

# Status of the MONSTER detector

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on behalf of the MONSTER collaboration

<sup>1</sup>CIEMAT , VECC, JYFL, IFIC, UPC

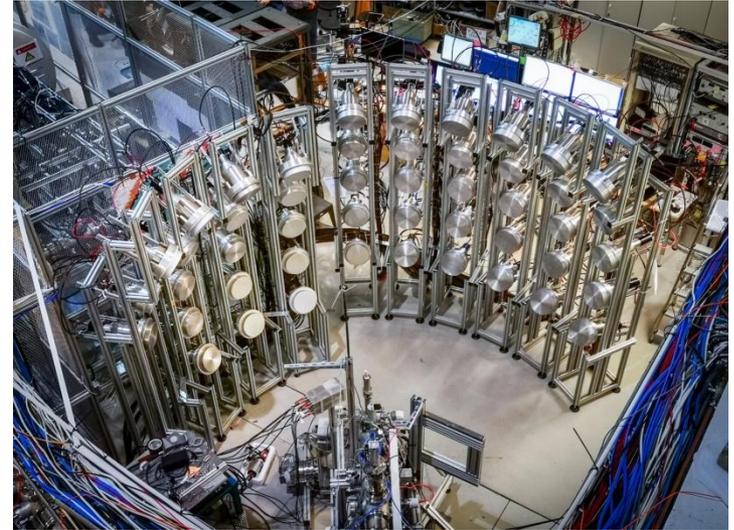
# Status of the MONSTER hardware

## MONSTER cells

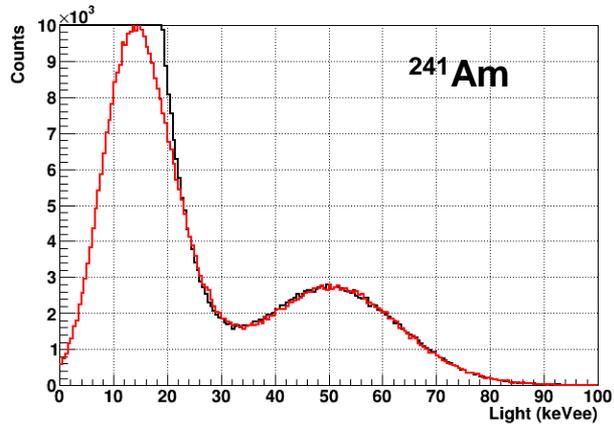
### Liquid scintillator (BC501A, EJ301)

- CIEMAT : 45 detectors (+ complete electronics / supports)
  - 26 St. Gobain
  - 19 CIEMAT/Scientifica (CiSci - made in Spain)
  - 45 PMT R4144 (+ 1 PMT R11833 spare)
  
- IFIC : 3 CiSci+ 6 PMT R4144
- UPC : 3 CiSci
- JYFL : 8 CiSci + 8 PMT R11833
- VECC : 10 VECC detectors + PMT R4144

