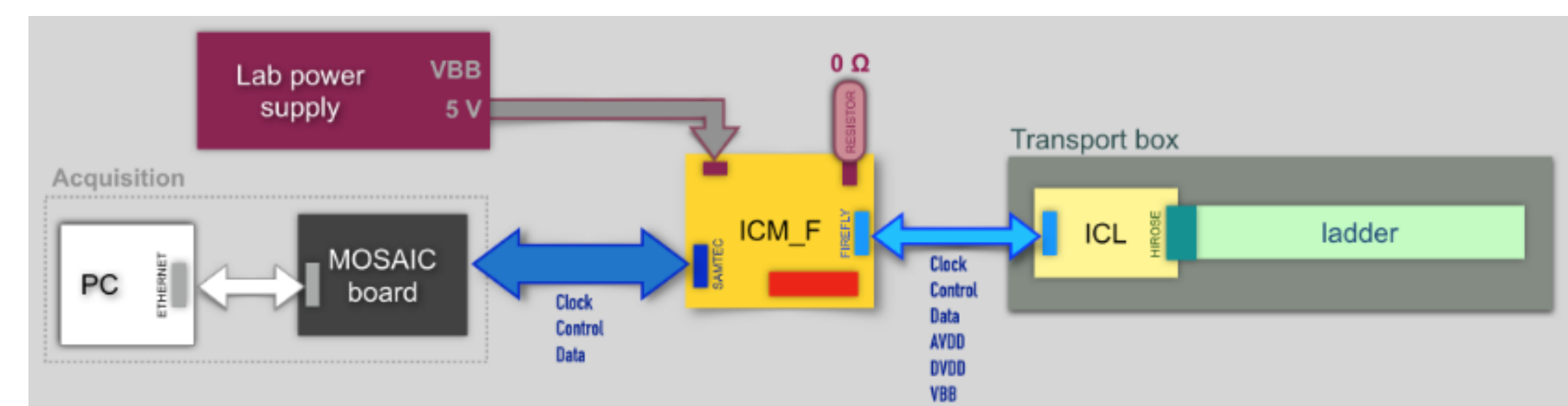


Commissioning: Ladder quality assurance

- several stages
- performed at CERN for all the ladders after the assembly, before gluing them to the disks
- results stored in an online database



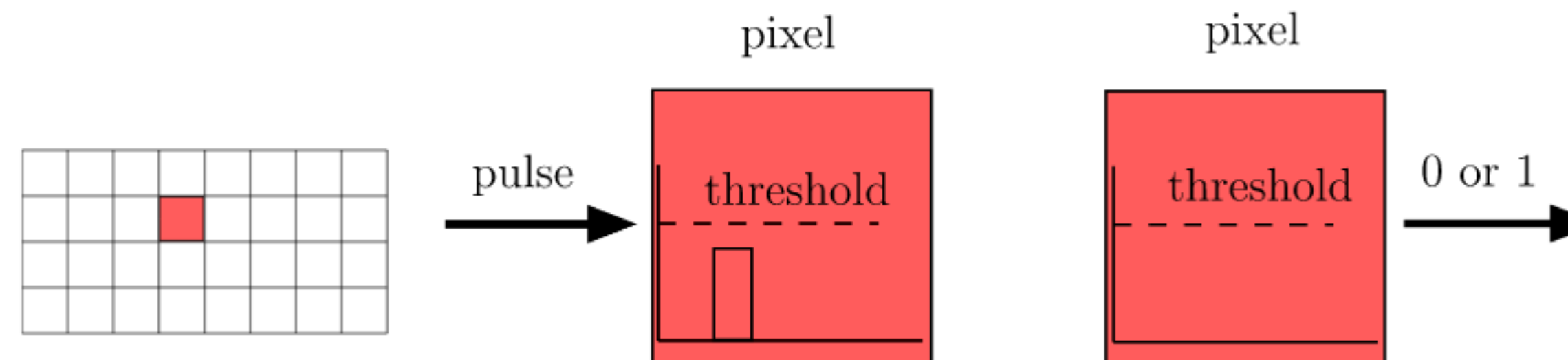
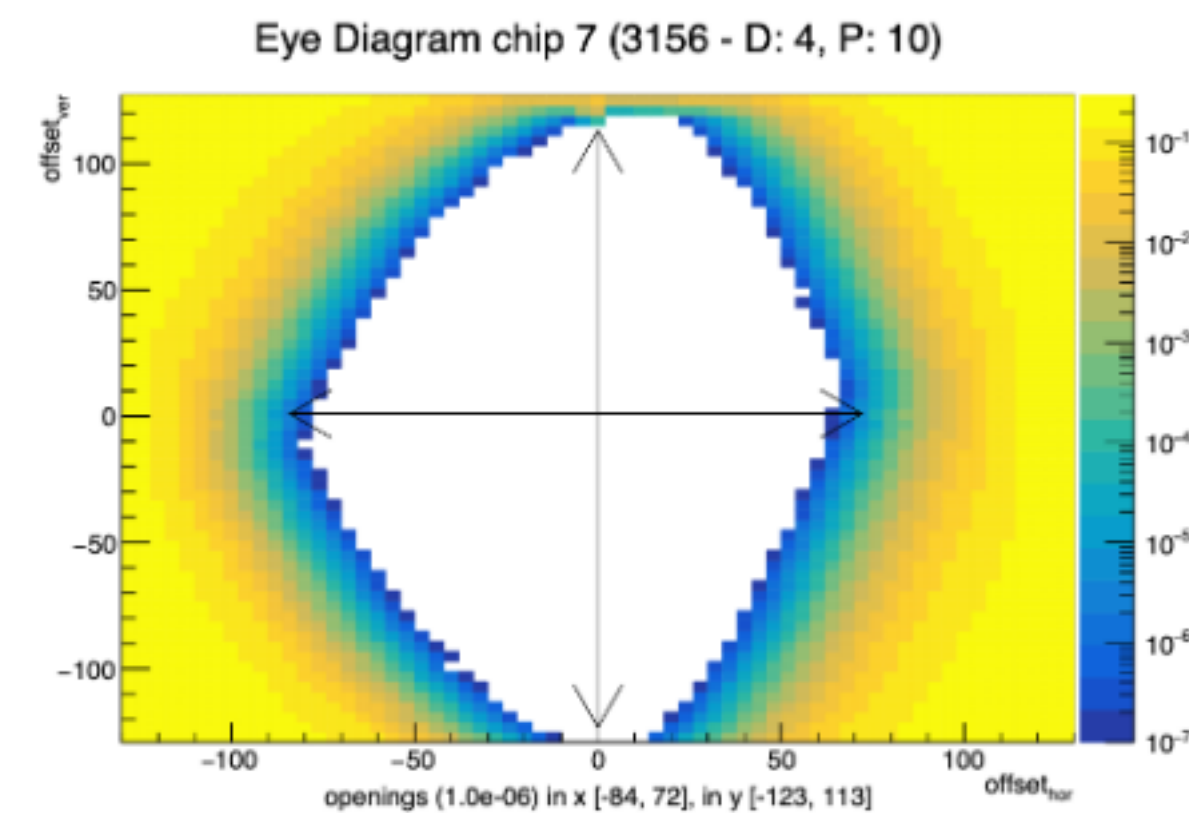
Qualification tests



