

# MSD Report

*Gianluigi Silvestre on behalf of PG group*

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07/04/2021

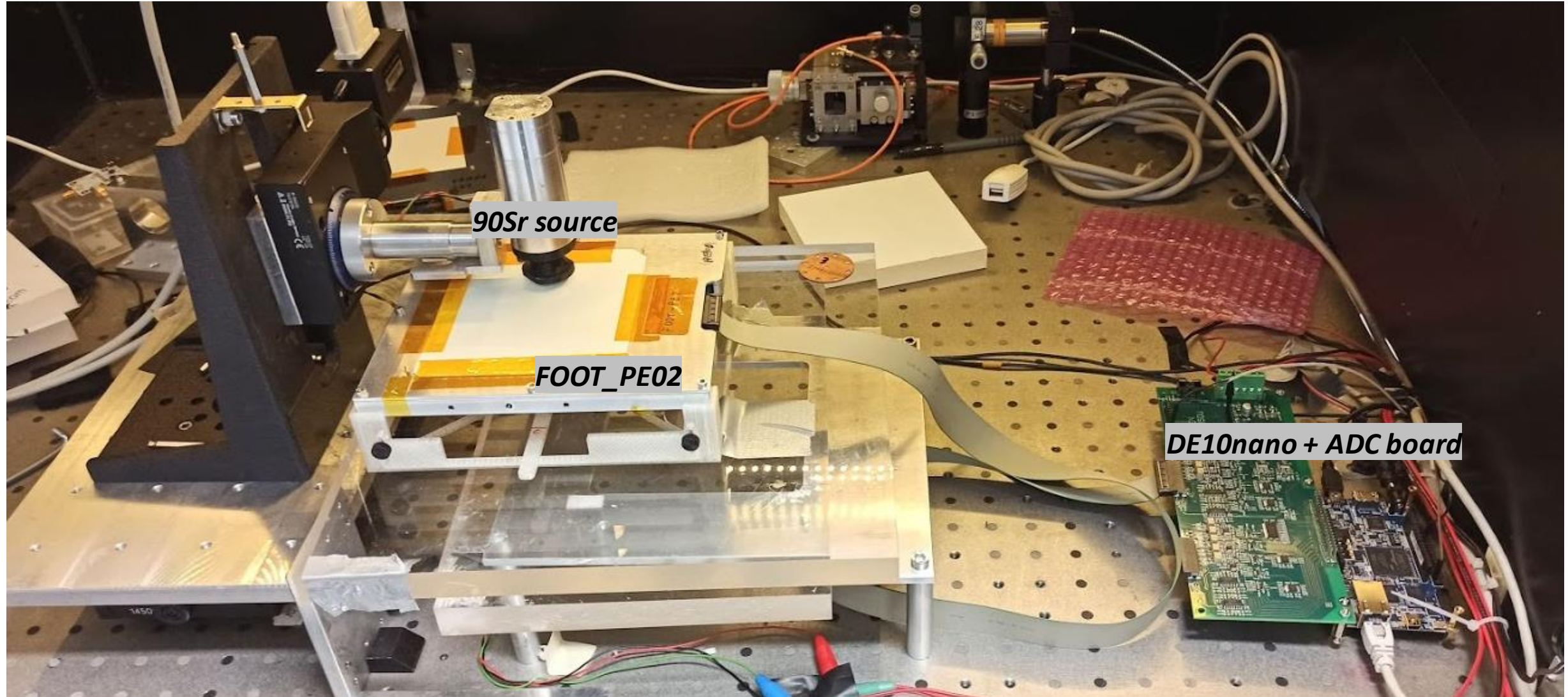
# Full DAQ chain

The image displays the FOOT TDAQ SOFTWARE interface and a terminal window. The software window, titled "FOOT TDAQ SOFTWARE - Partition FOOT\_DE10Partition", shows the system is in a "RUNNING" state. It includes a "Run Control" section with buttons for SHUTDOWN, INITIALIZE, UNCONFIG, CONFIG, STOP, START, HOLD TRG, and RESUME TRG. The "Run Information & Settings" section shows the run number as 3430. The "Segments & Resources" section shows a tree view with "RootController" and "ROOT\_RCA" both in a "RUNNING" state. The "Dataset Tags" section shows a list of components: CHIP, DDC, DF, DFConfig, DQM, FOOT\_RCA, Histogramming, ISRepository, MTS, Monitoring, PMG, and RDB. The terminal window, titled "tdaq@footpg1:~", shows a table of data for events 26 through 37, including total words, word rate, and time in seconds. The data shows a decreasing trend in word rate and time as the number of events increases.

Events	Total words	Word rate	kwps	seconds
26	1904444	70.535	kwps	seconds
27	1970144	70.3623	kwps	seconds
28	2035844	70.2015	kwps	seconds
29	2101544	70.0515	kwps	seconds
30	2167244	69.9111	kwps	seconds
31	2232944	69.7795	kwps	seconds
32	2298644	69.6559	kwps	seconds
33	2364344	69.5395	kwps	seconds
34	2430044	69.4298	kwps	seconds
35	2495744	69.3262	kwps	seconds
36	2561444	69.2282	kwps	seconds

