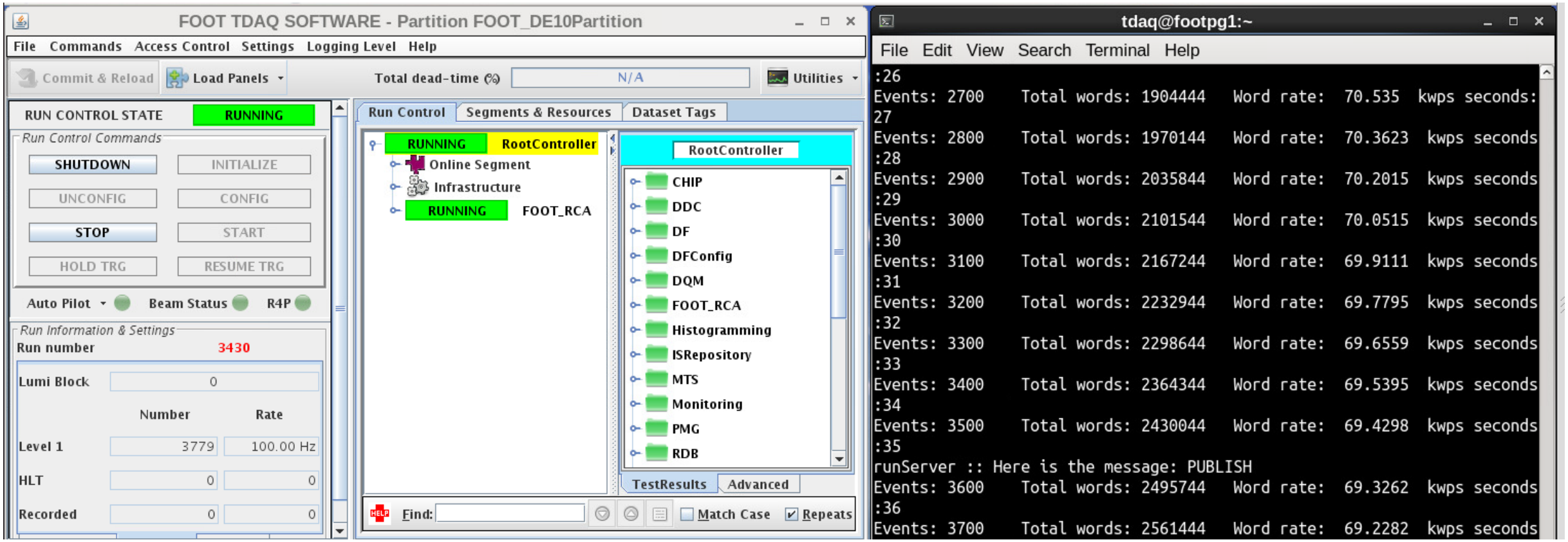
MSD Report

Gianluigi Silvestre on behalf of PG group

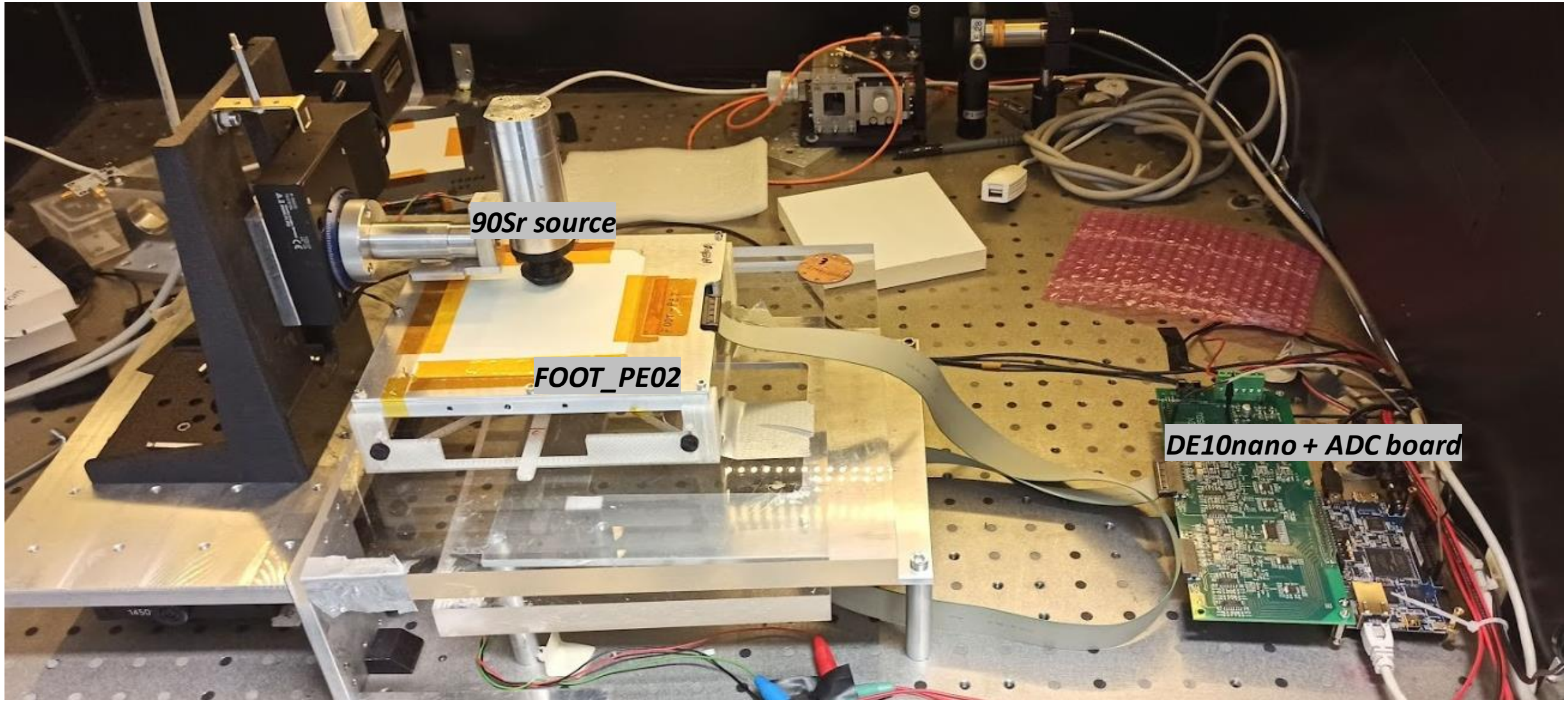
07/04/2021

Full DAQ chain

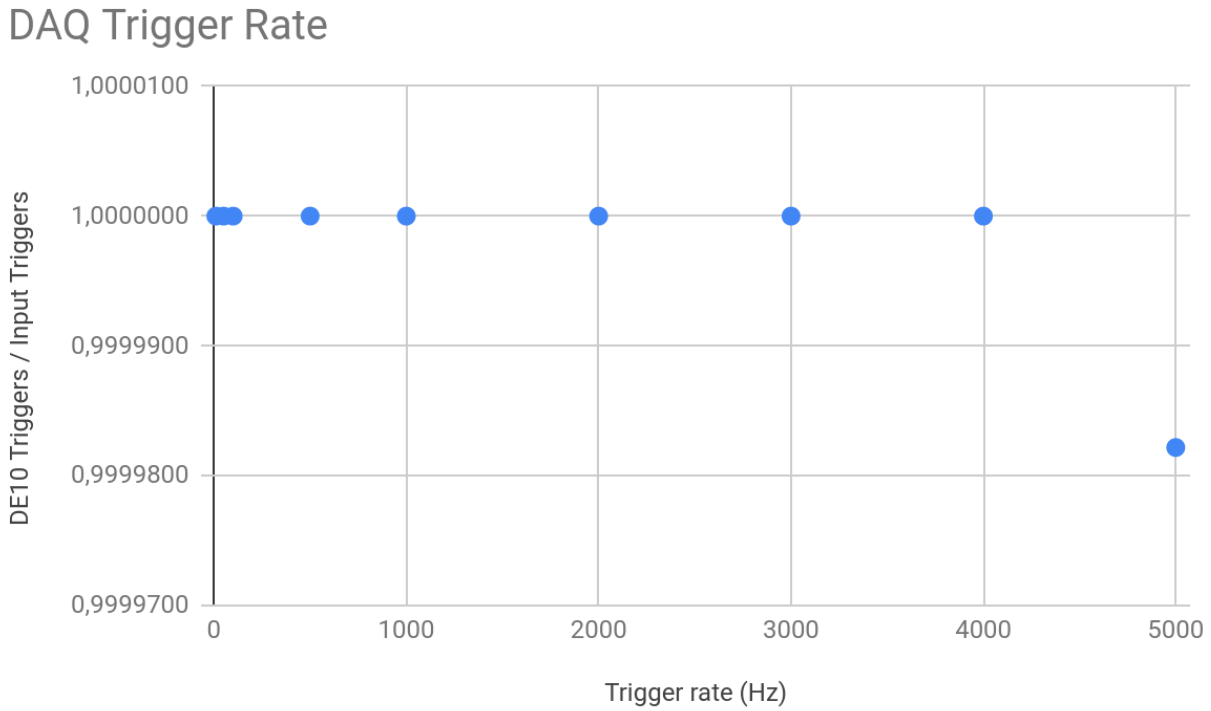


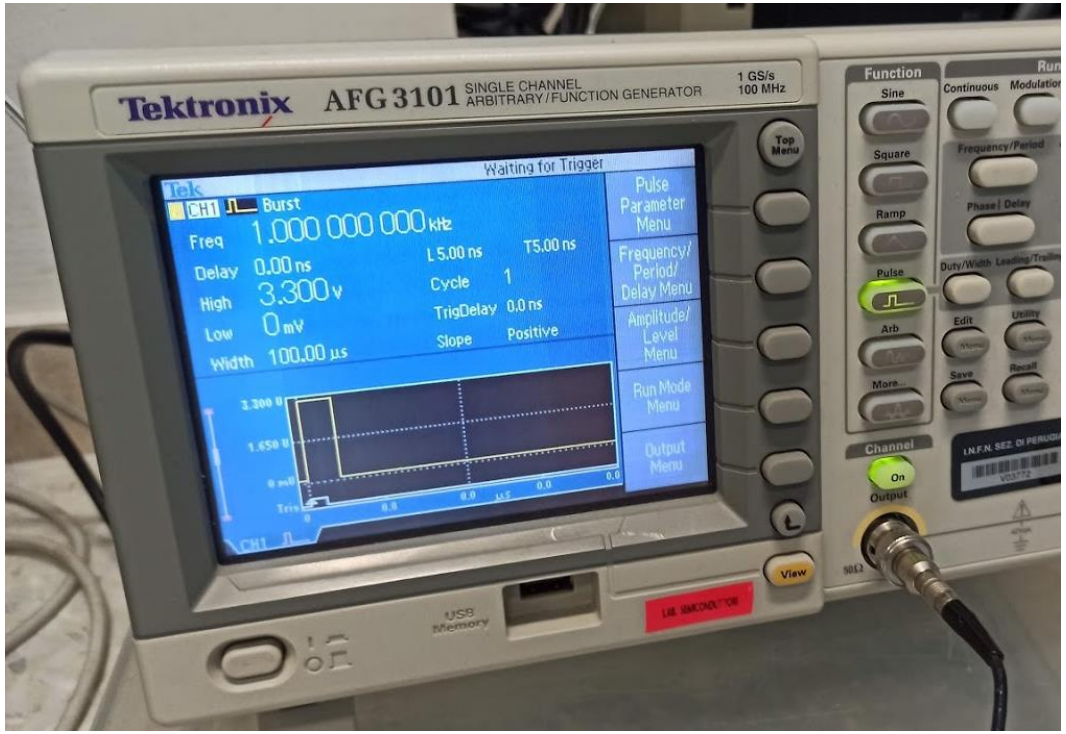
- The full DAQ chain (detector + ADC board + DE10nano + Bologna software) now works
- Need to debug and refine the DE10 firmware
- Raw data can be correctly compressed/converted for data analysis
- ToDo: add relevant acquisition control histograms/graphs to the software