- smoke test

both with and without back-bias voltage (-3 V):

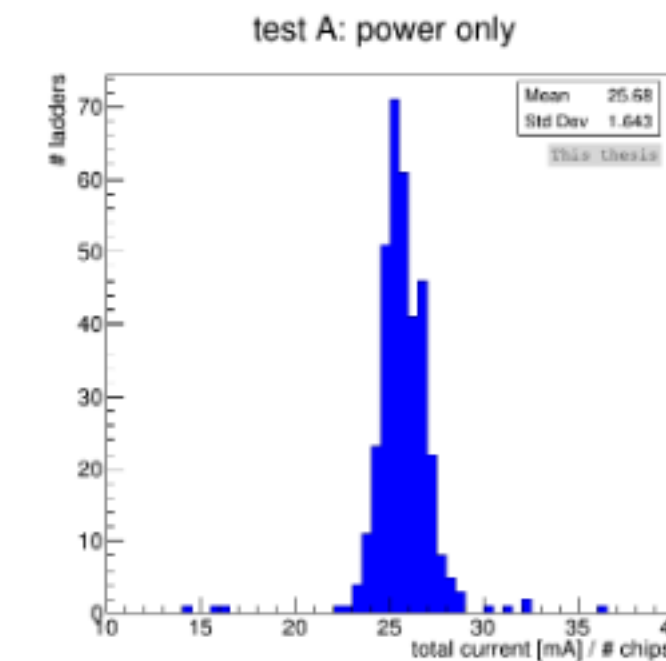
- readout test
- FIFO scan
- digital scan: dead, inefficient and noisy pixels
- threshold tests
- noise occupancy
- eye diagram: output signal strength and stability



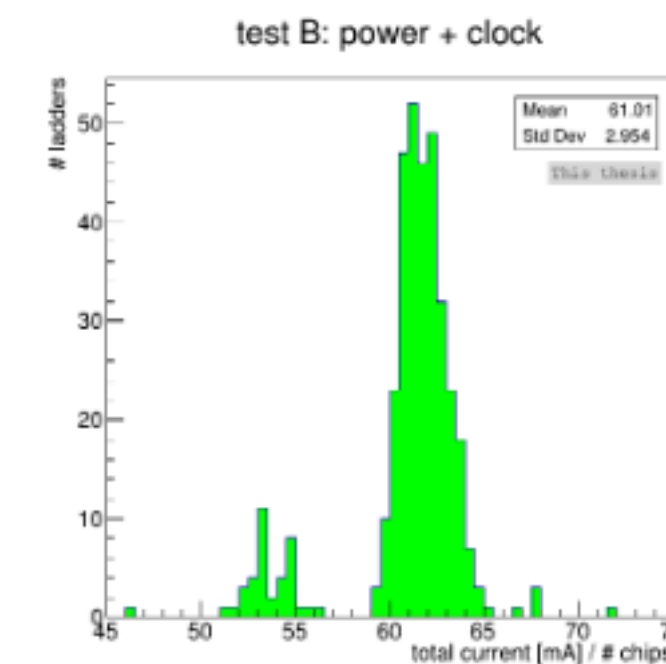
Ladder qualification analysis

to describe the characteristic of the detector after
subjecting the chips to various qualification tests

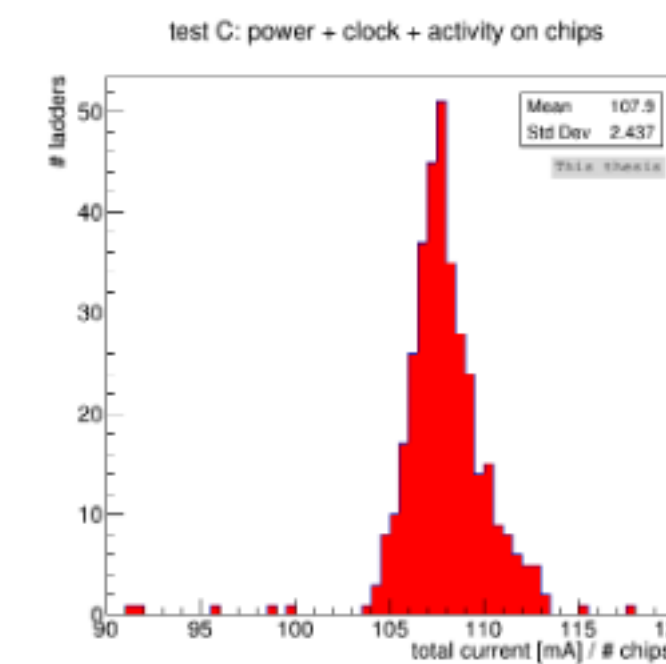
- power consumption + correlations
- threshold and noise characteristics
- dead, noisy and inefficient pixels
- VCASN values



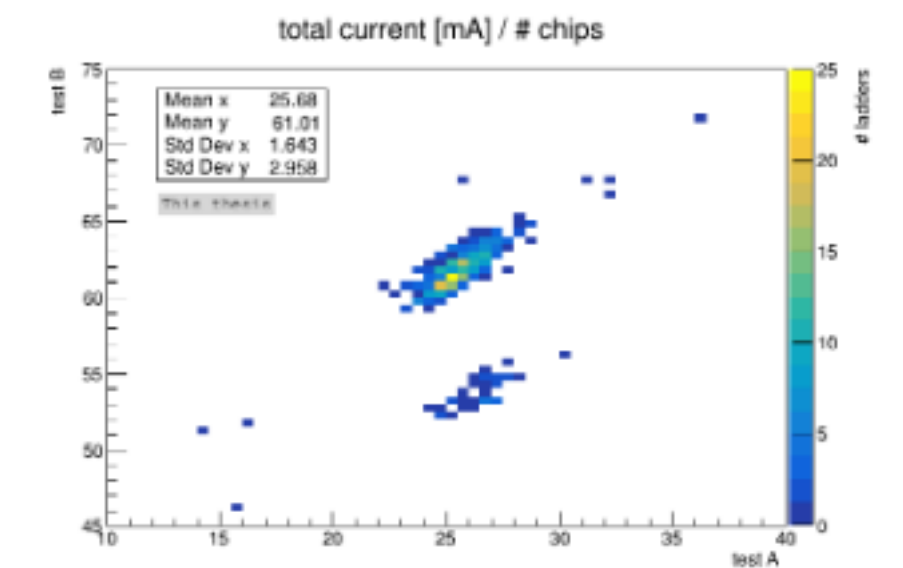
(a)