- 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

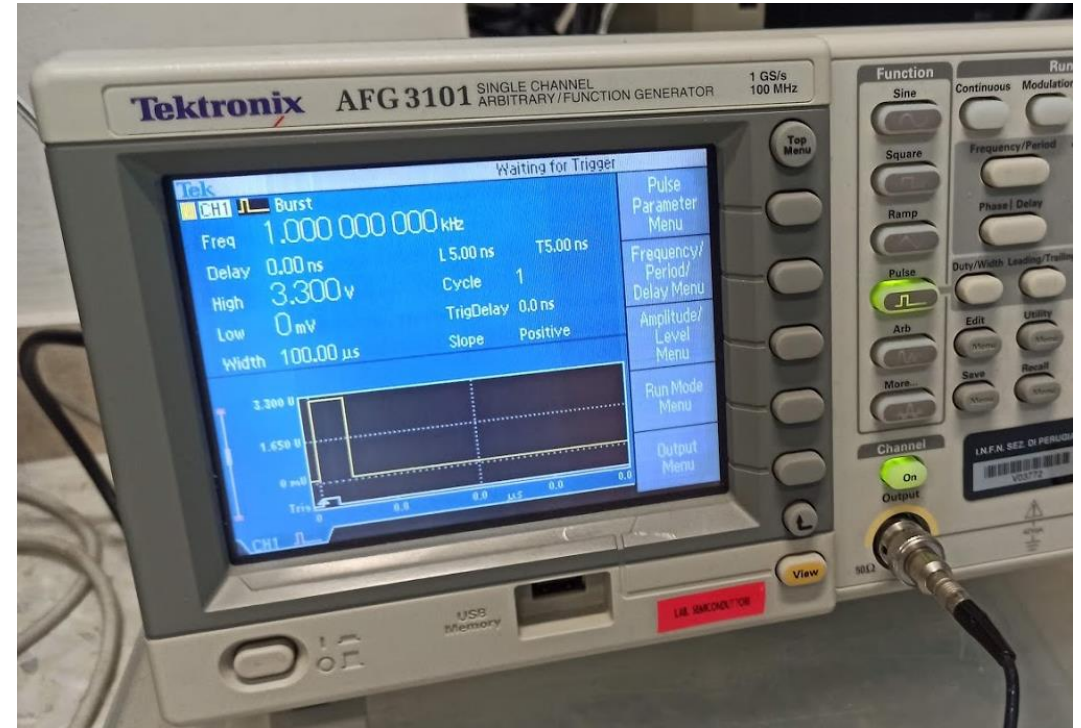
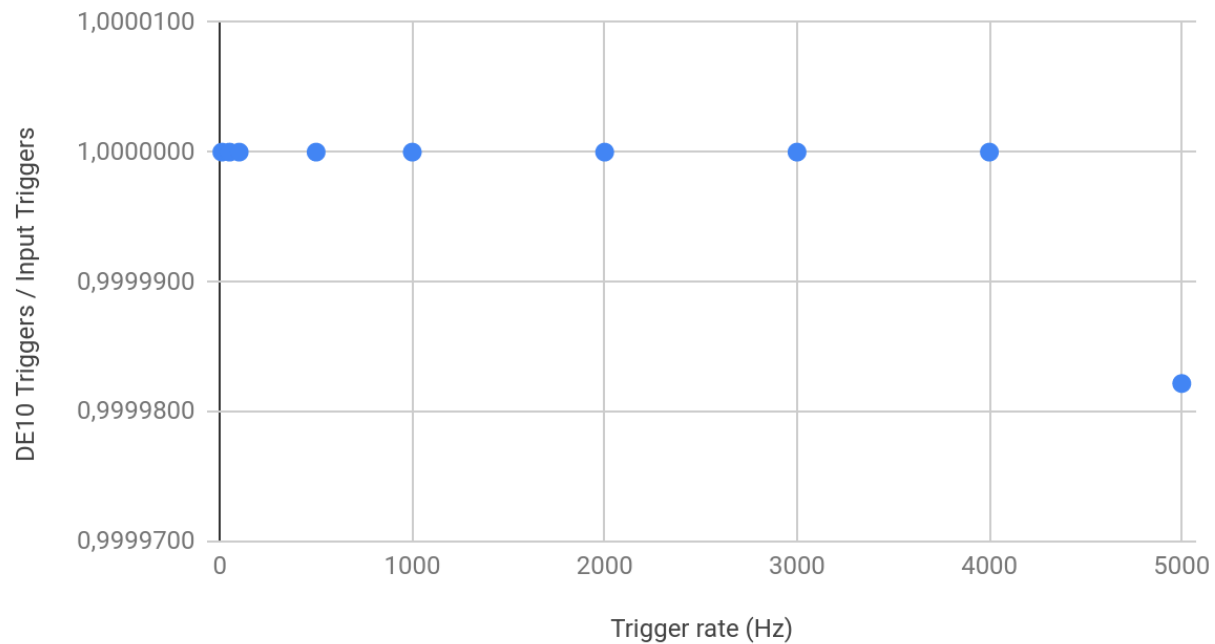
# Setup for data acquisition





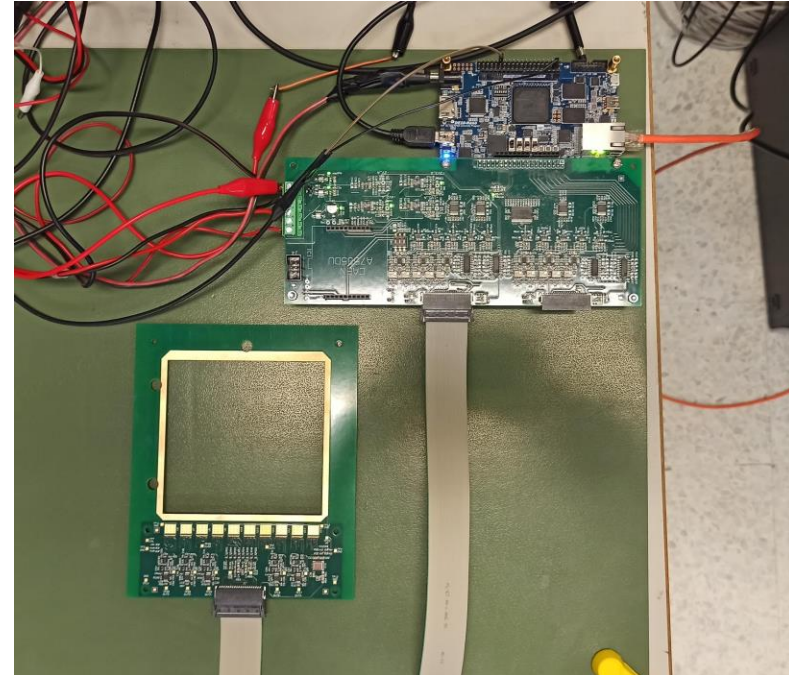
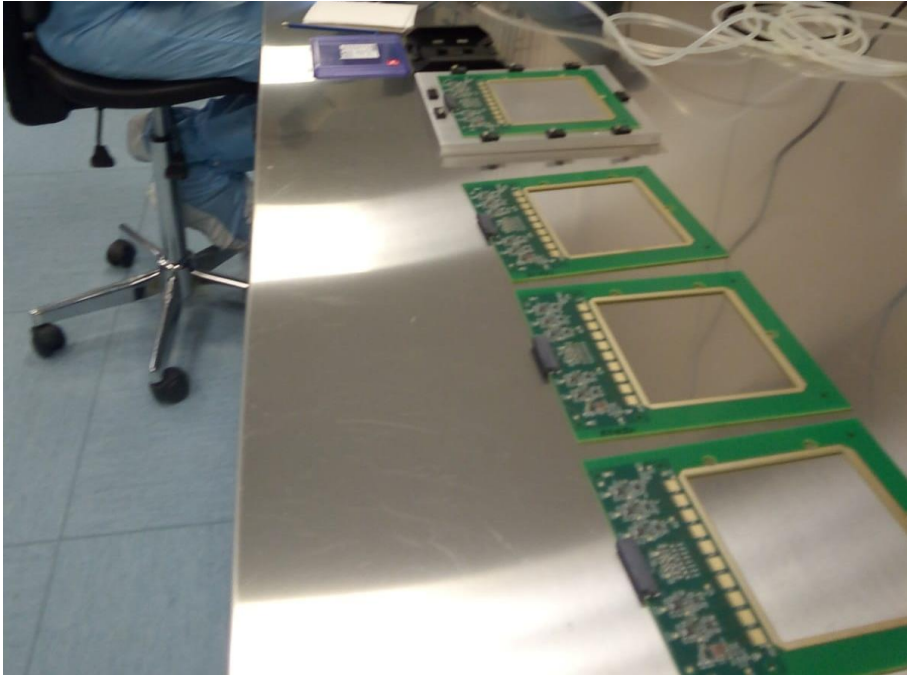
# Trigger Rate Performance