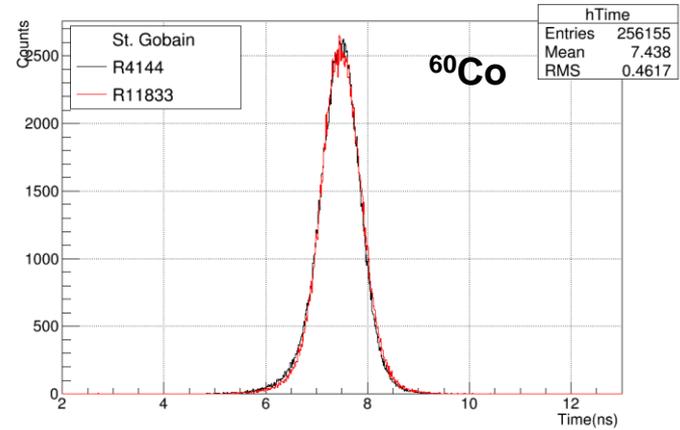
**Total: 69 detectors**



# MONSTER Performance

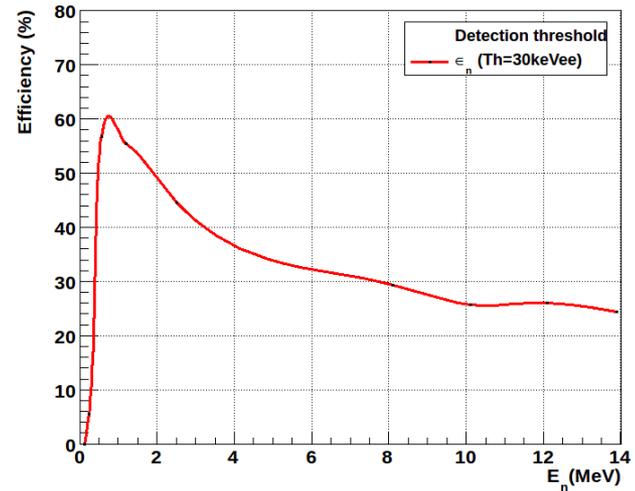
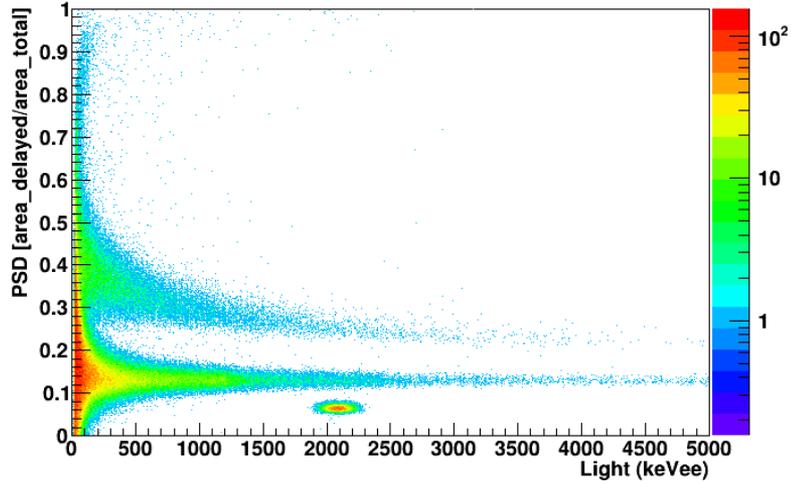