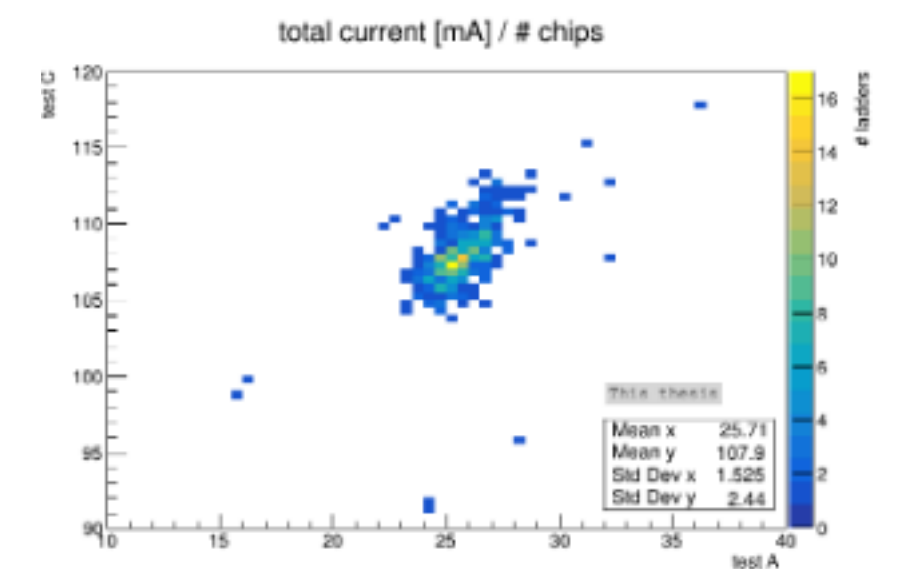
(b)



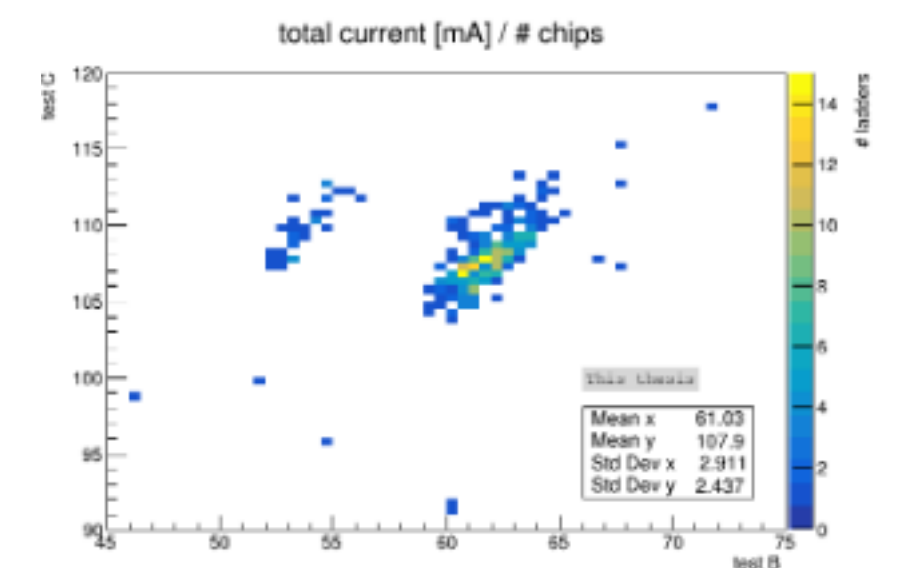
(c)



(a)



(b)