DAQ Trigger Rate



- 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

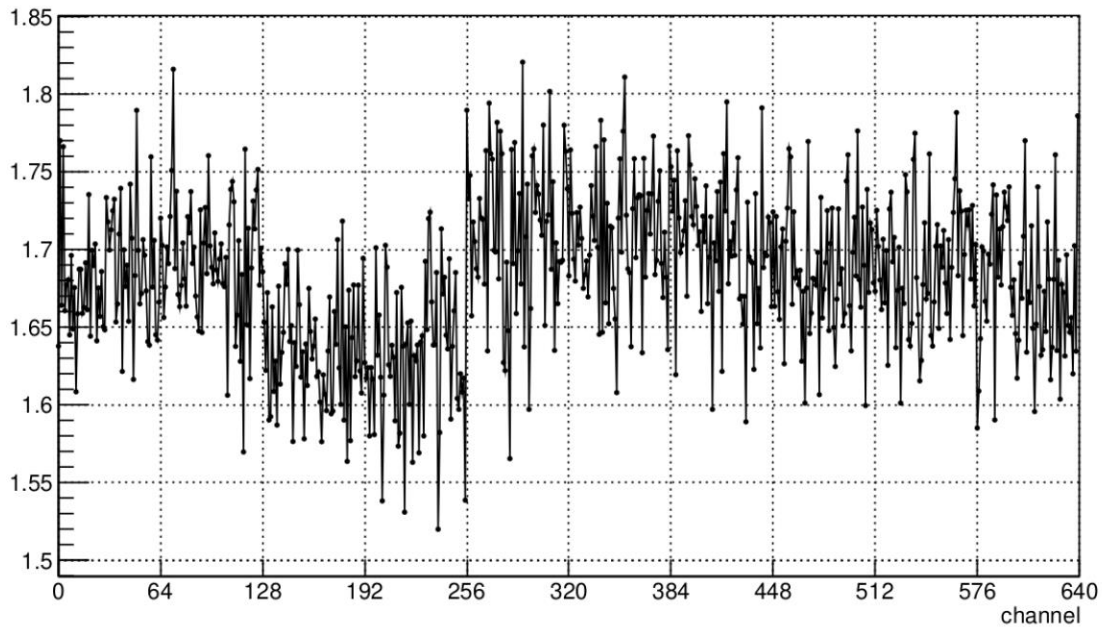
# Detector construction status



- 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

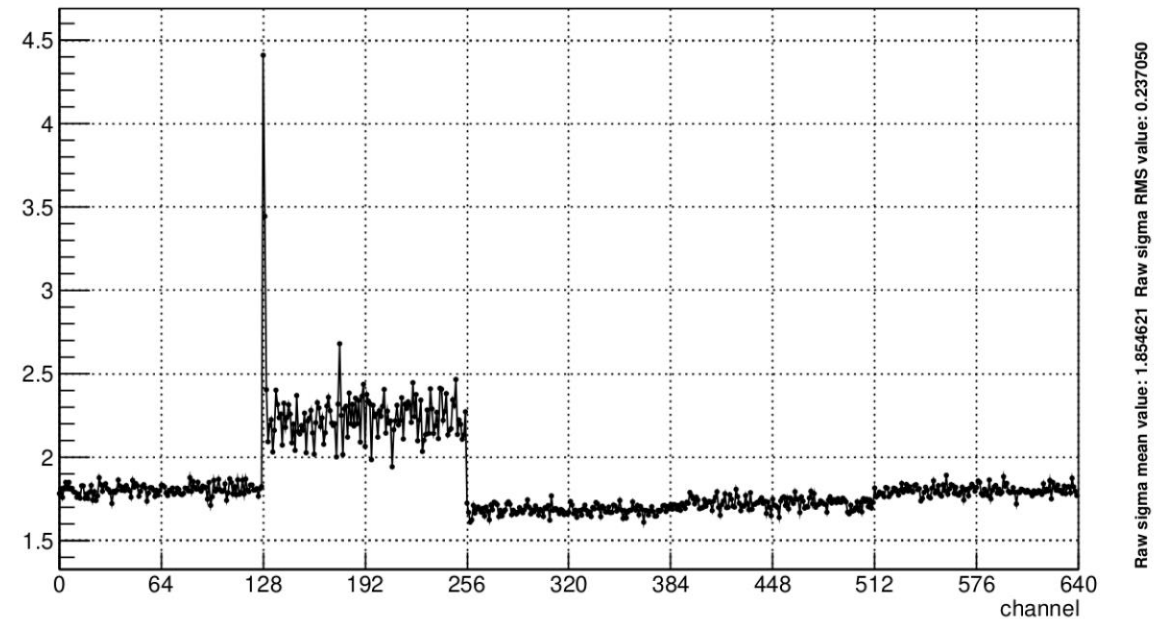