Threshold ~25 keVee



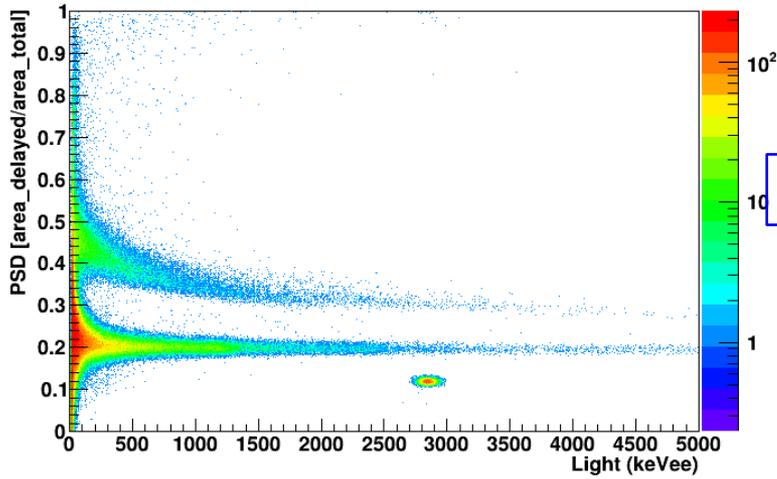
FWHM =  $0.81 \pm 0.03$  ns

SC009 -  $^{252}\text{Cf}$  source



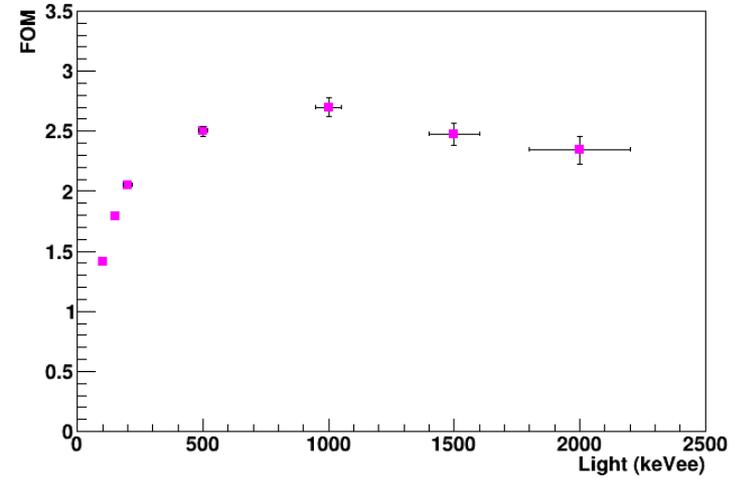
# MONSTER Performance

CA0122 -  $^{252}\text{Cf}$  source

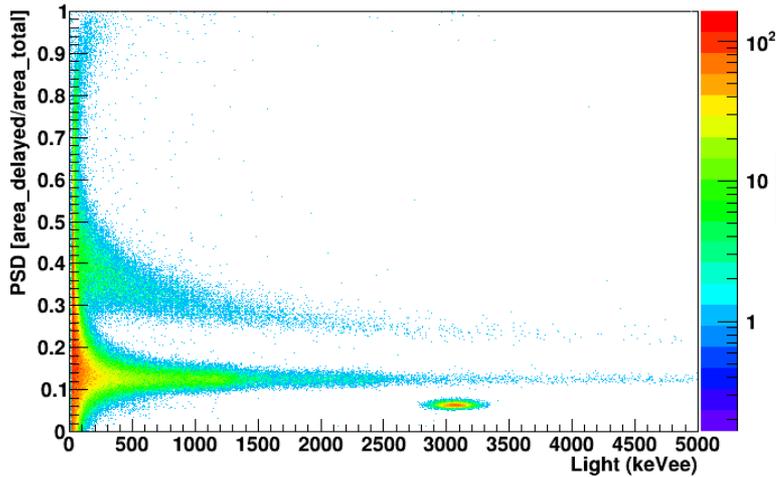


PMT R11833

CA0122 -  $^{252}\text{Cf}$  source - FOM variation

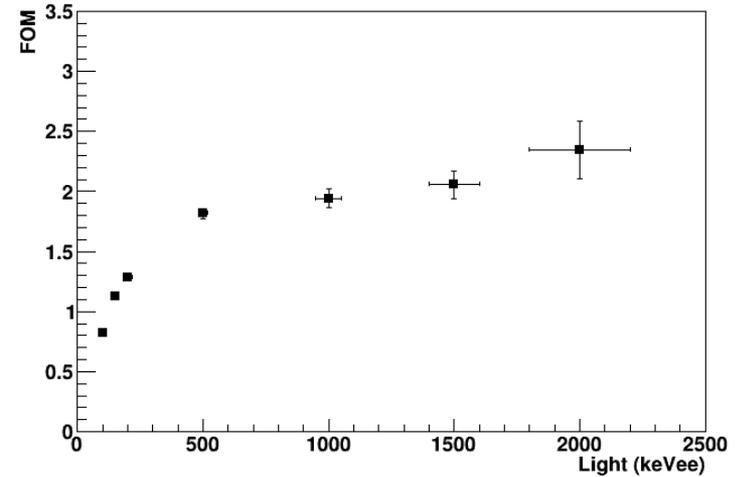


D122 -  $^{252}\text{Cf}$  source



PMT R4144

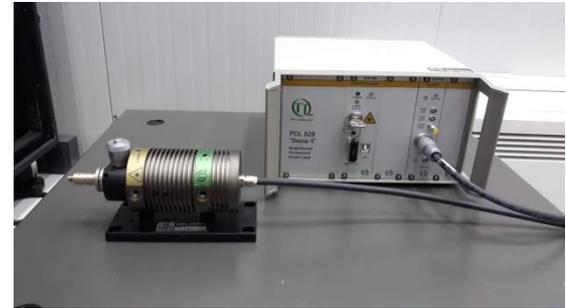
D122 -  $^{252}\text{Cf}$  source - FOM variation