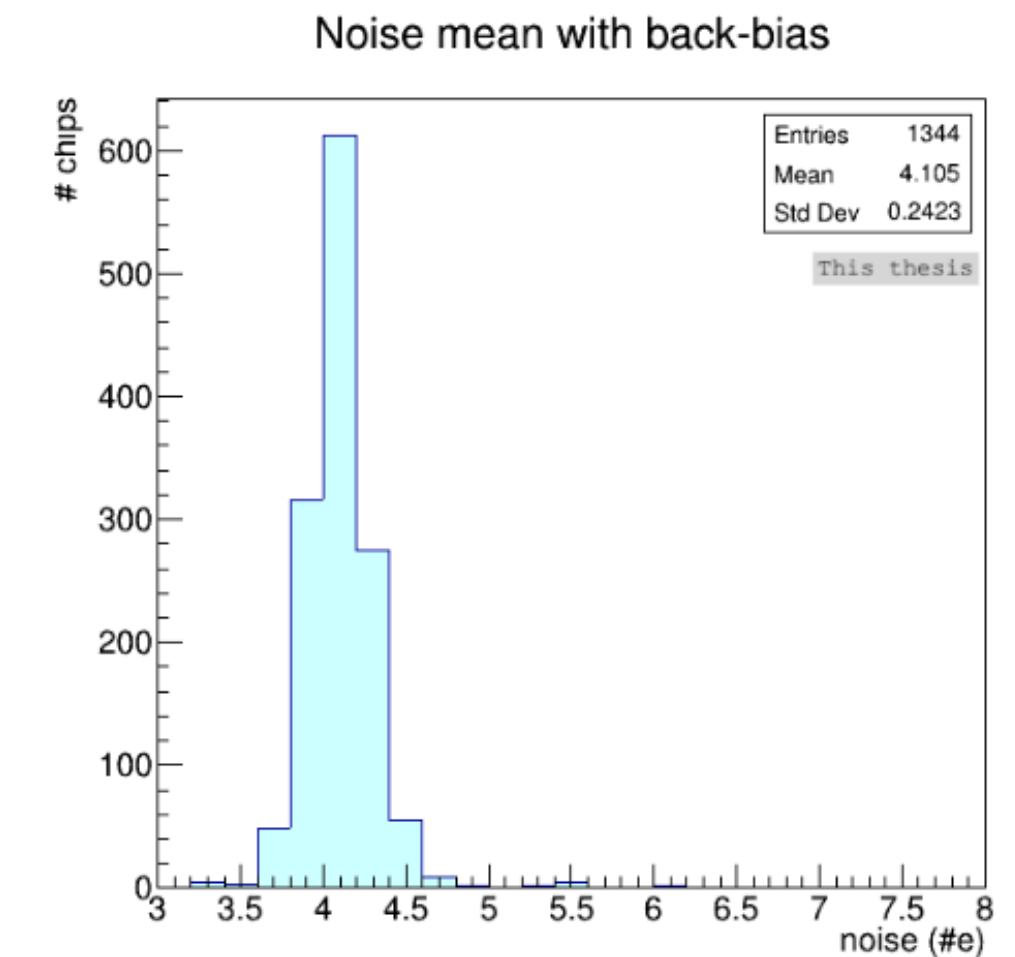
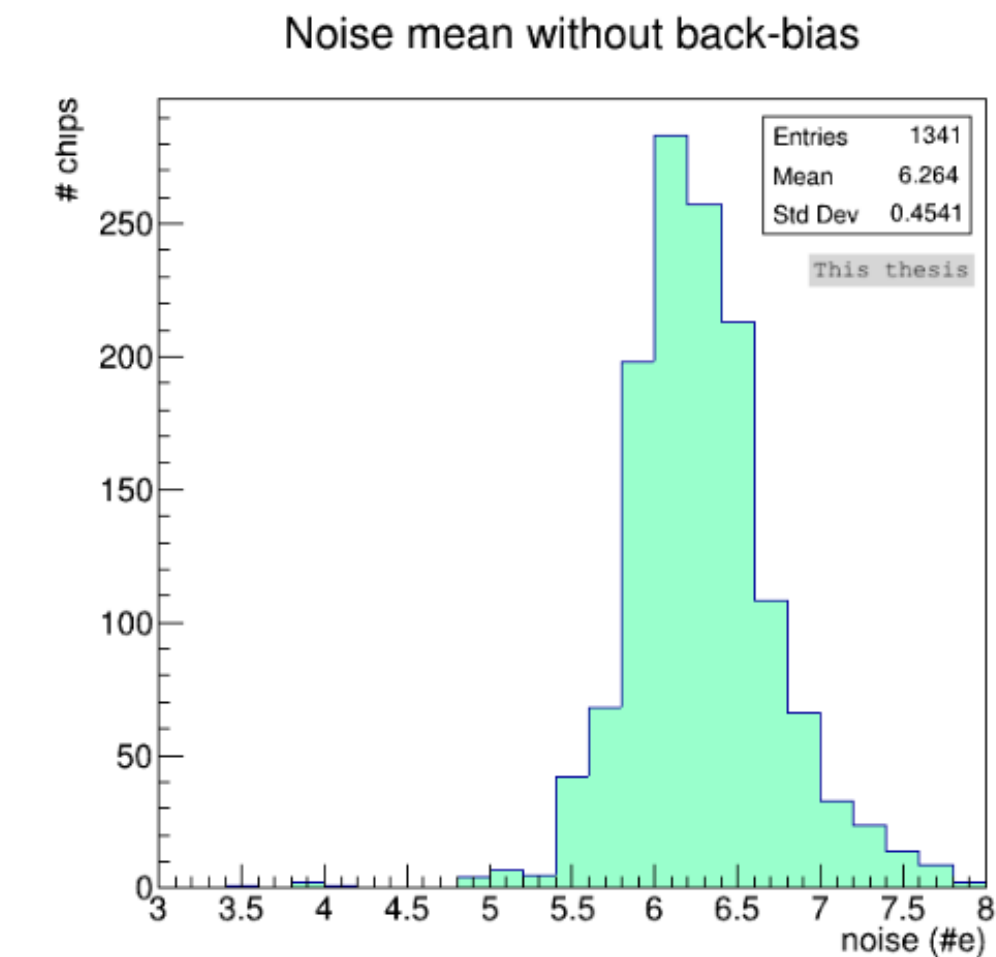
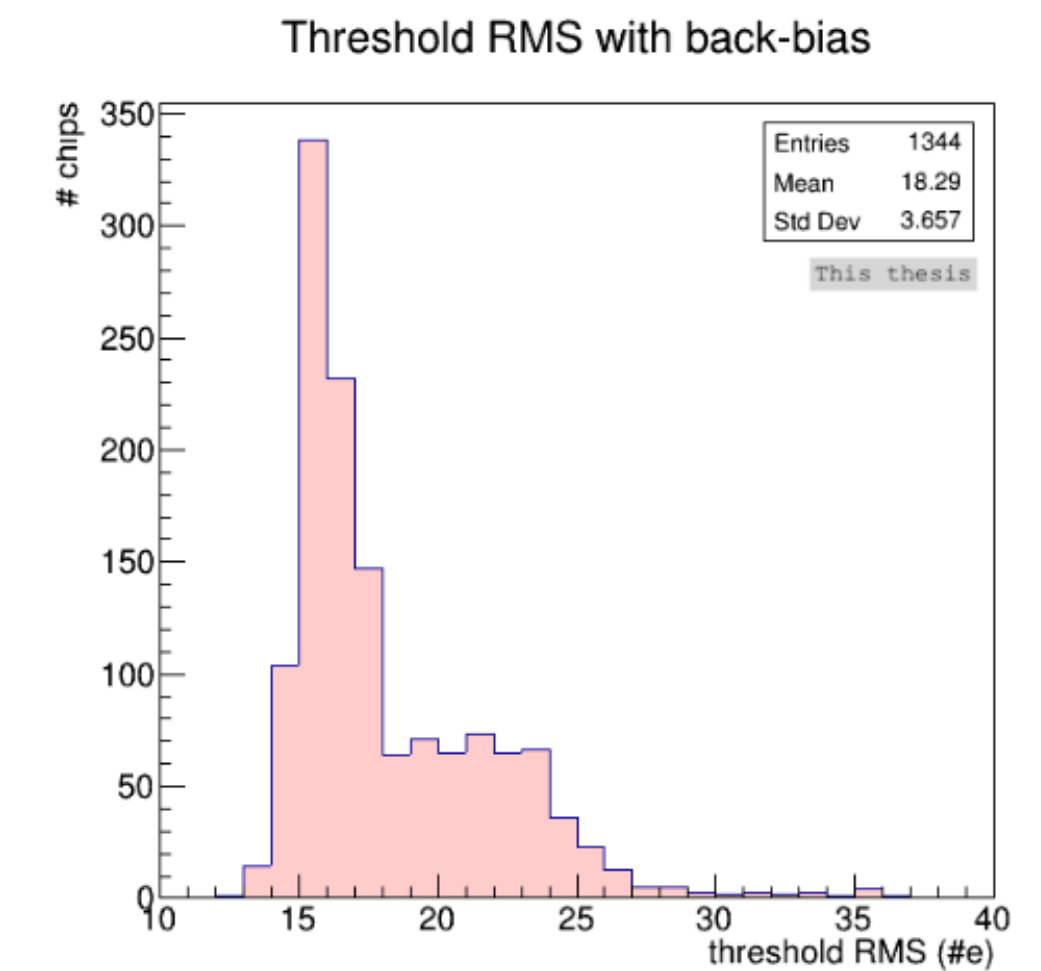
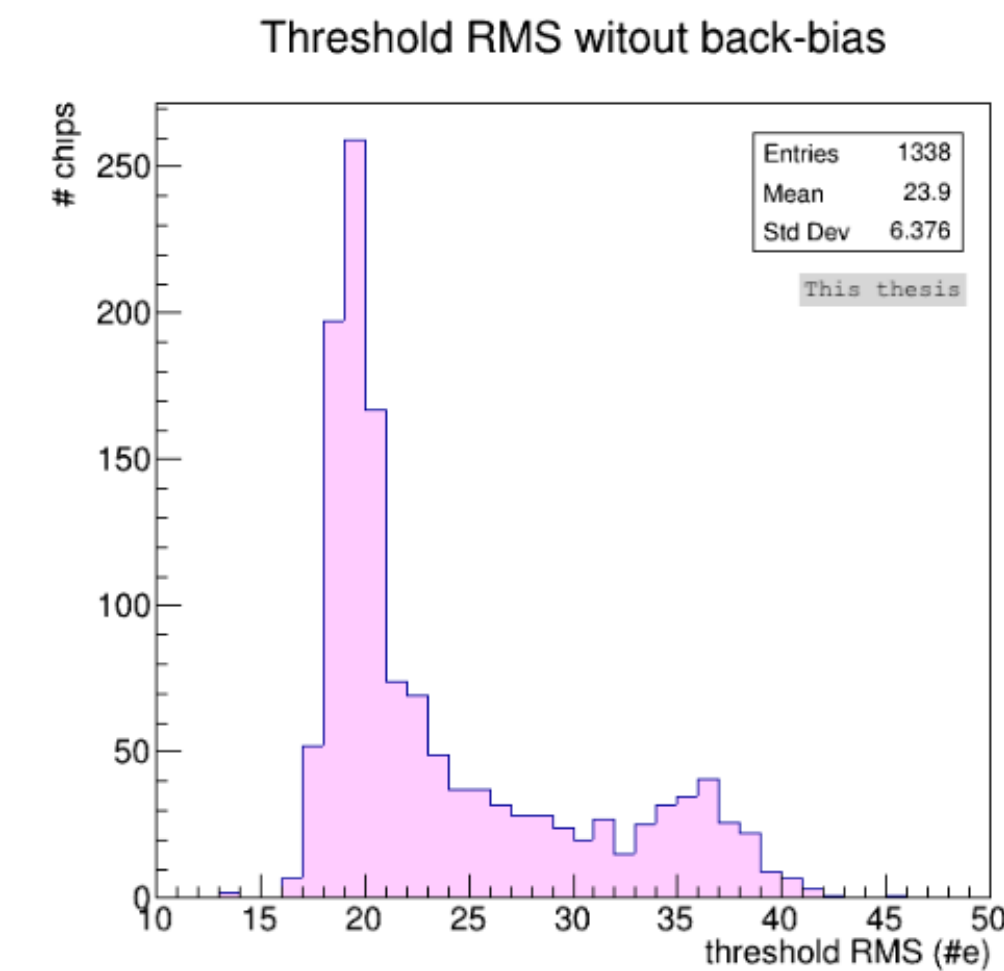