# Detector construction status

Sigma for filecalibrations/foot\_3305



Good Hybrid

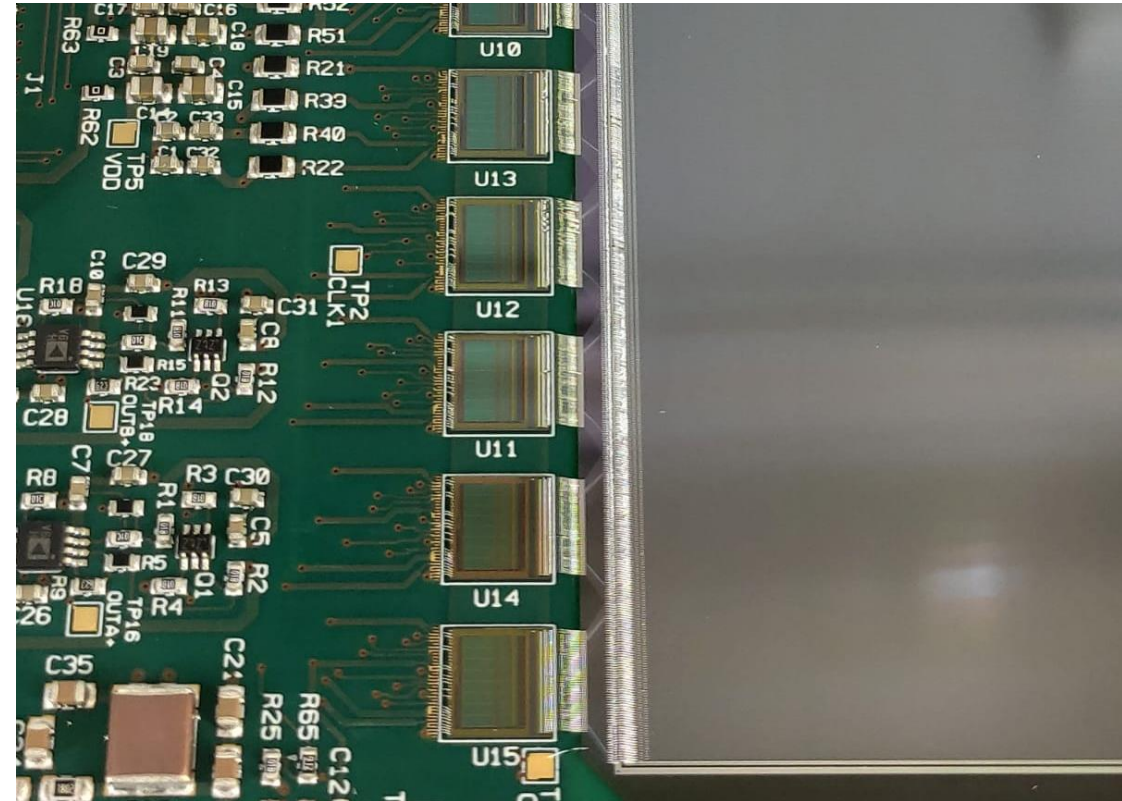
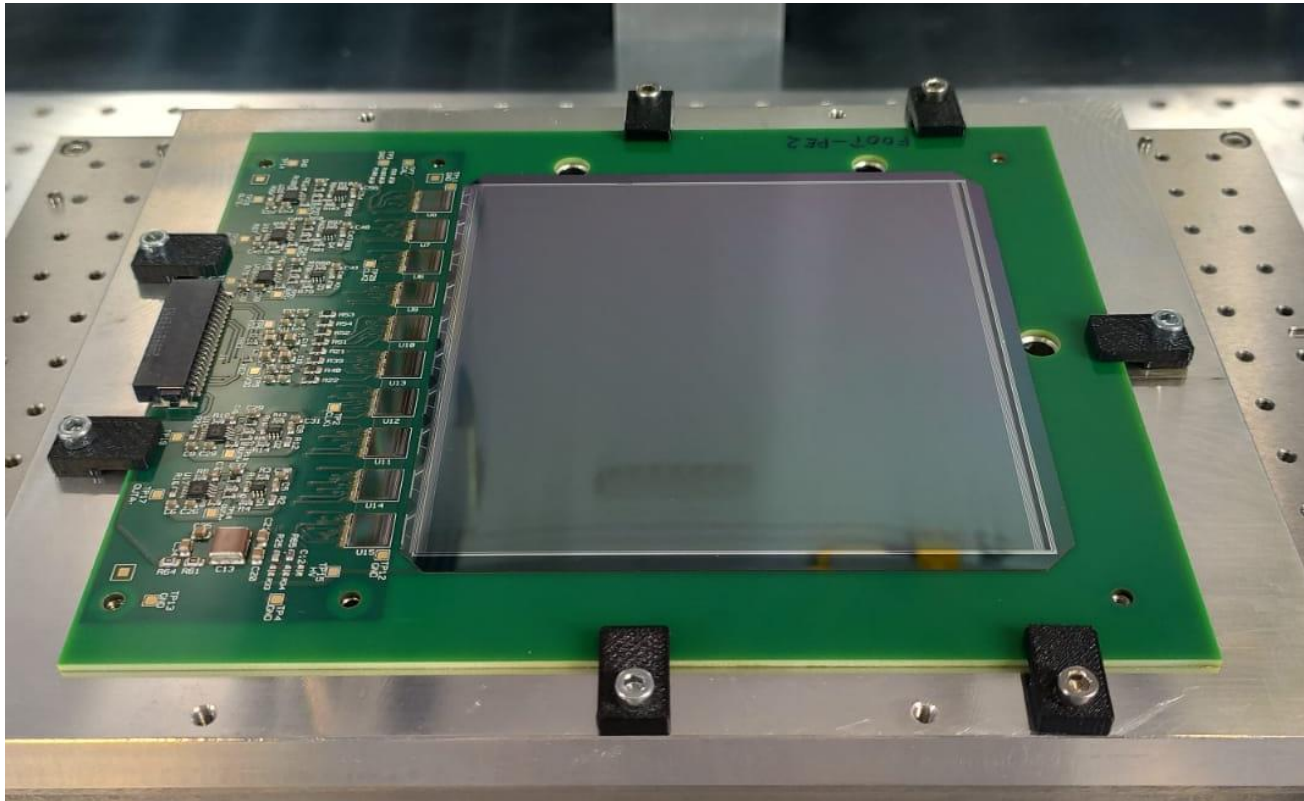
Raw Sigma for filecalibrations/foot\_3305