# Status of the MONSTER hardware

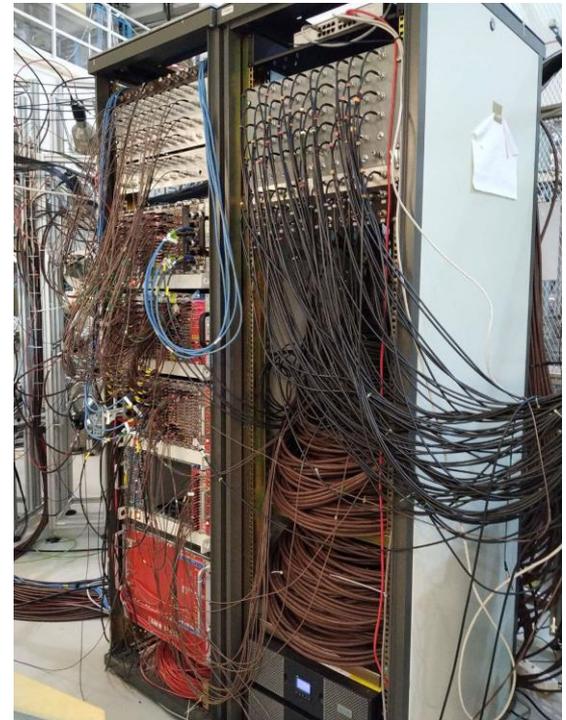
## Laser driven gain stabilisation system (CIEMAT)

- Laser + driver
- Optical fibre bundles for 100 detectors
- NaI reference well detector (identical to the IFIC design for DTAS)