(c)

Ladder qualification analysis

to describe the characteristic of the detector after
subjecting the chips to various qualification tests

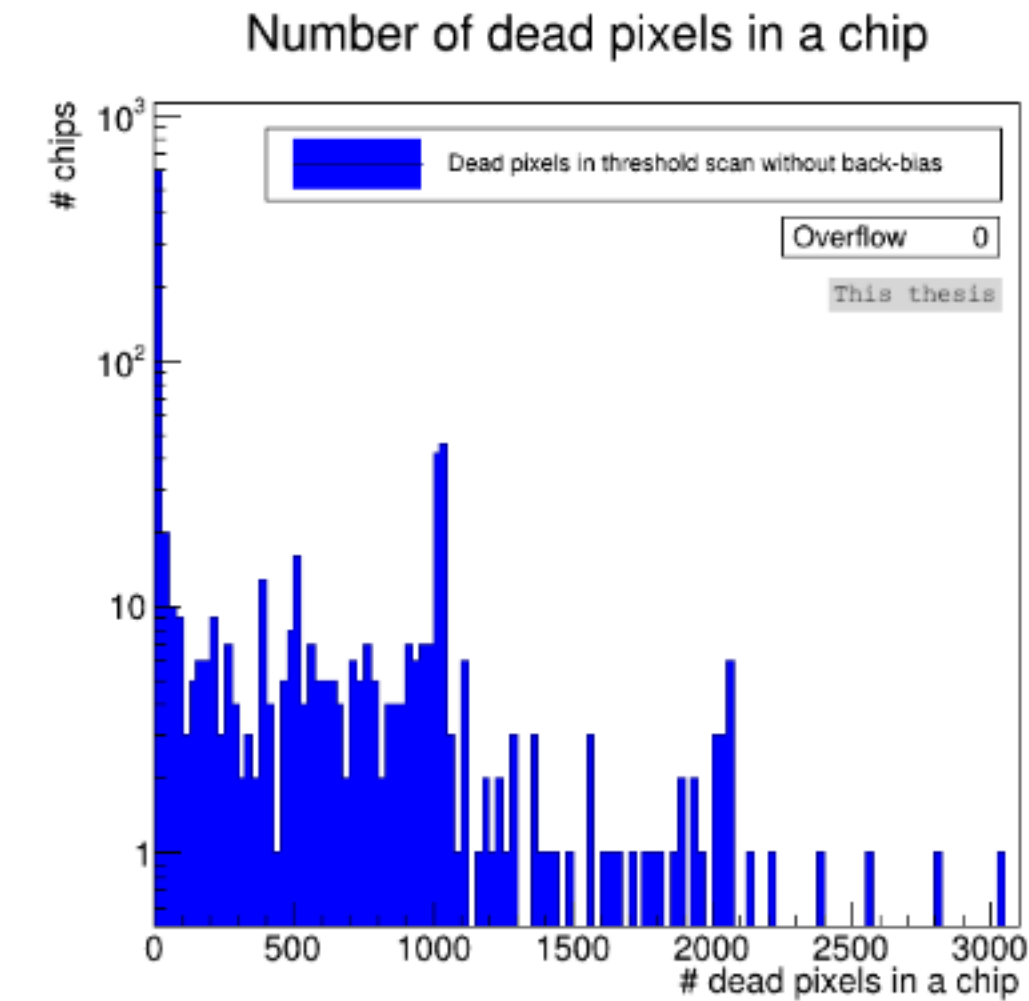
- power consumption + correlations
- **threshold and noise characteristics**
- dead, noisy and inefficient pixels
- VCASN values