Bad Hybrid

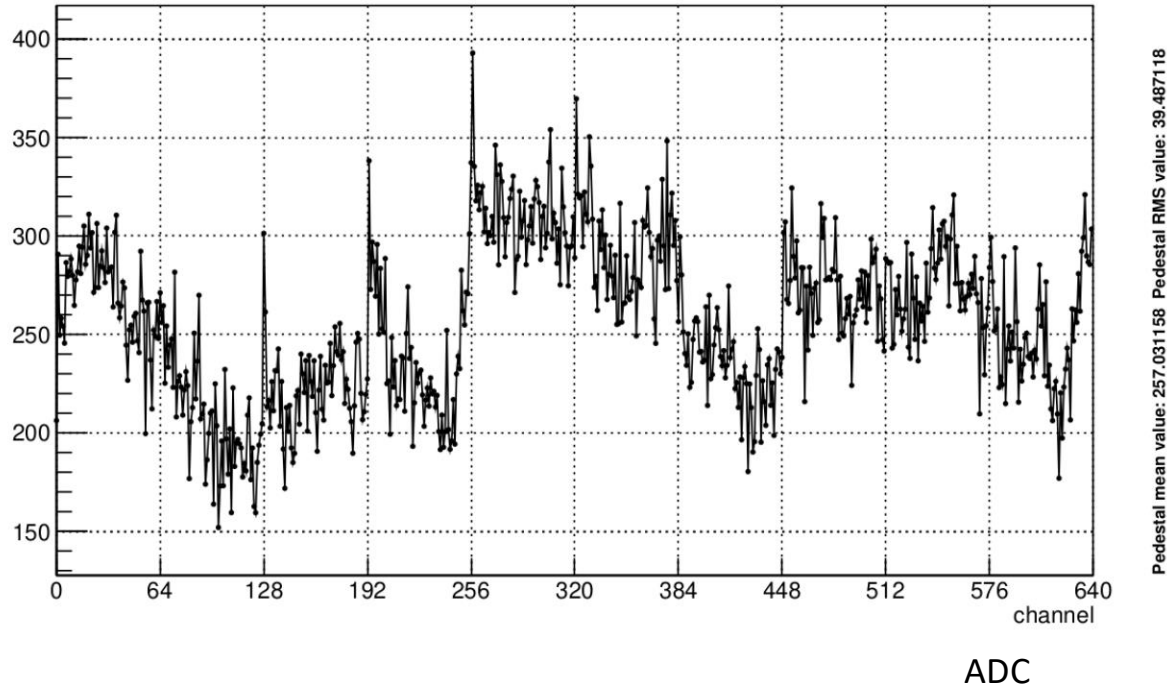


# First Final Prototype: FOOT\_PE02

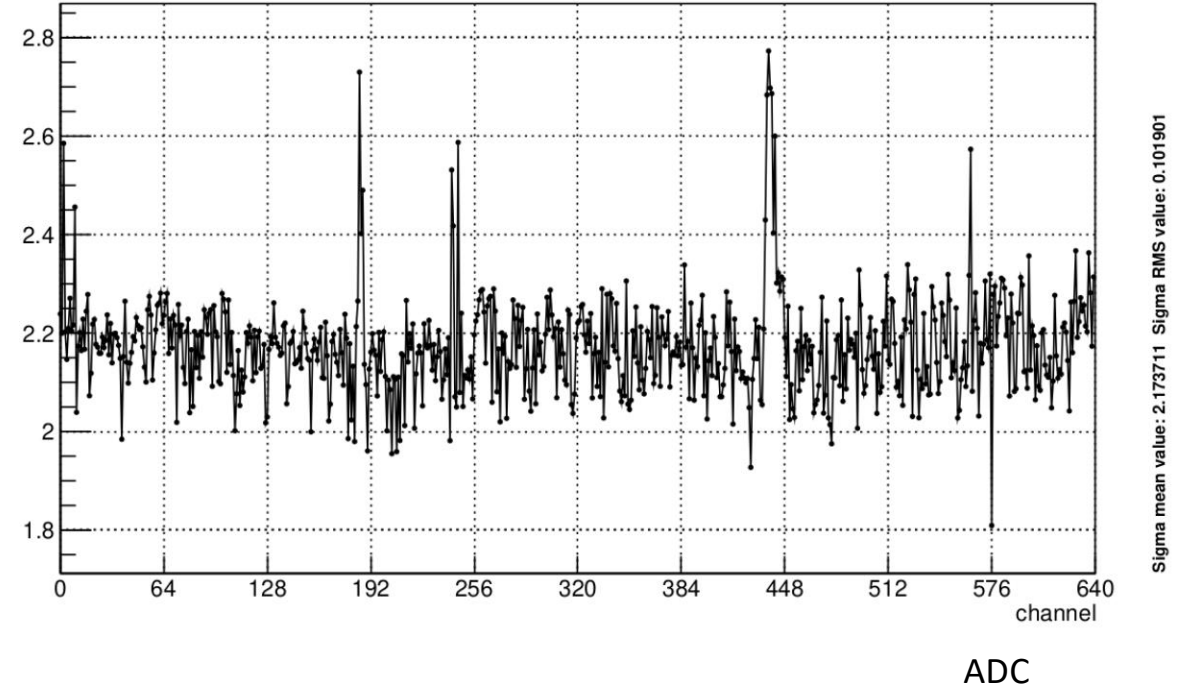


# Typical Noise of the detector

Pedestals for file calibrations/foot\_3362\_1