## Electronics (CIEMAT, JYFL, VECC)

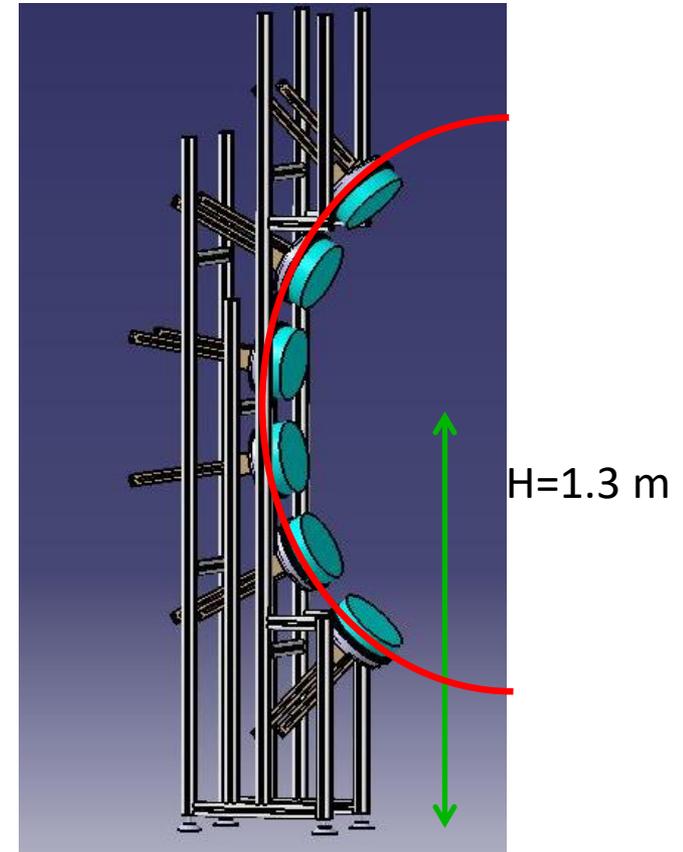
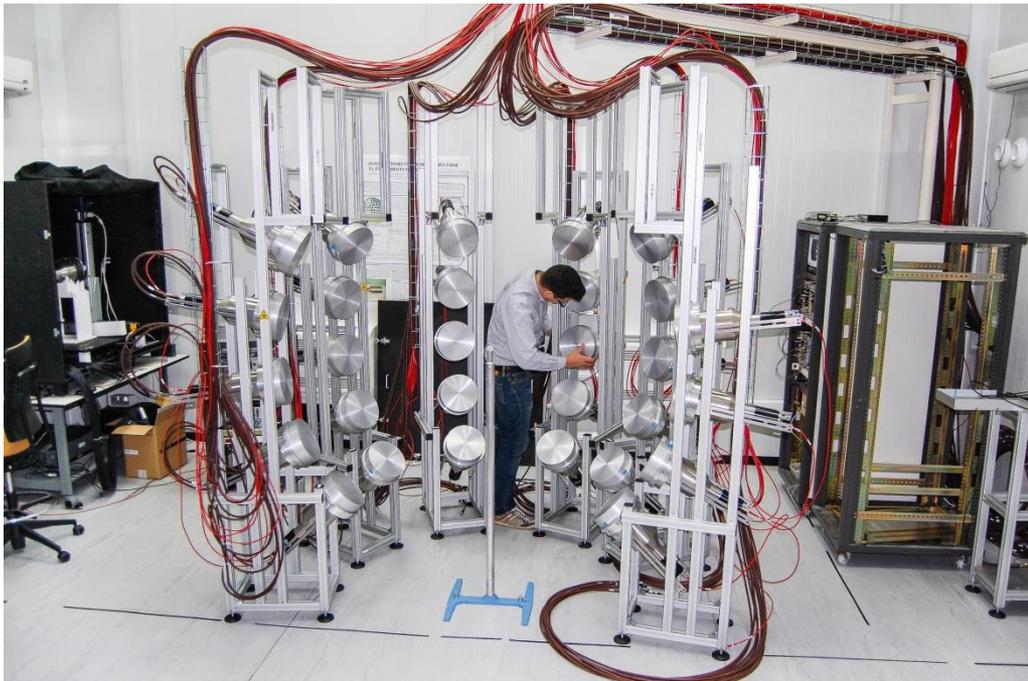
- Signal cables (low attenuation) 15 m long
- HV cables 15 m long
- HV Mainframe + cards
- Trigger electronics (several NIM crates)
- UPS