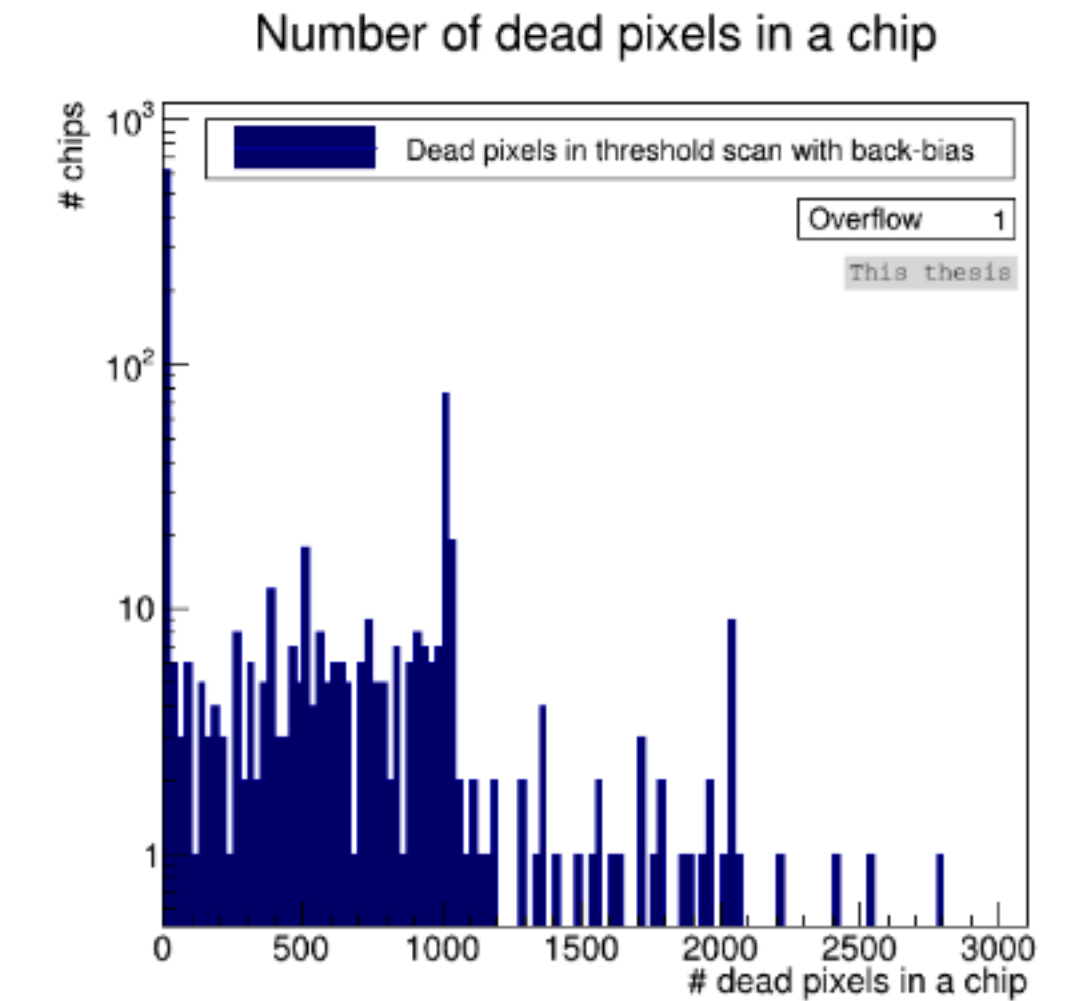
Ladder qualification analysis

to describe the characteristic of the detector after
subjecting the chips to various qualification tests

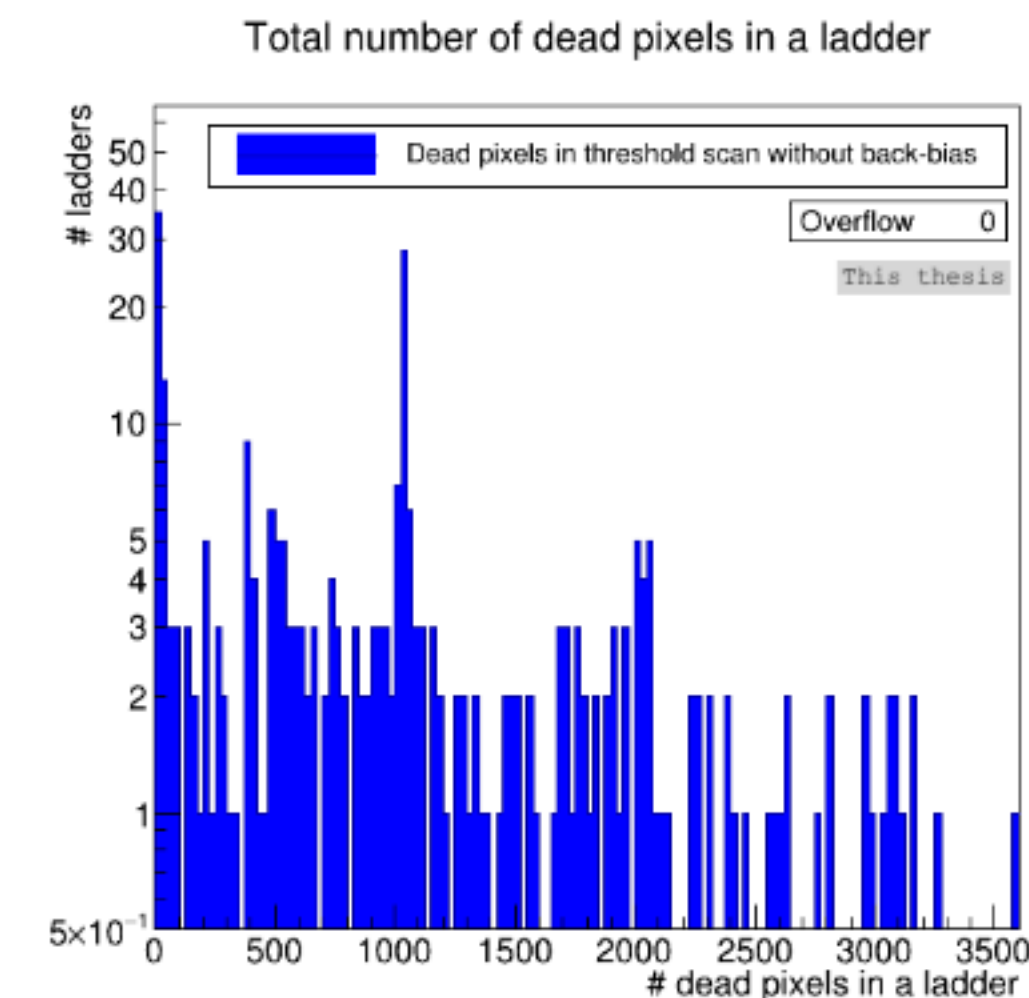
- power consumption + correlations
- threshold and noise characteristics
- **dead, noisy and inefficient pixels**
- VCASN values