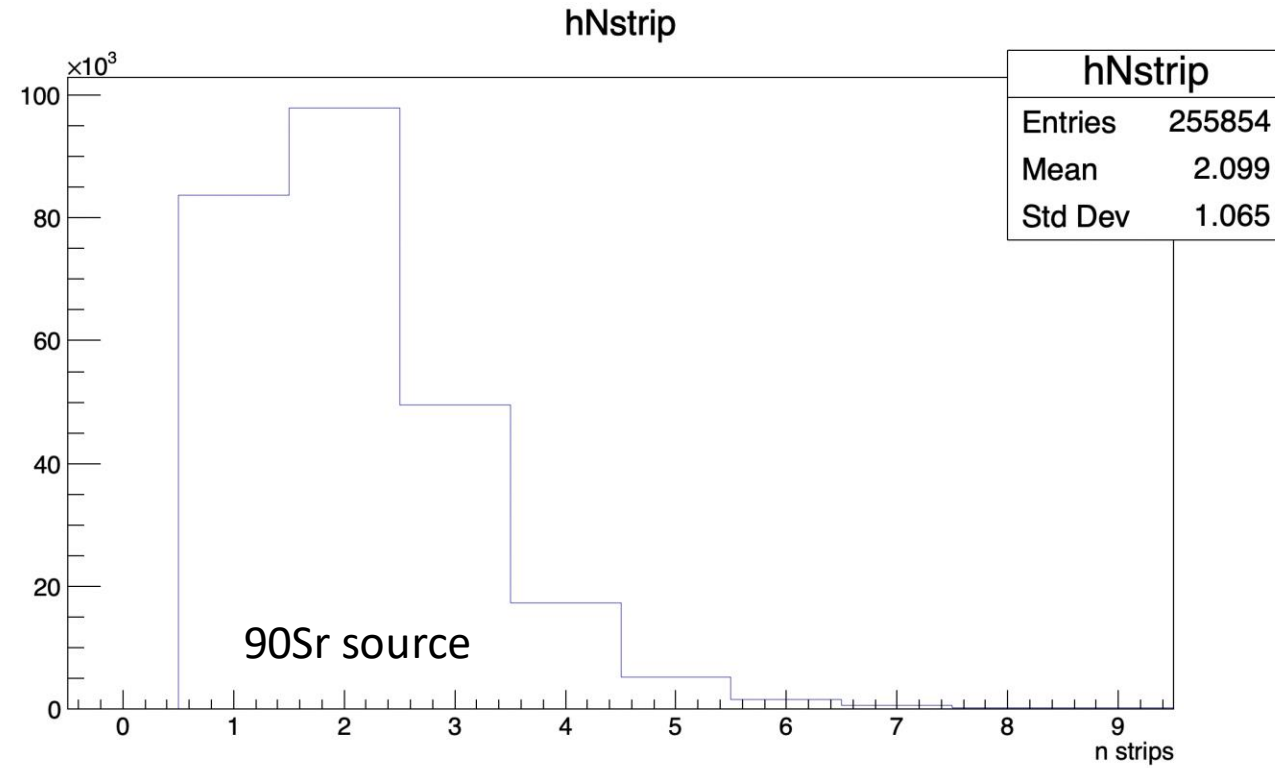
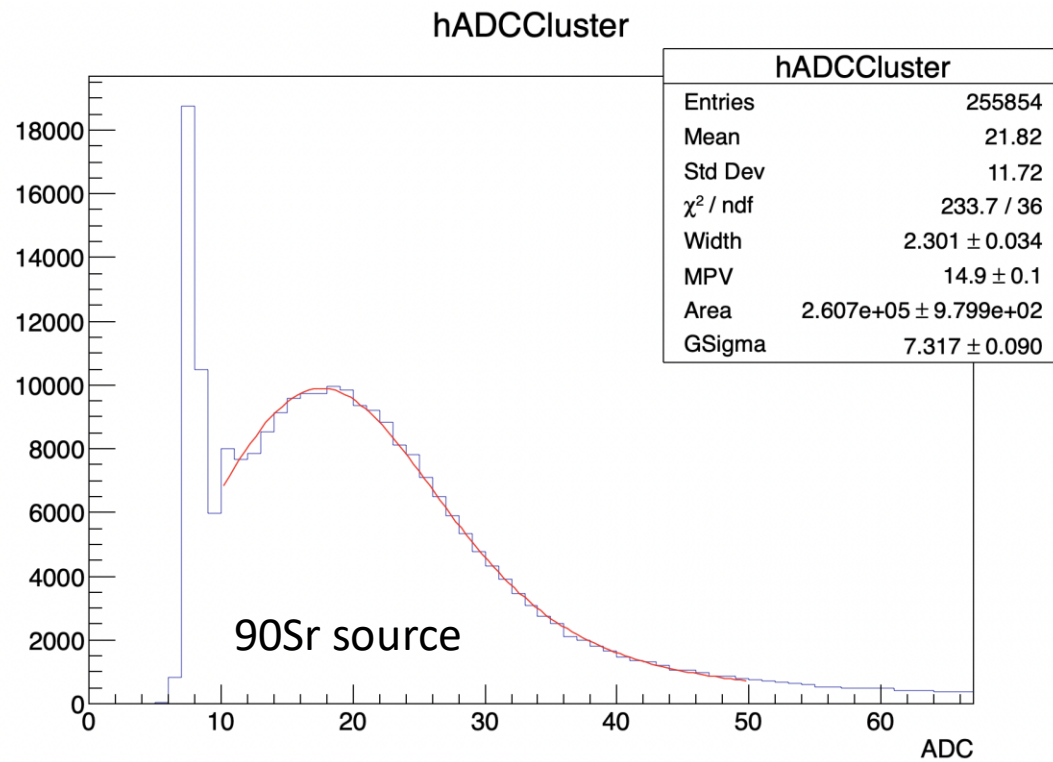
Sigma for file calibrations/foot\_3362\_1



- Mean pedestals value of readout electronics  $\approx 260$  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