# Status of the MONSTER hardware

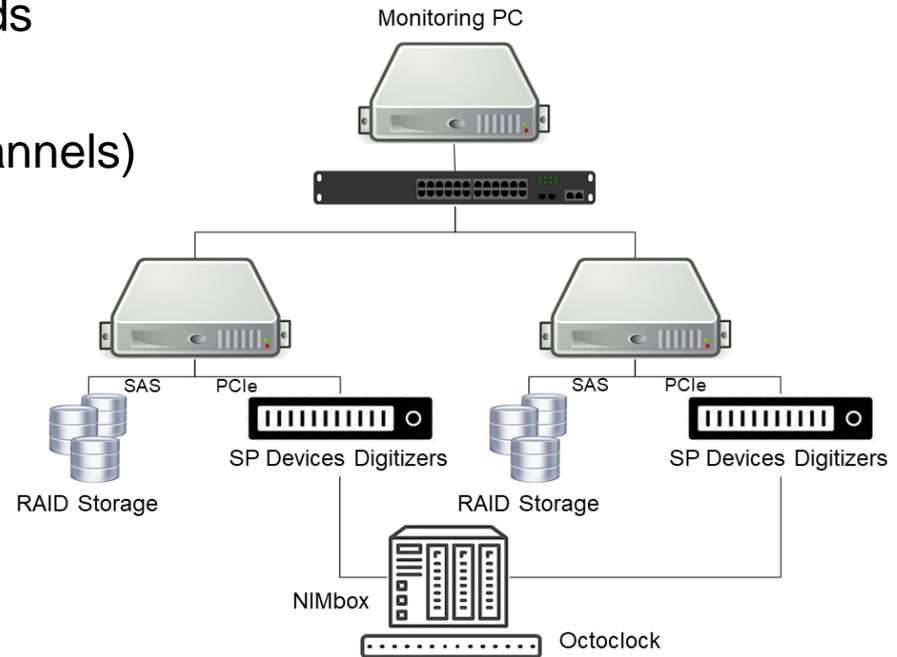
## Detector supports

- 8 CIEMAT + 2 JYFL
- Aluminum profile
- Rack type 2.5 m height
- Beam height 1.35 m



# MONSTER DAQ architecture

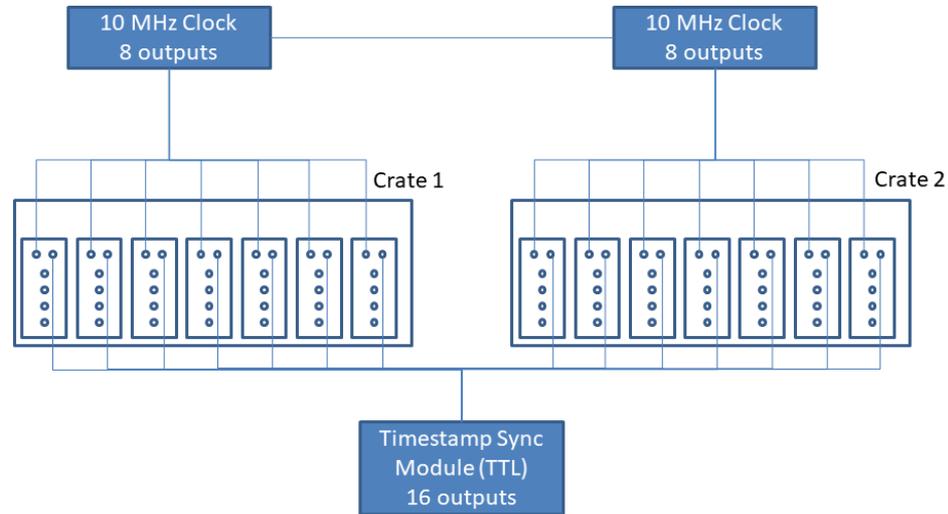
- SP Devices ADQ14DC-VG with 4 channels (1 GS/s, 14-bit)
- PCs with a PCIe crate containing 6-8 cards
- Disk storage systems (96 TB/PC)
- NI Octoclock-G CDA-2990 (10MHz, 8 channels)
- Two types of operation
  - triggered
  - triggerless
- Triggering/veto system developed for a Wiener digital logic programmable module
- Max data flow  
Raw data: 600MB/s/PC  
Processed data: 1600MB/s/PC (6000 sig/s/detector)



# MONSTER DAQ Timestamping

## Standalone:

- Common clock to all ADQ14DC
- Synchronization by reset the timestamp with external signal



## As sub-system:

- Available clocks (white rabbit?)
- Synchronization for Absolute Time (T0 signal)
- Correlation with implantation detectors, gamma detectors, beam information (and other subsystems)

# MONSTER DAQ status

## CIEMAT DAQ

- 14 x ADQ14DC (4 channels, 14 bit & 1 Gsample/s)
- 2 high end PCs (+1 already ordered)
- 5 Xeon Phi PCIe multicore coprocessor boards
- 2 x 96 Tbyte disk servers
- 2 x PCIe expansion boxes
- DAQ Software is running and tested in a first experiment.
- On-line analysis software (CIEMAT version)  
based on ROOT is running