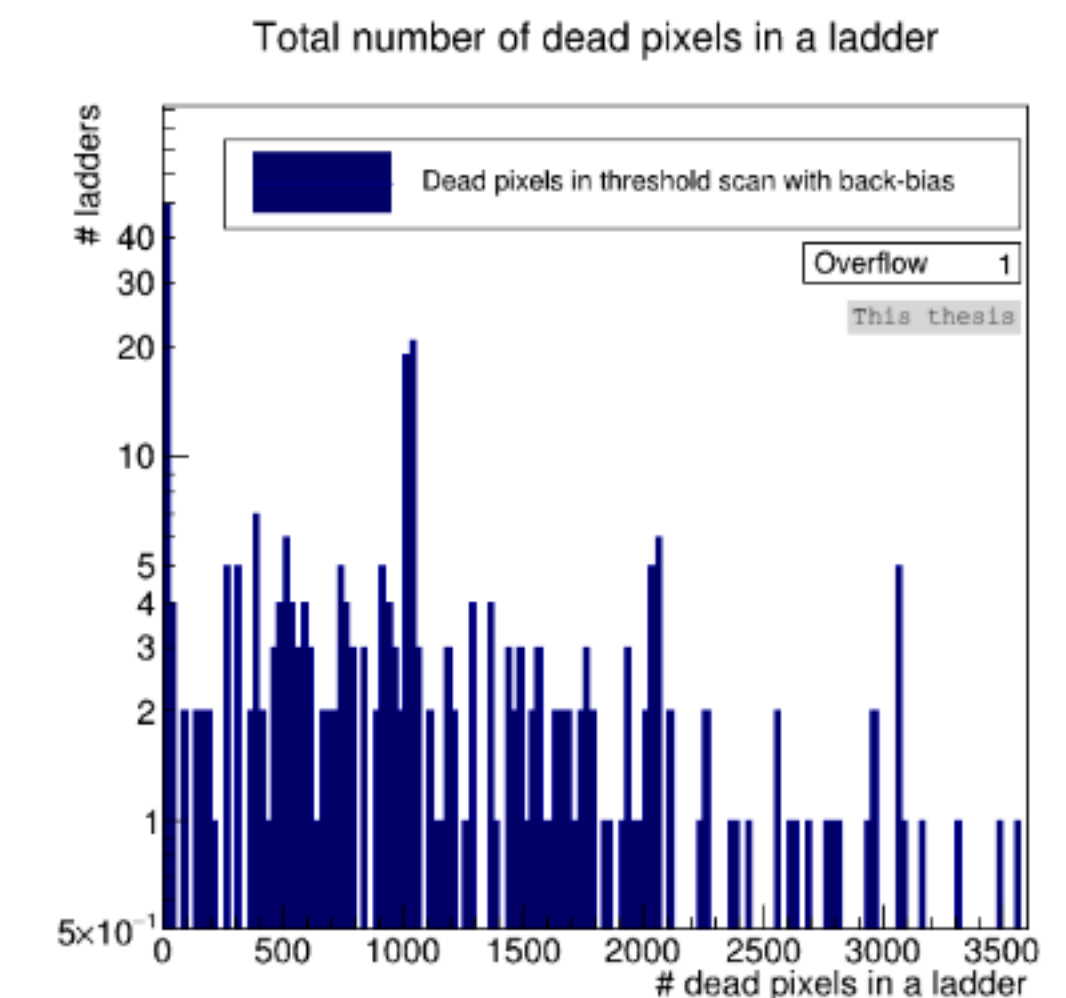
(a)



(b)



(c)

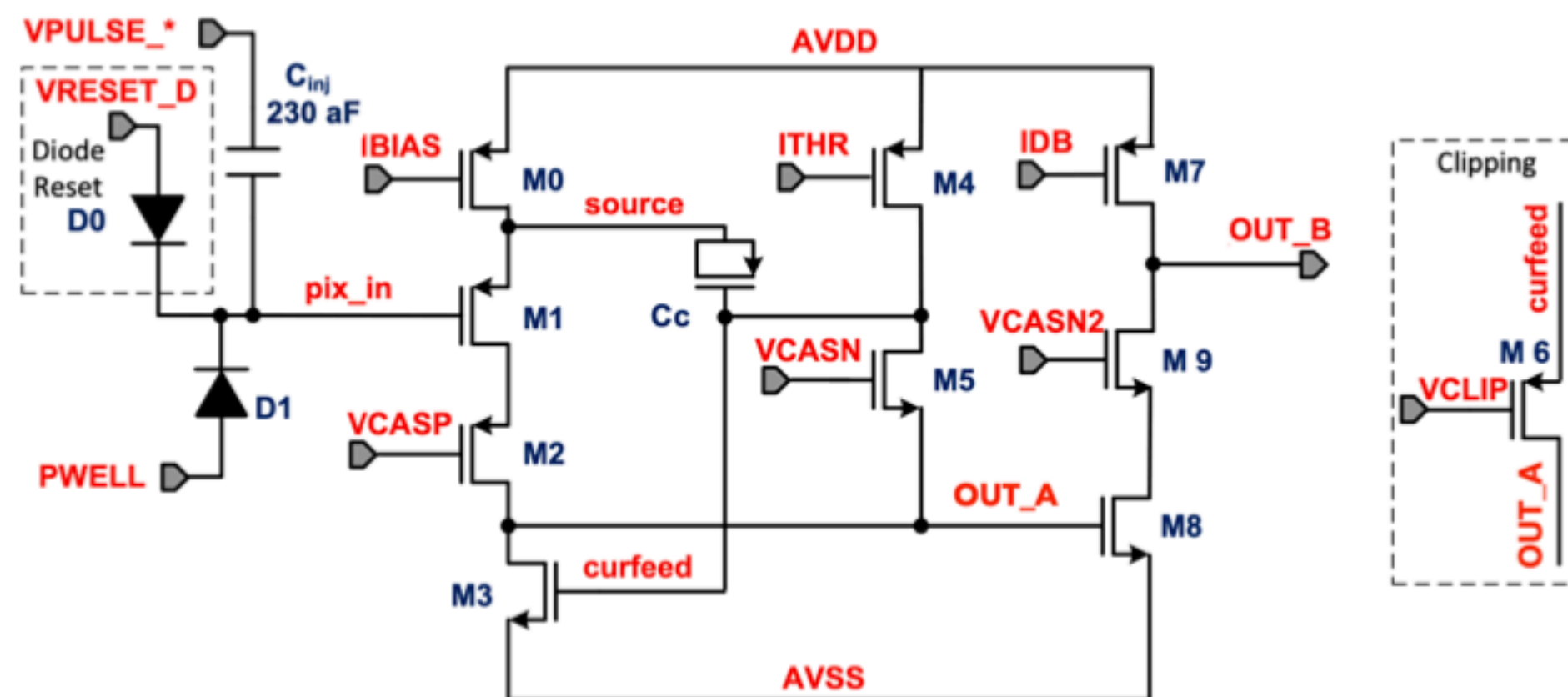


(d)