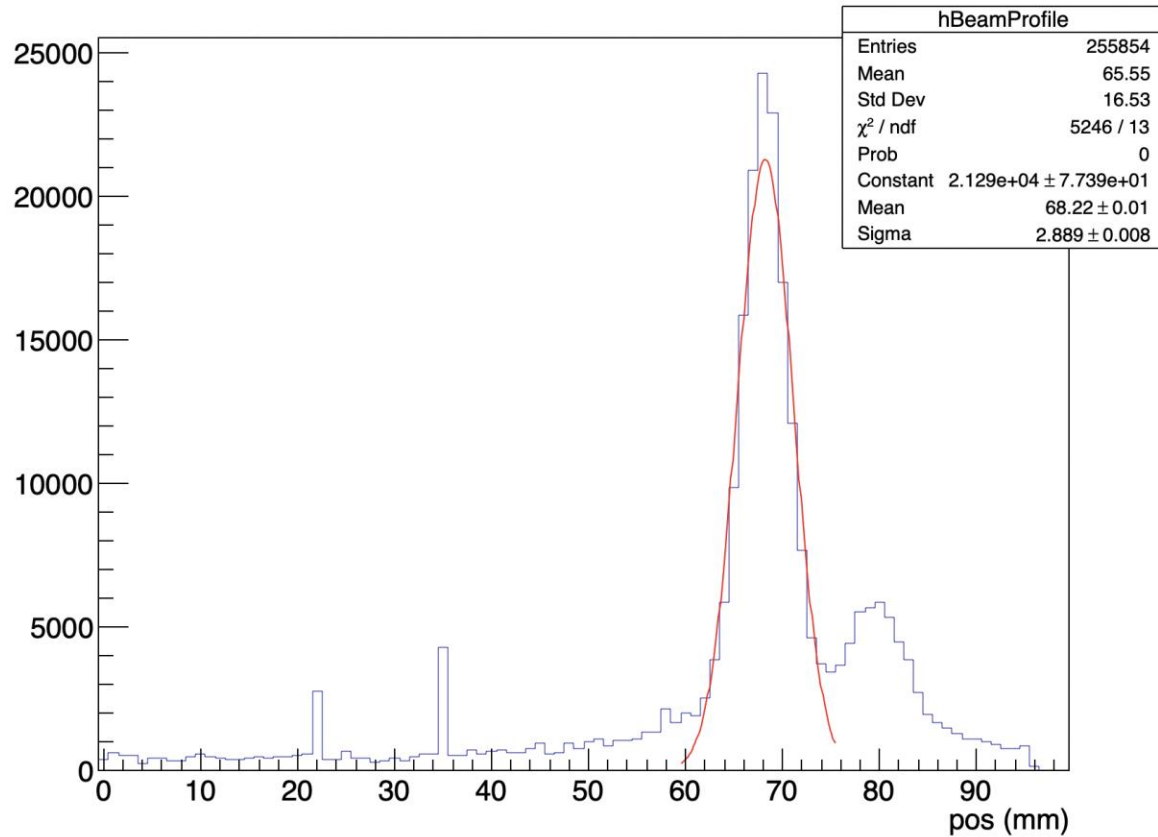
# Signal distributions



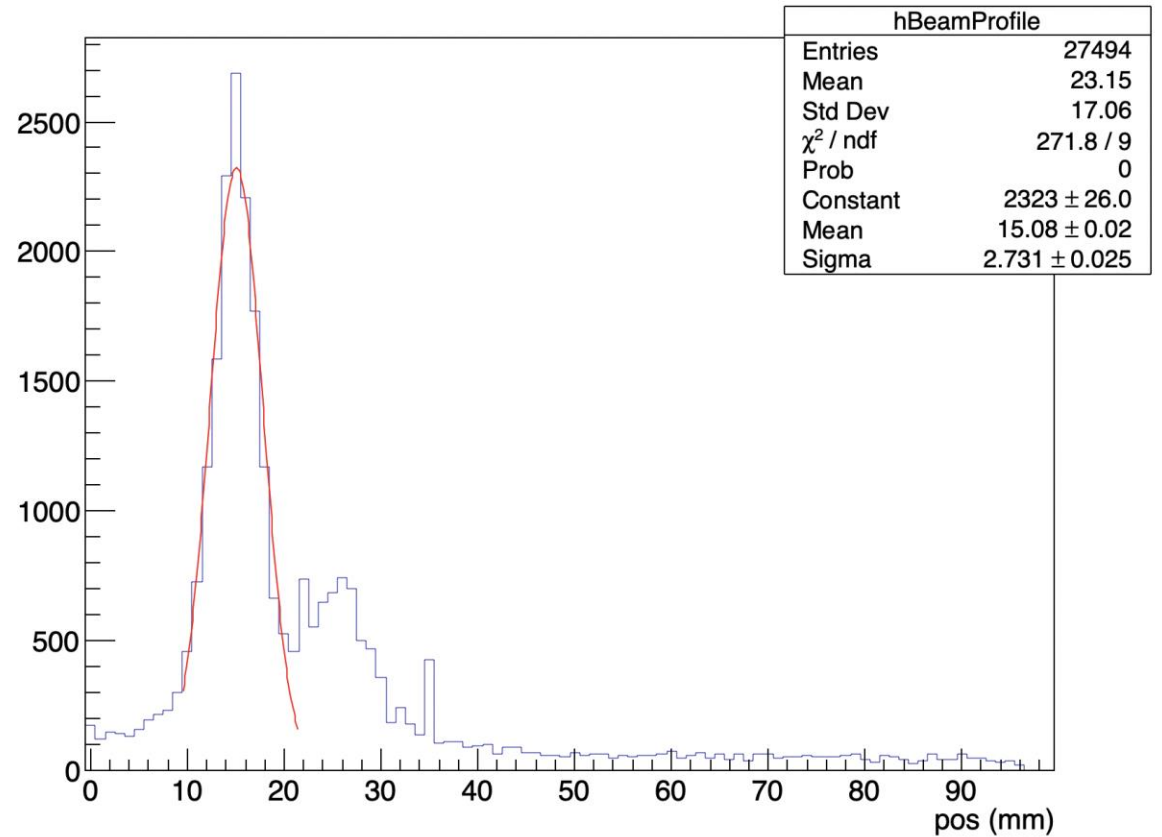
- Signals from 90SR radioactive source
- Most Probable Value compatible with the values from the first prototype
- Cluster width as expected from a MIP