## JYFL DAQ

- 2 x ADQ14DC
- 1 PC + Disk server

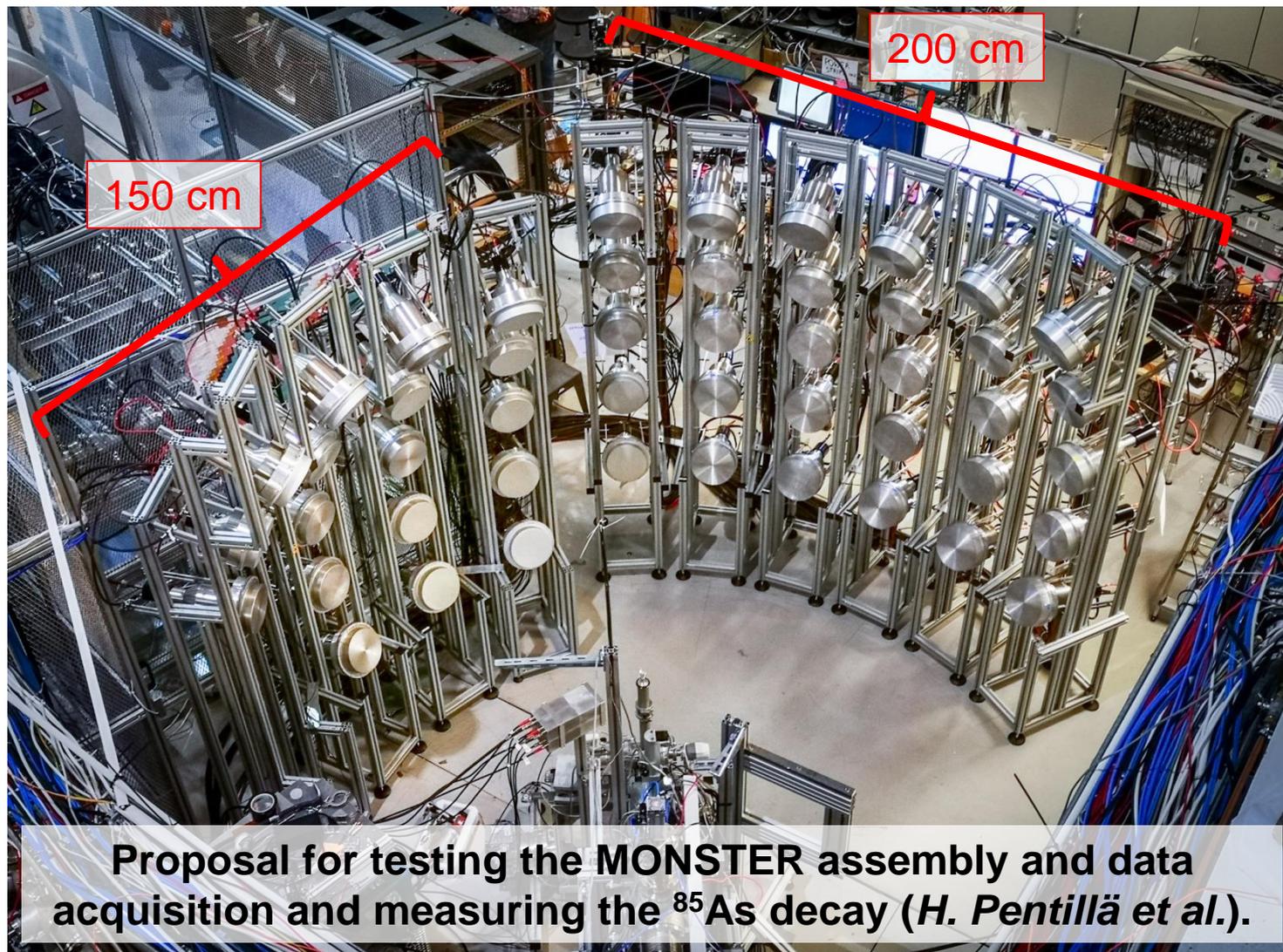
Total: 64 channels