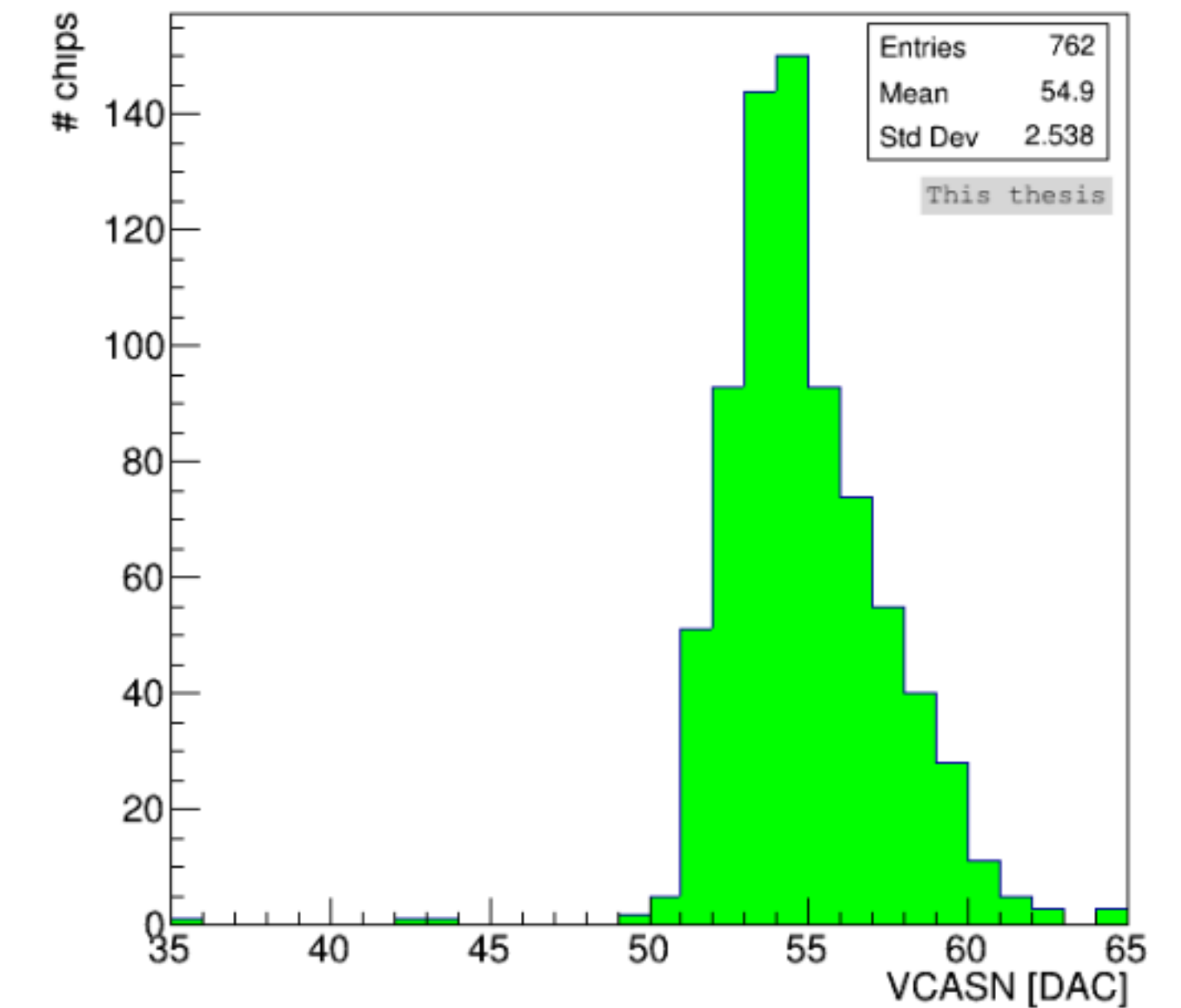
Ladder qualification analysis

to describe the characteristic of the detector after
subjecting the chips to various qualification tests

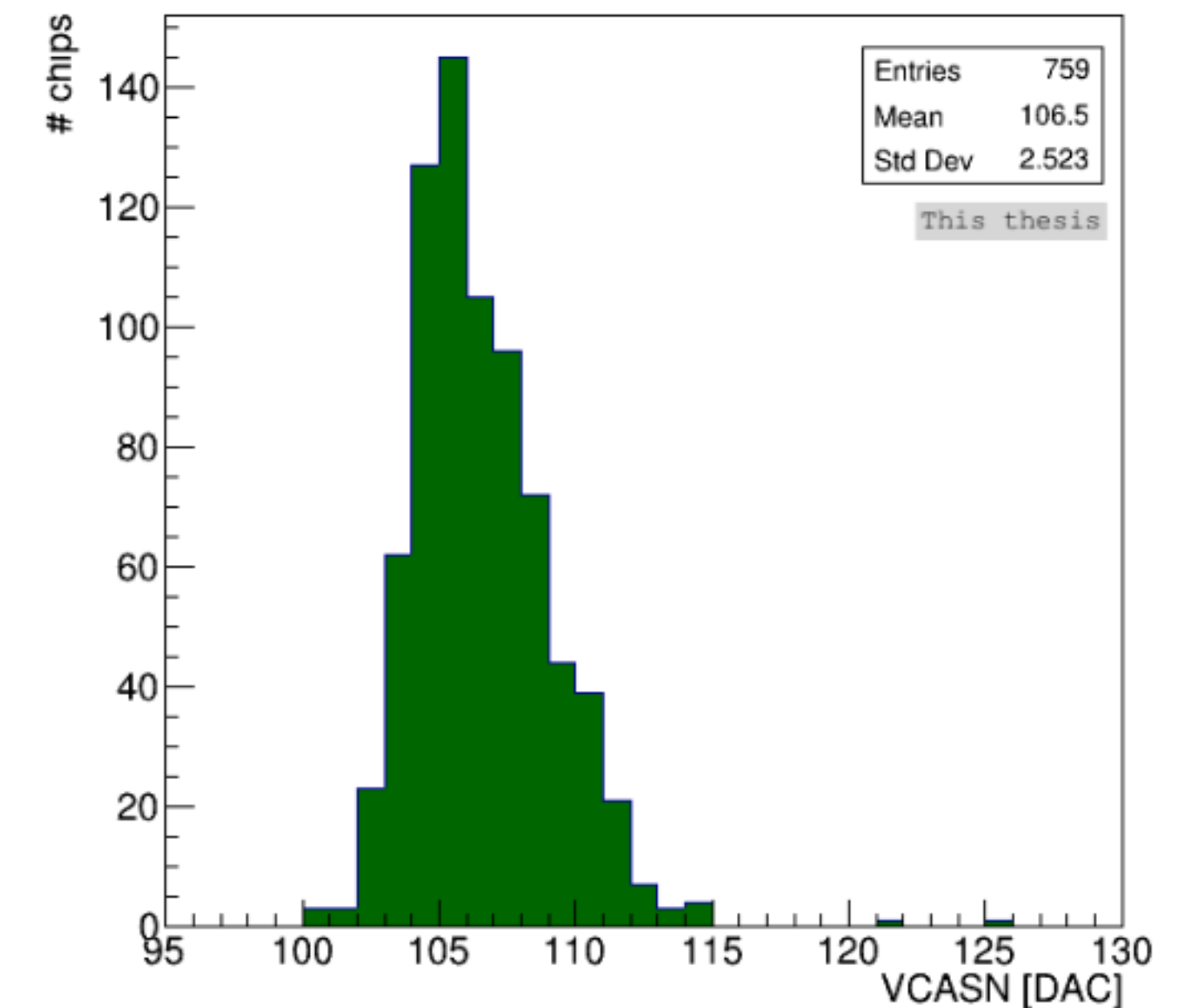
- power consumption + correlations
- threshold and noise characteristics
- dead, noisy and inefficient pixels
- VCASN values



Average VCASN without back-bias



Average VCASN with back-bias



Summary

- new pixel tracker in the forward direction
- fully assembled
- uniform threshold, small number of dead or noisy pixels, low occupancy rate

Thank you for your attention!