# Clusters Position Distributions

hBeamProfile



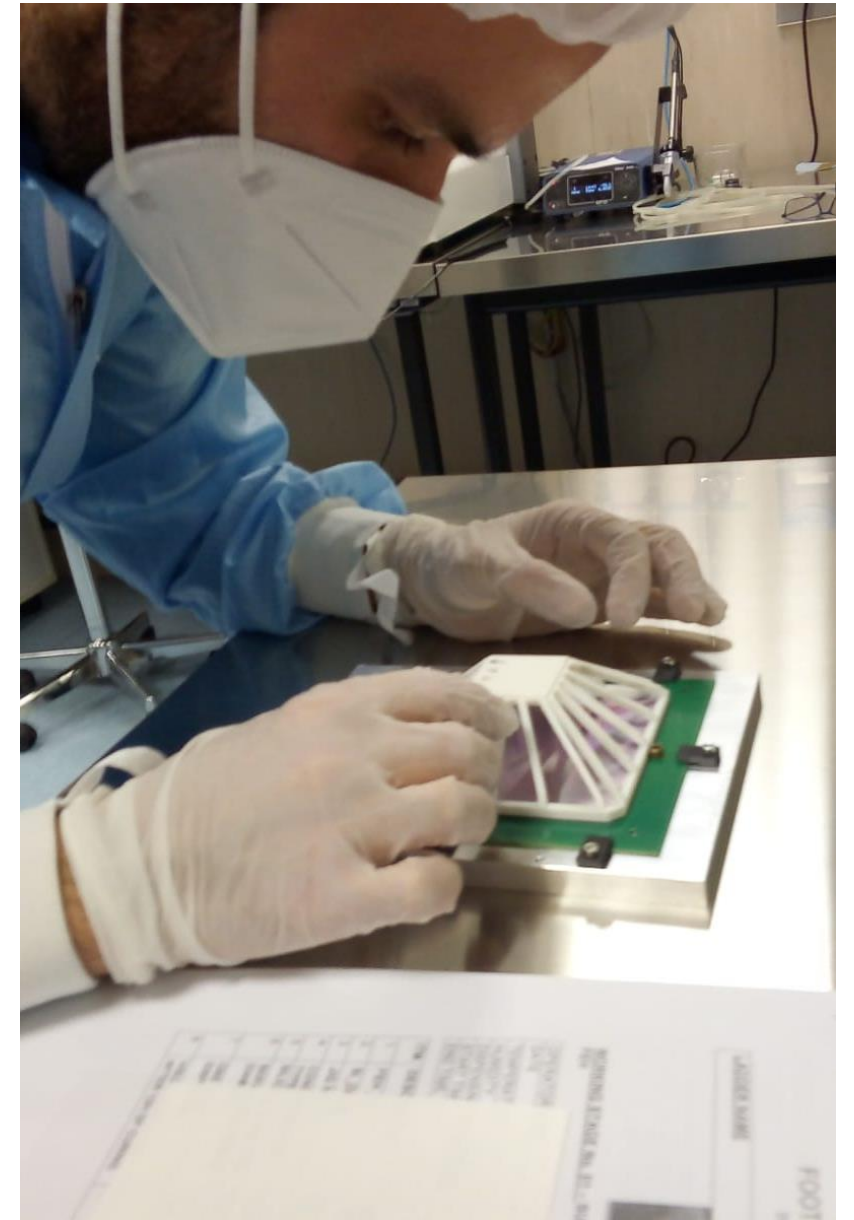
hBeamProfile



- 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

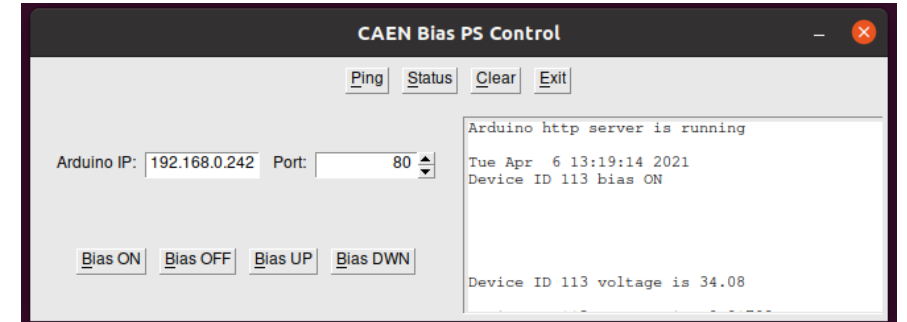
- Build the other detectors
- Study systematics after construction assembly



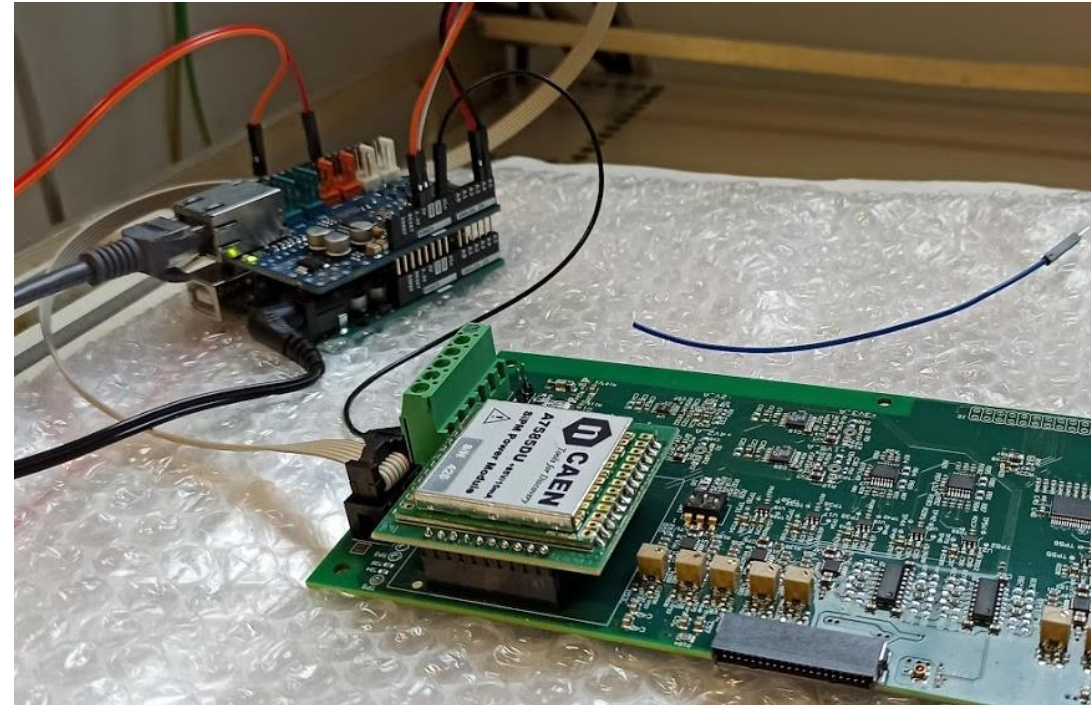
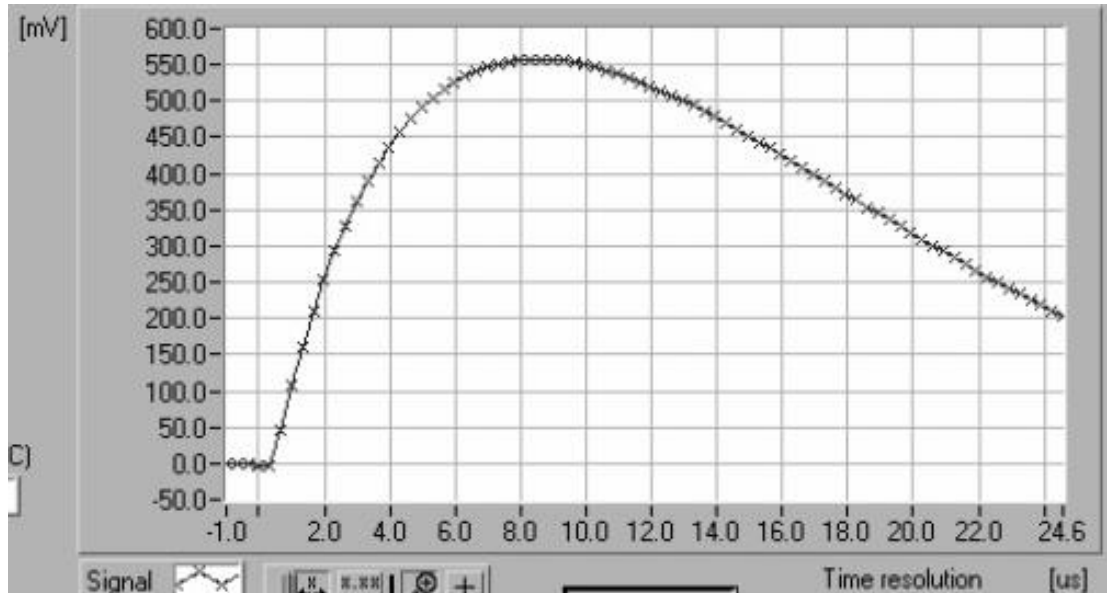


# ToDo

- 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