Setup for data acquisition



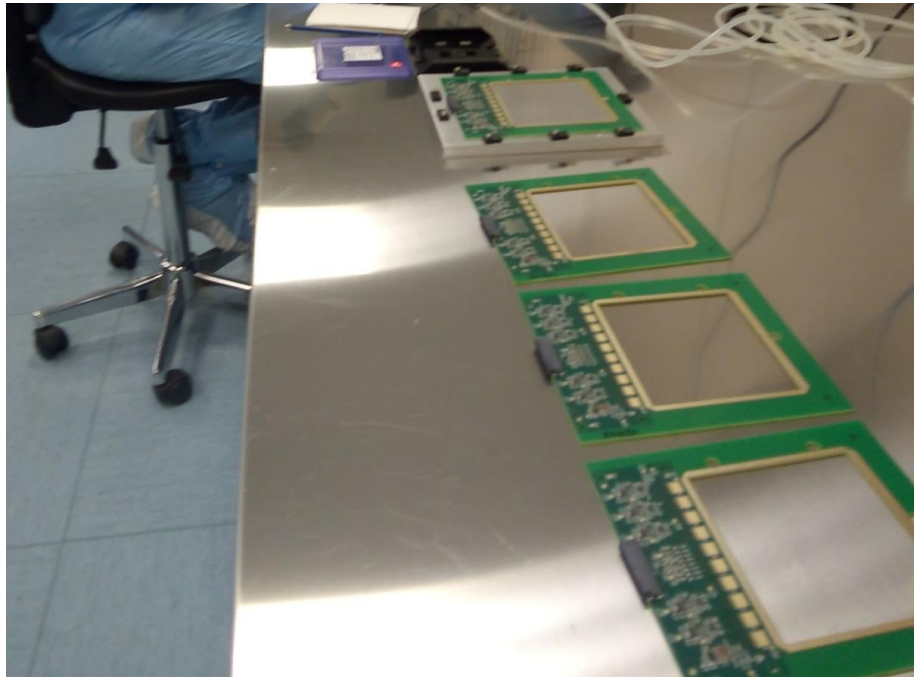
Trigger Rate Performance

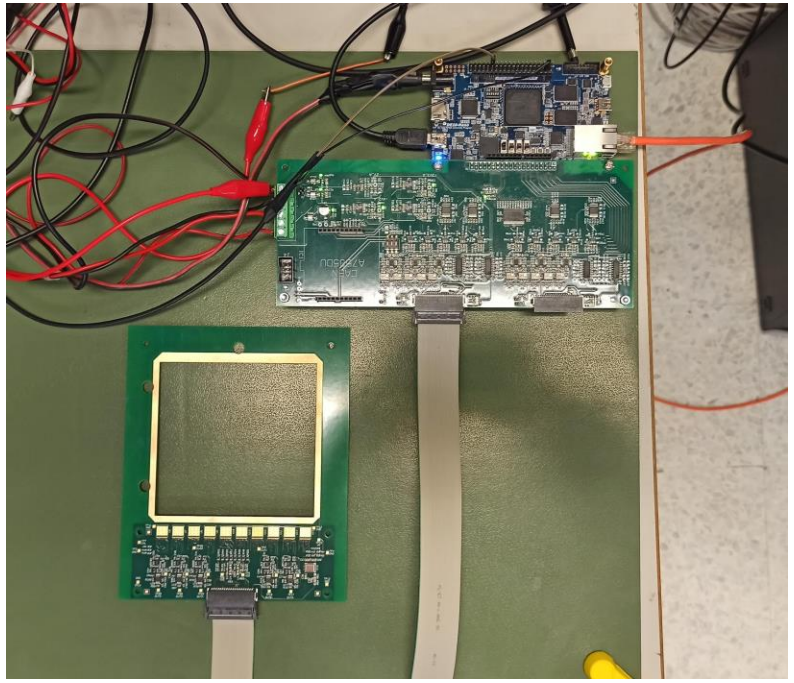




- Trigger provided by an external pulser
- Pulse frequency from 10 Hz to 5 kHz
- Maximum trigger rate > 1 kHz as expected (with a single DE10nano)
- Data bandwidth: measurements ongoing

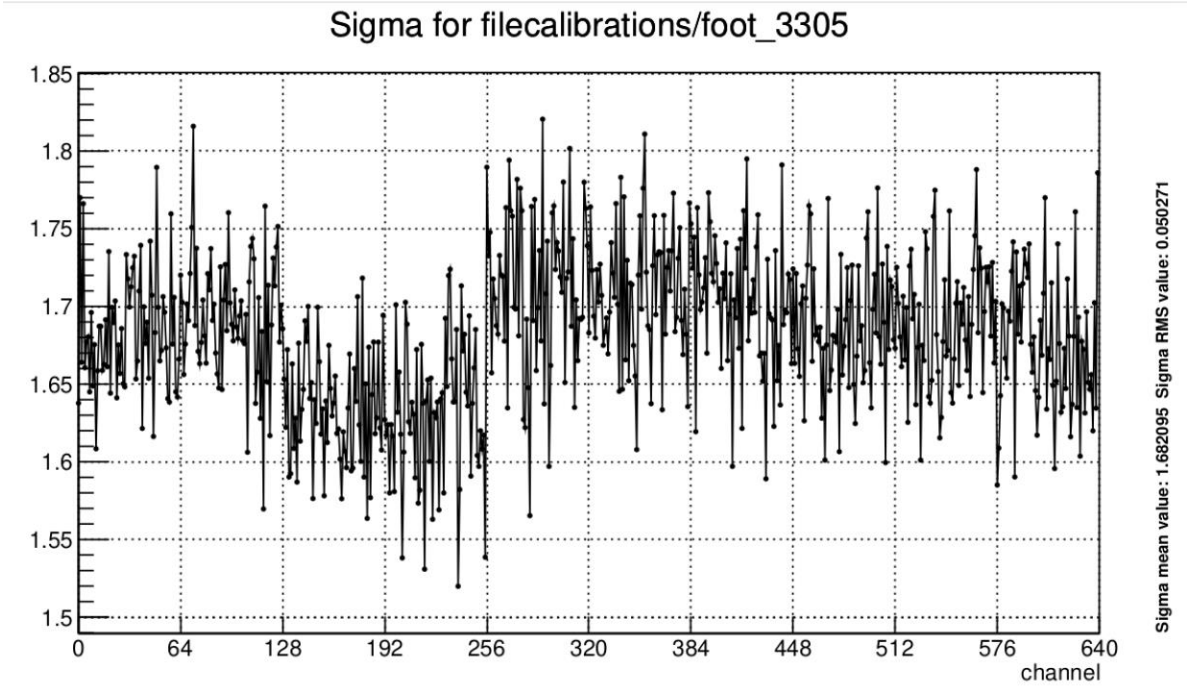
Detector construction status



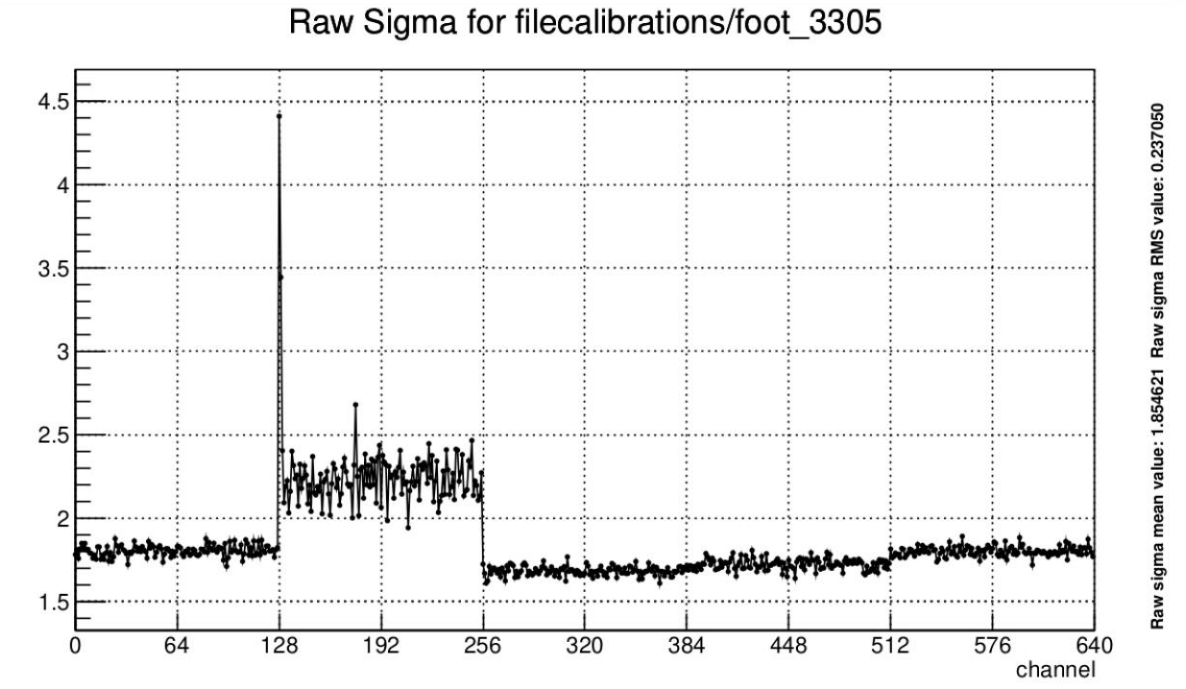


- Fully tested 15 hybrid boards from Artel before readout ASIC bonding (IDE1140)
  - 14 of them work fine, waiting for replacement of the last one
- 6 hybrids fully equipped with readout ASICS
  - All of them work as foreseen
- 2 full detectors assembled
  - Detectors tested with radioactive sources
  - More detectors are ready to be assembled in the next month

Detector construction status

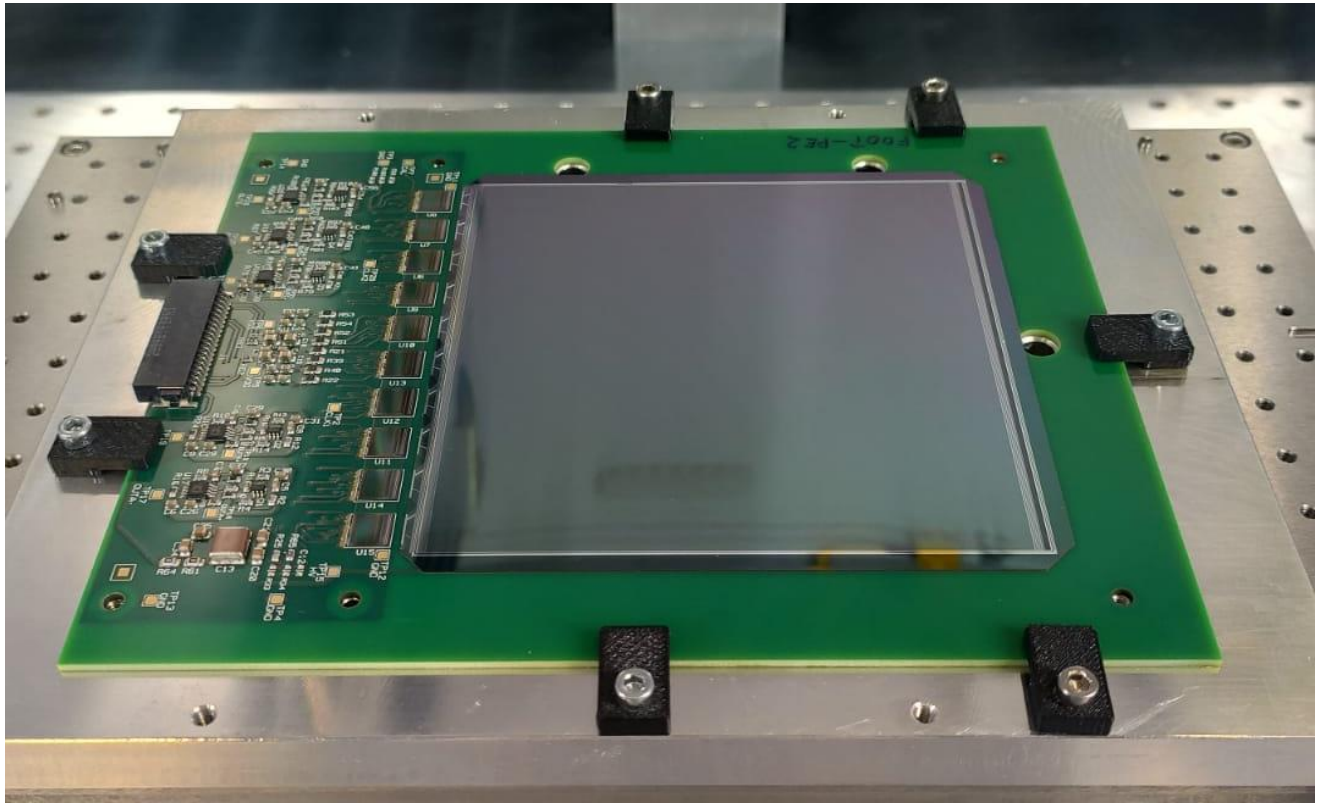


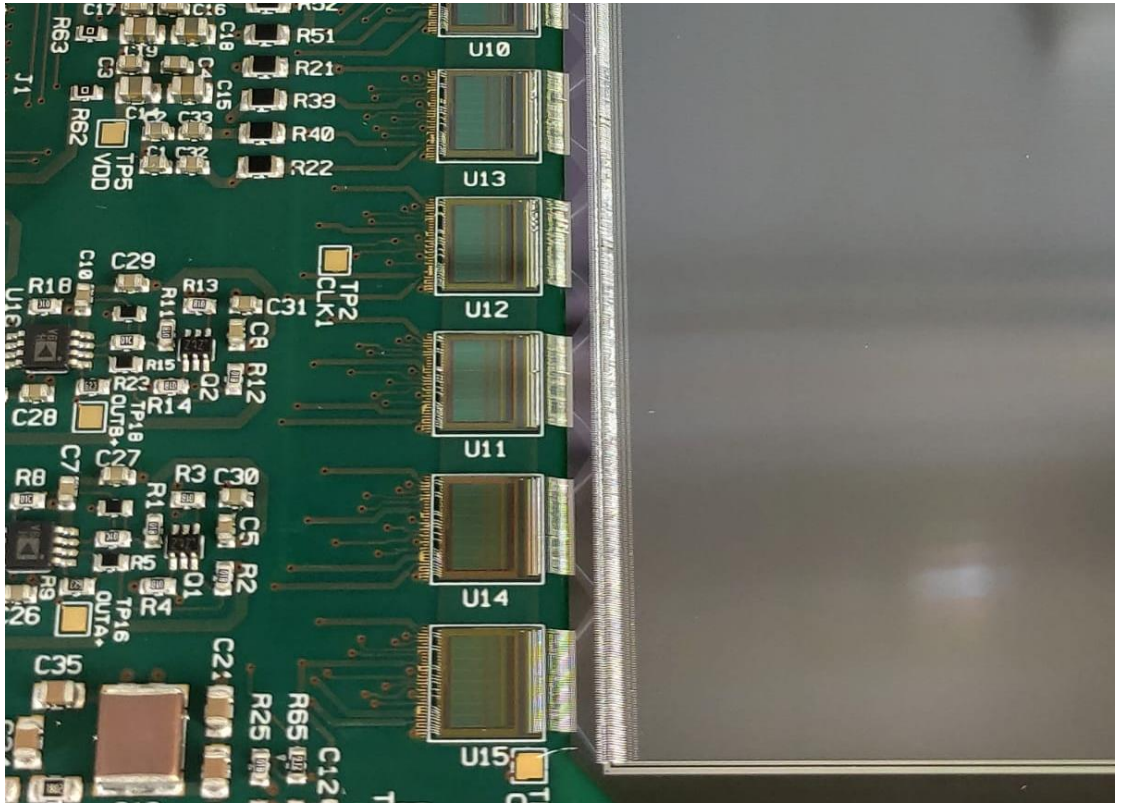
Good Hybrid



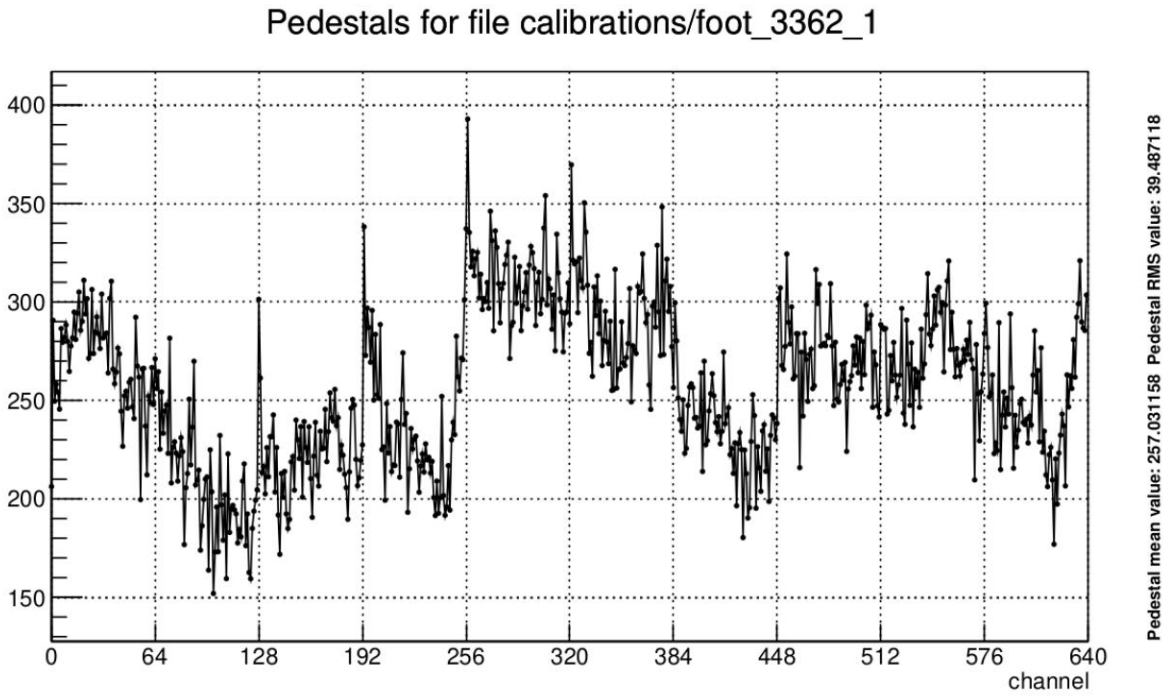
Bad Hybrid

First Final Prototype: FOOT_PE02

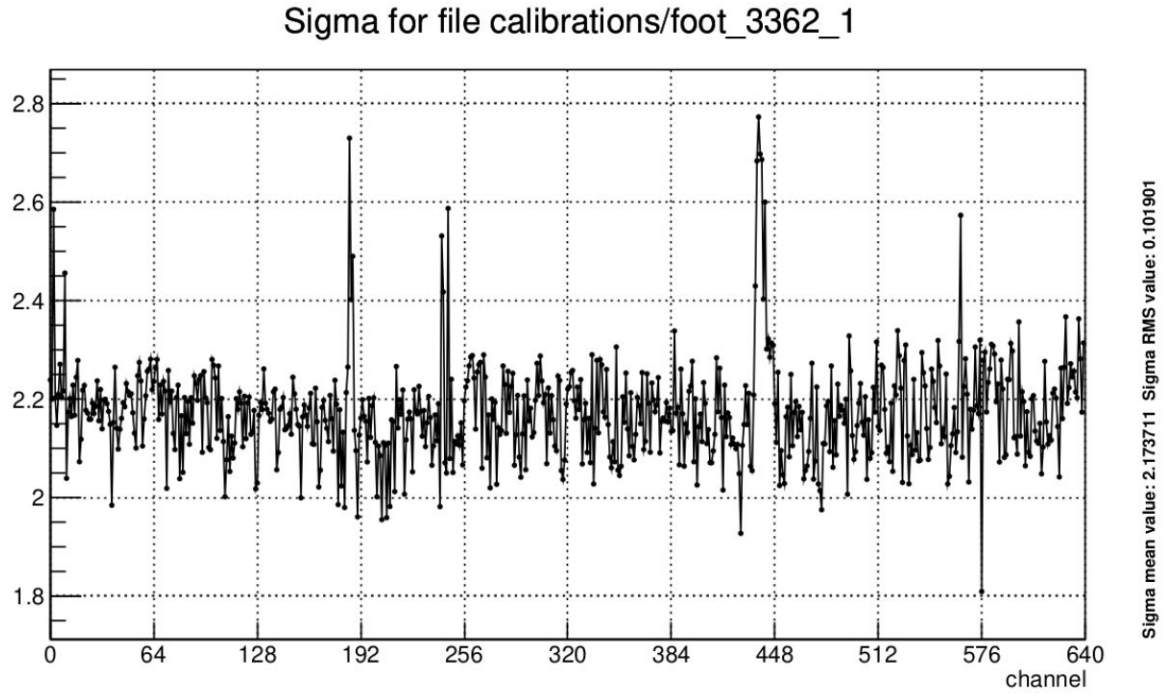




Typical Noise of the detector



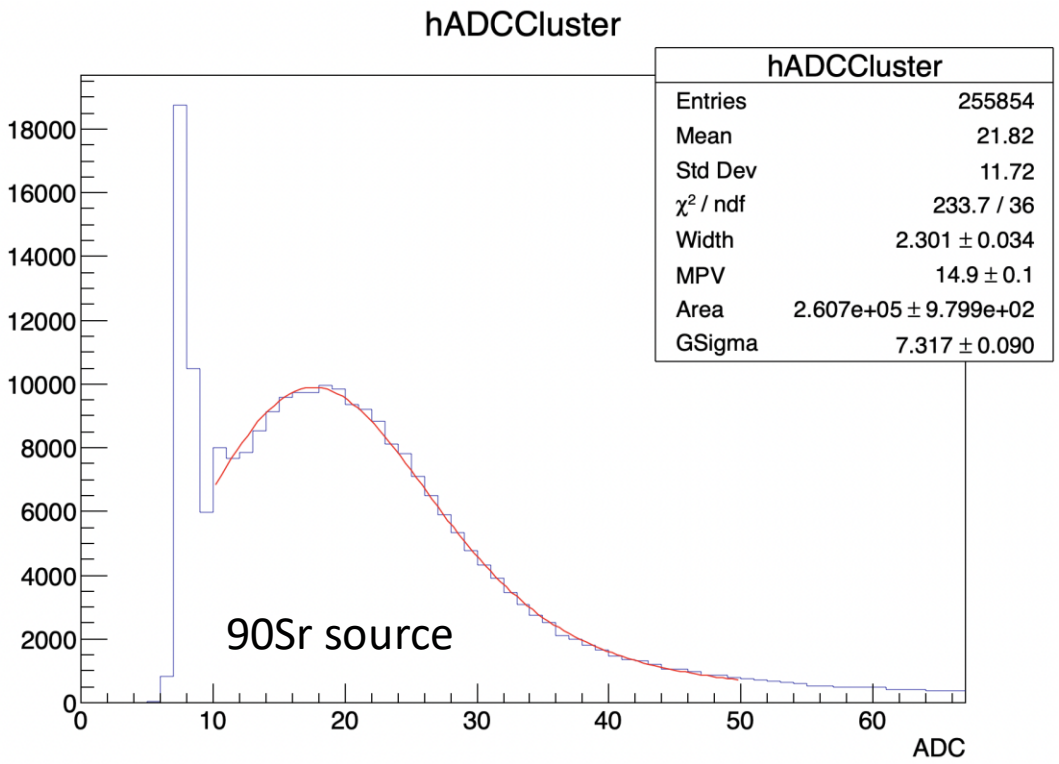
ADC

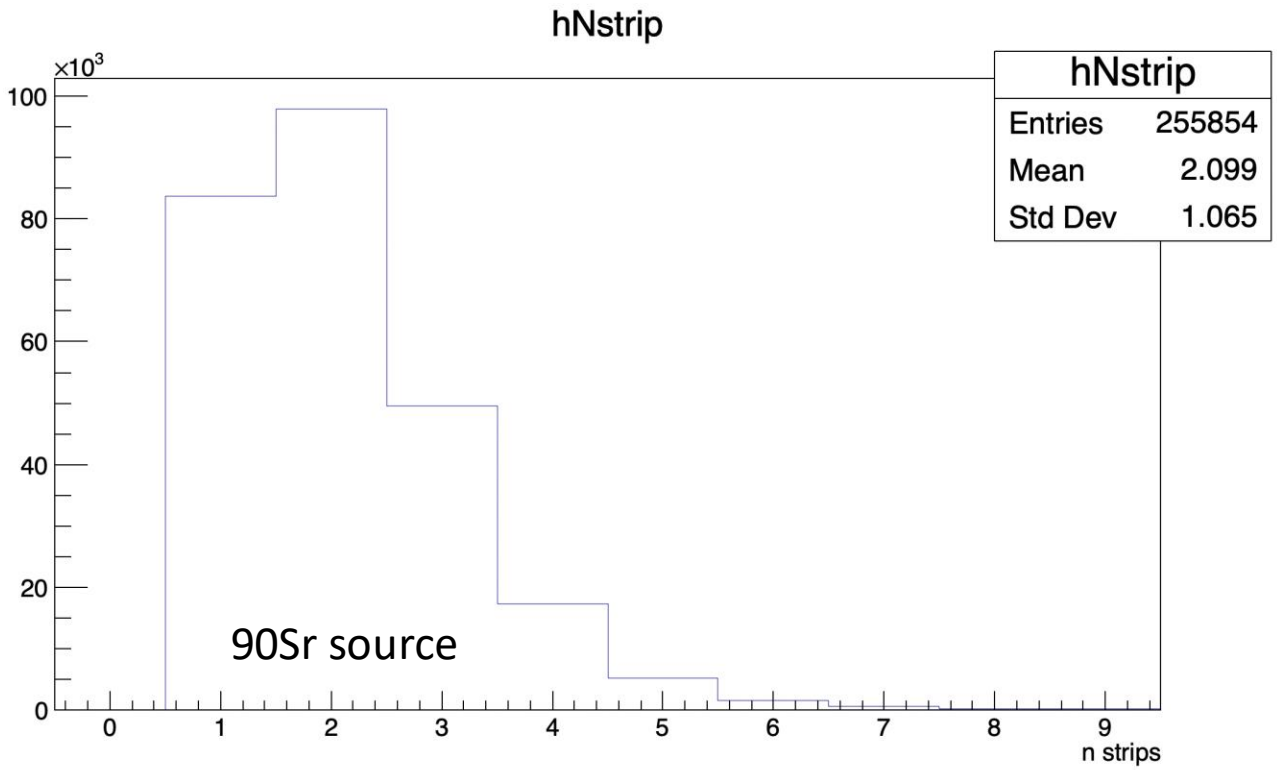


ADC

- Mean pedestals value of readout electronics ≈ 260 ADC counts
- Typical channel noise after sensor gluing less than 3 ADC
- Leakage current @55V : around 200nA
- Leakage current stability tested over several days of continuous operation
- All values are within the expected ranges
- Long term noise stability measurements are ongoing

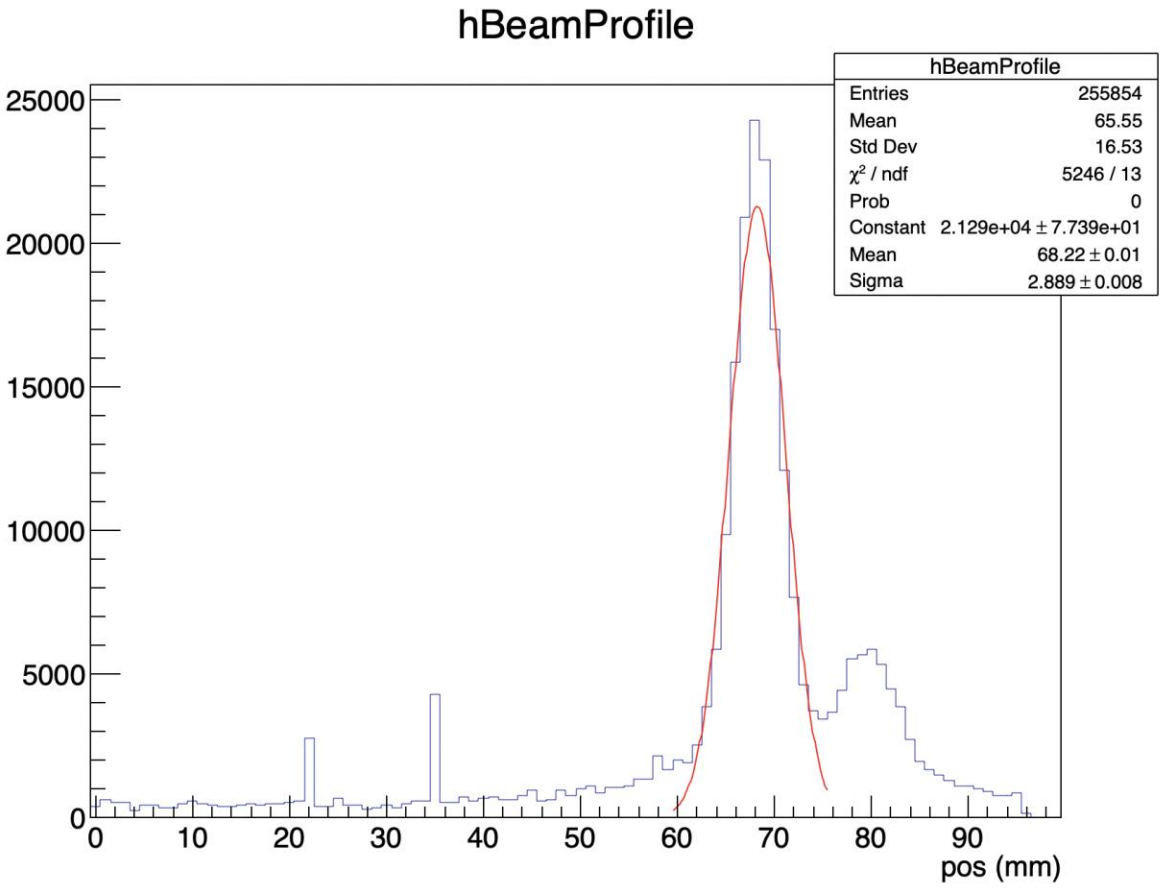
Signal distributions

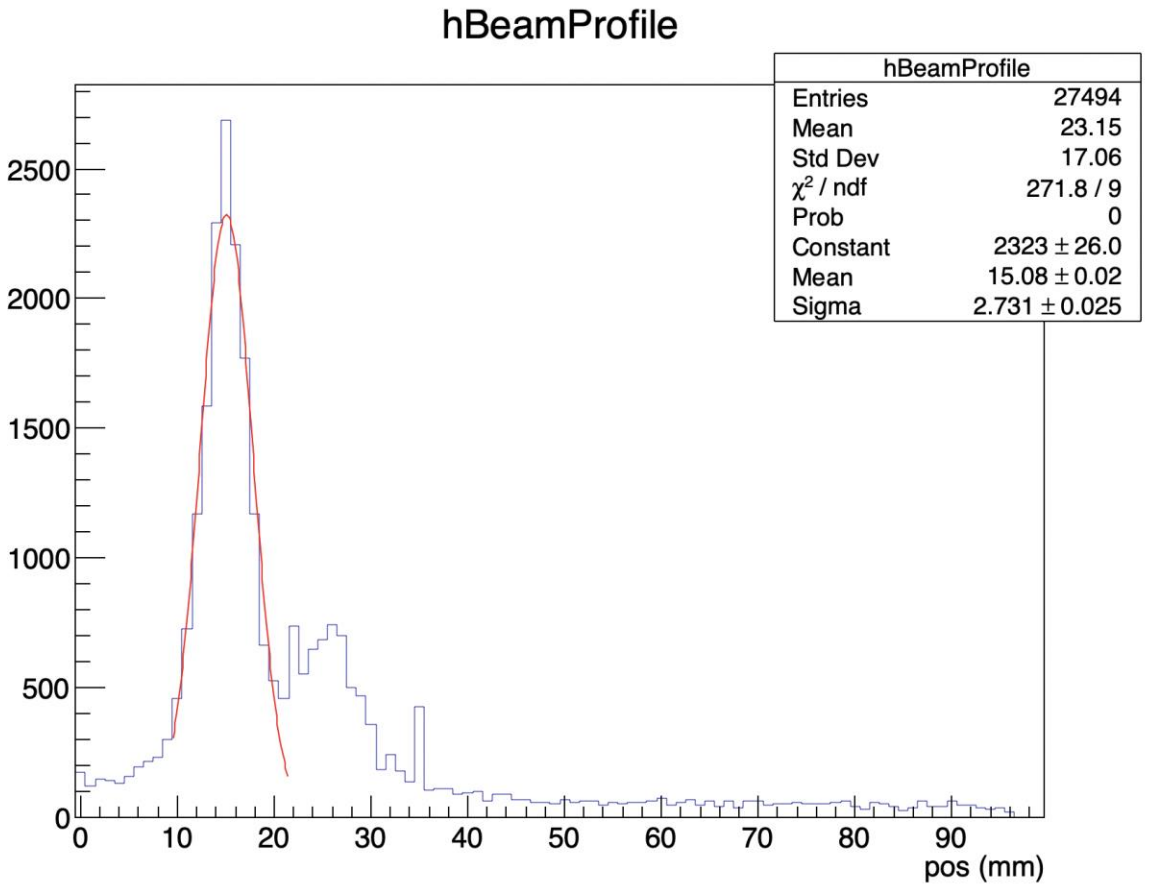




- Signals from 90SR radioactive source
- Most Probable Value compatible with the values from the first prototype
- Cluster width as expected from a MIP

Clusters Position Distributions

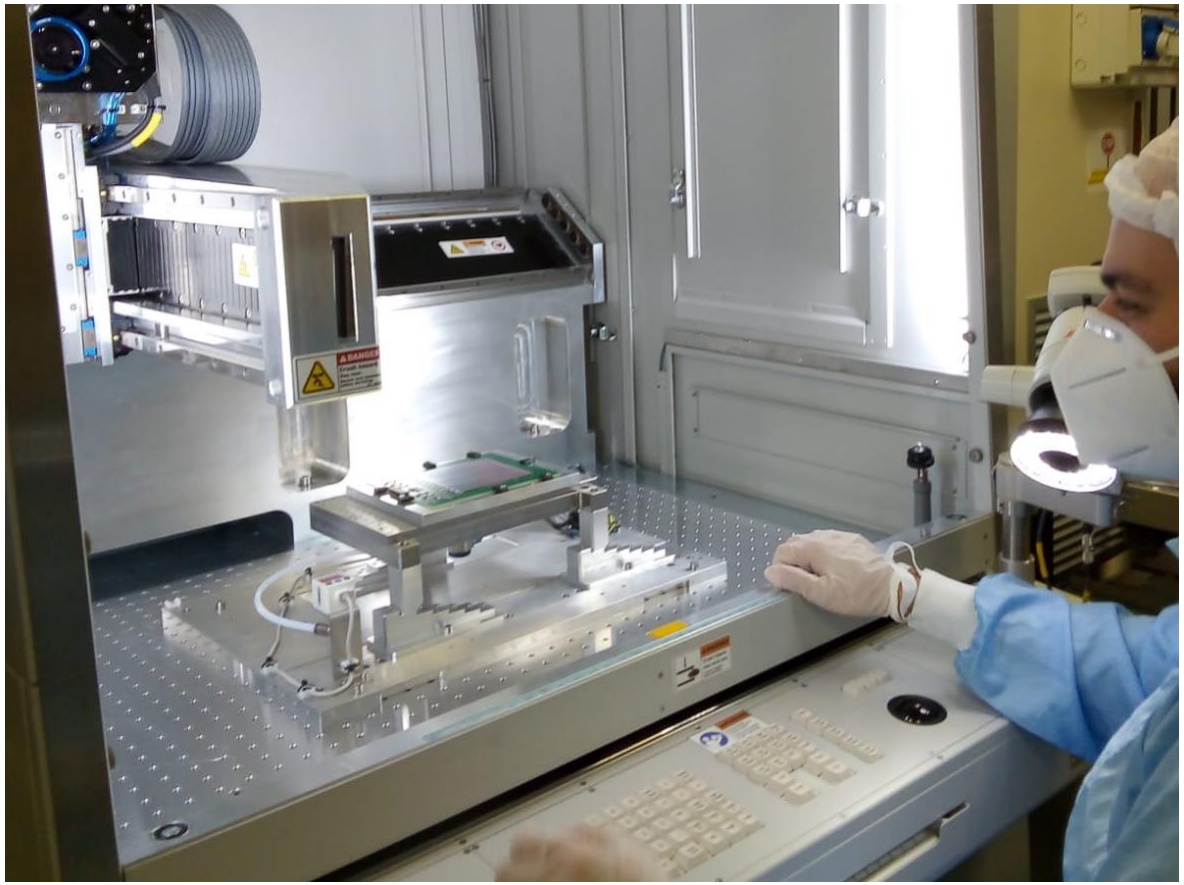


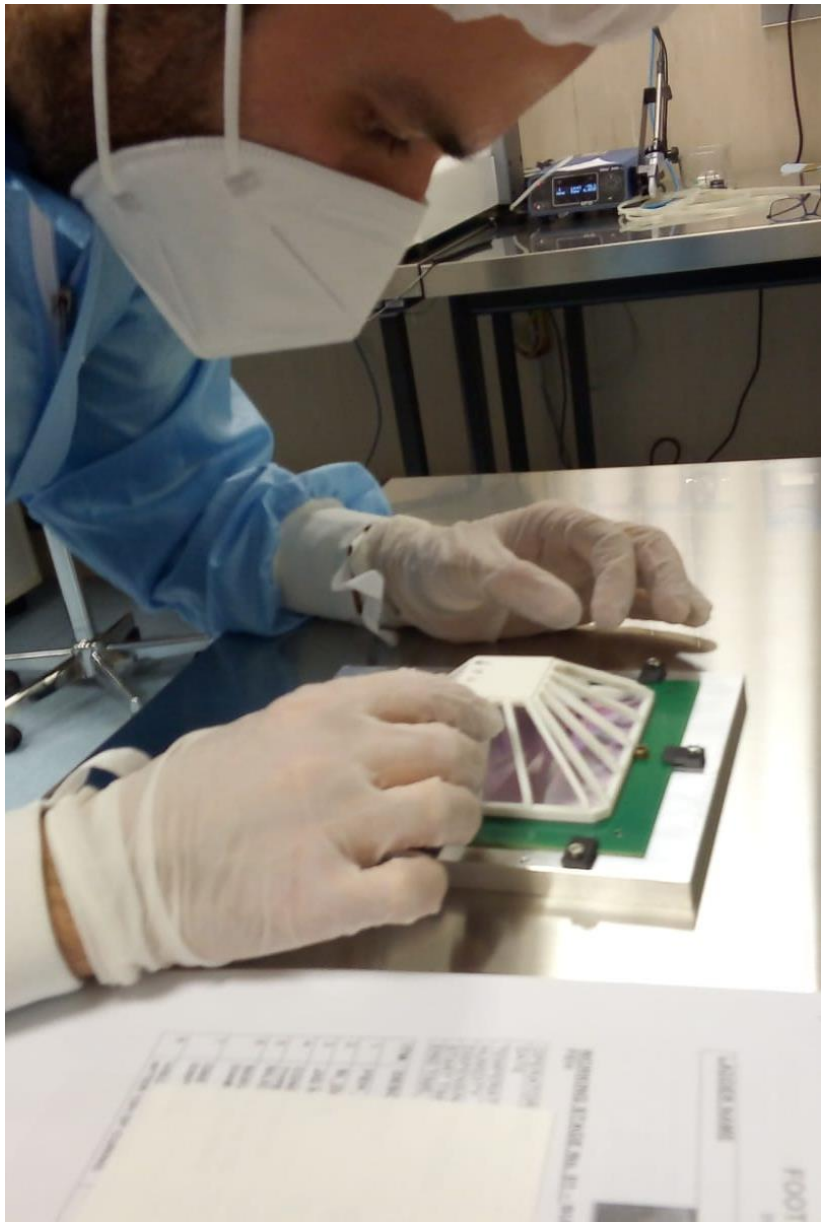


- Test with naked and collimated 90Sr source
- Reconstructed "beam" profile correctly moves as we move the source
- Width values compatible with known values
- Double peak (peripheral hole in collimator)

ToDO

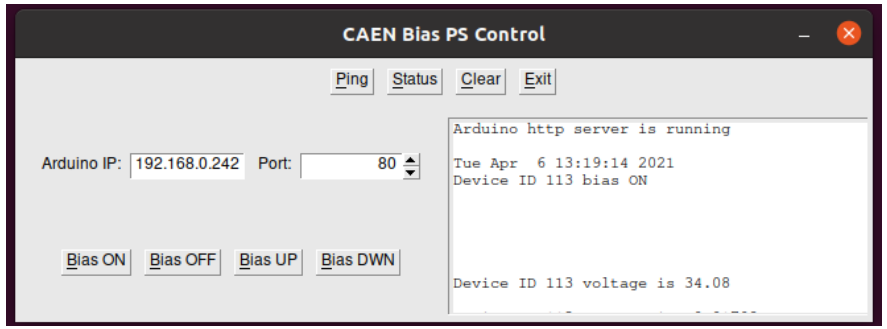
- Build the other detectors
- Study systematics after construction assembly



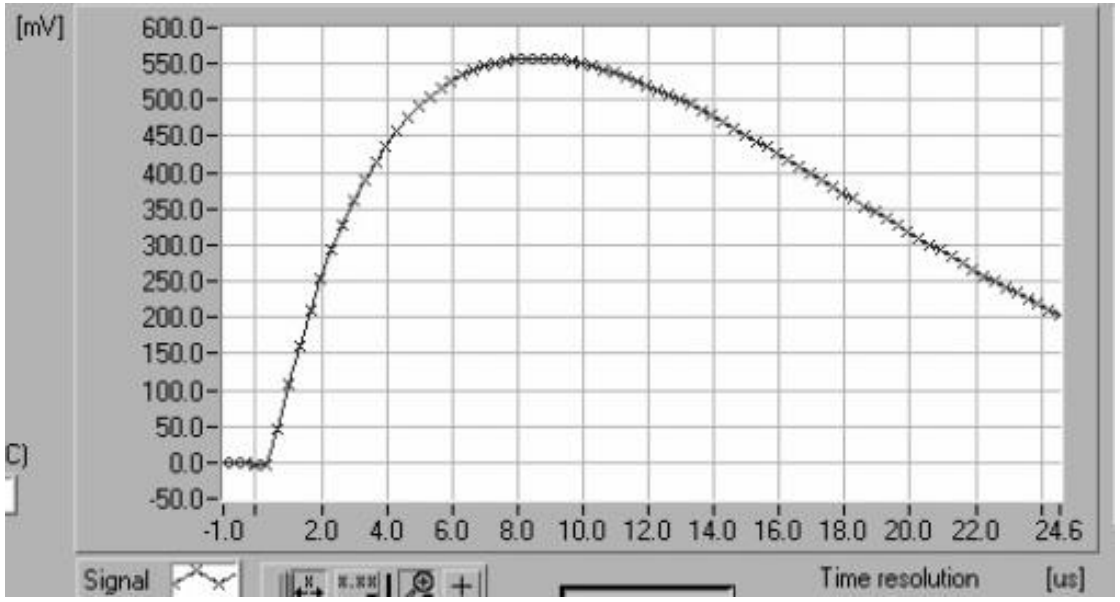


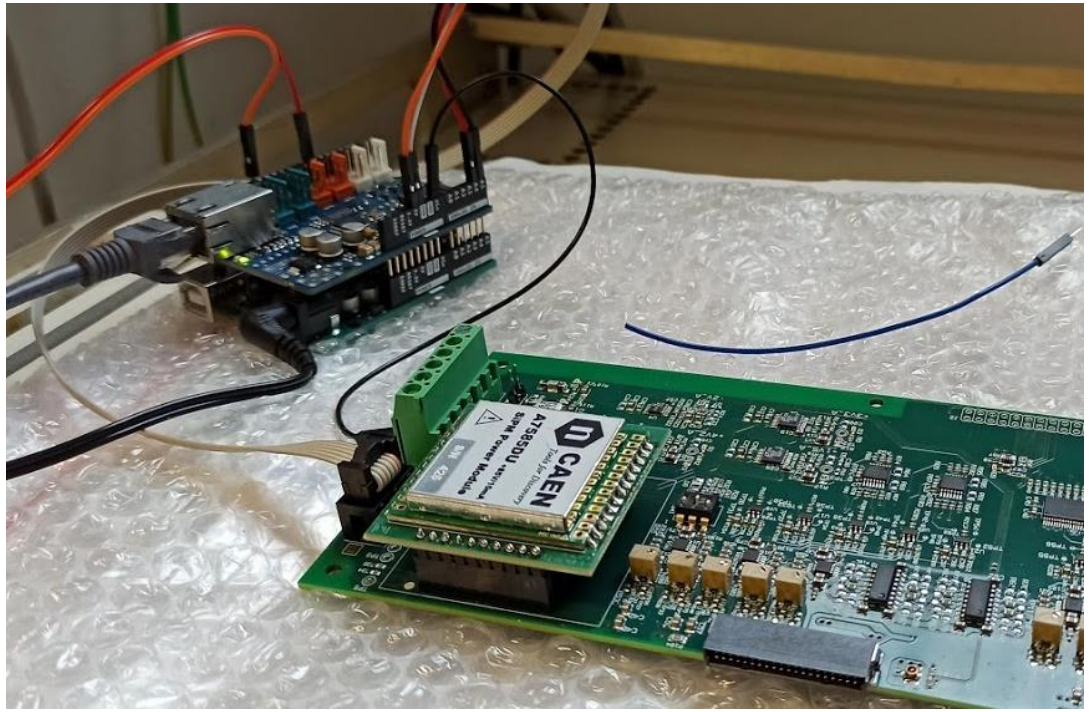
ToDO

- Test the new detectors with new DAQ system
  - Acquisition with multiple DE10 boards
- Acquire data for long term stability studies
- Verify optimal sampling time for the readout ASICs
- Verify optimal reverse polarizing voltage
- Integration of the CAEN Power Supply module for the bias



VA shaping function from IDEAs





ToDO

- At the accelerators:
  - Crosscheck optimal sampling time with heavy ions signals
  - Crosscheck optimal reverse polarizing voltage with heavy ions signals
  - Equalize the response function of all the readout ASICs
  - Internal alignment of the MSD subdetector with high energy particles