## VECC DAQ

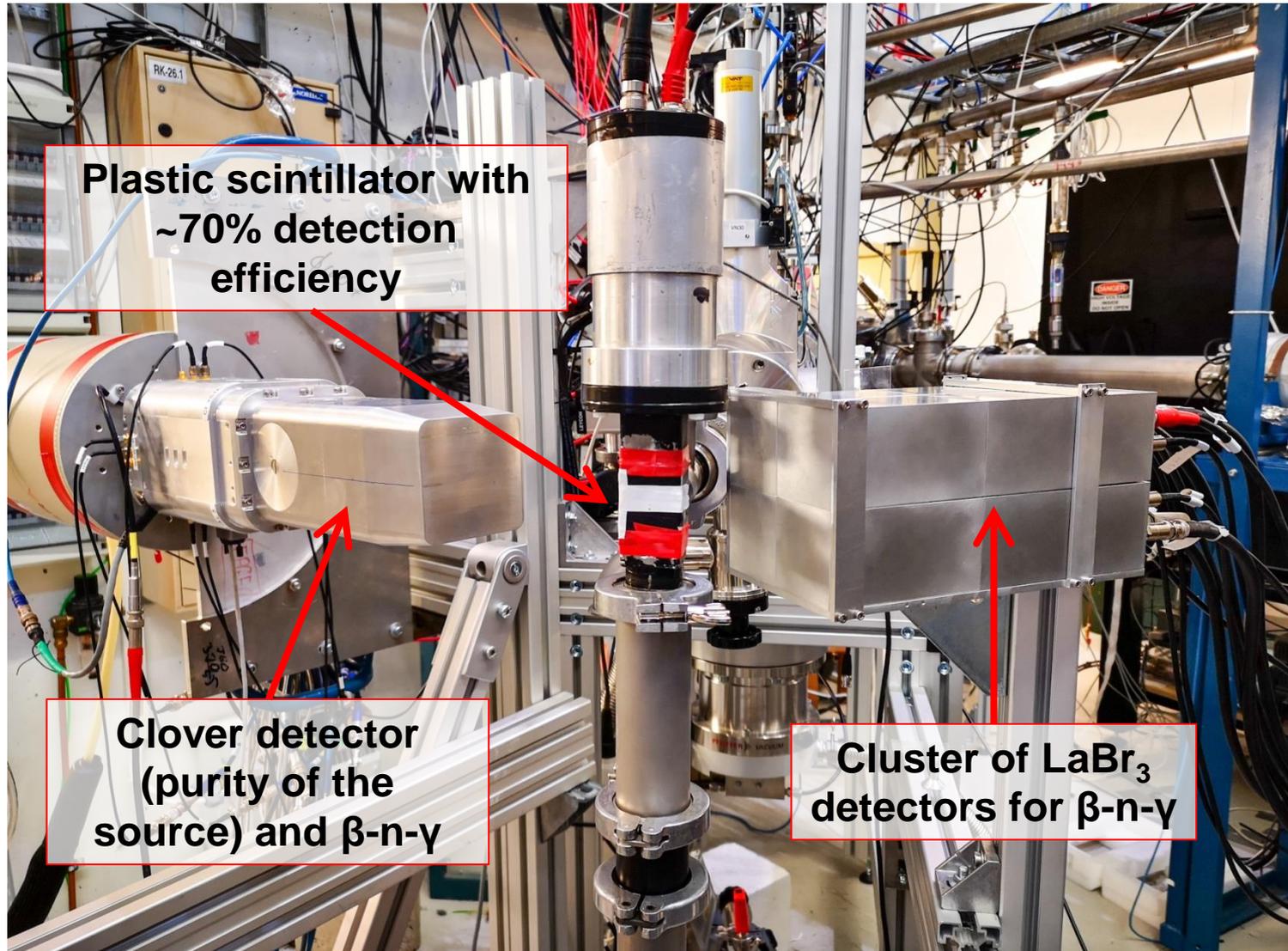
- Master control software under development at VECC.
- 2 x ADQ14DC (8 channels total).



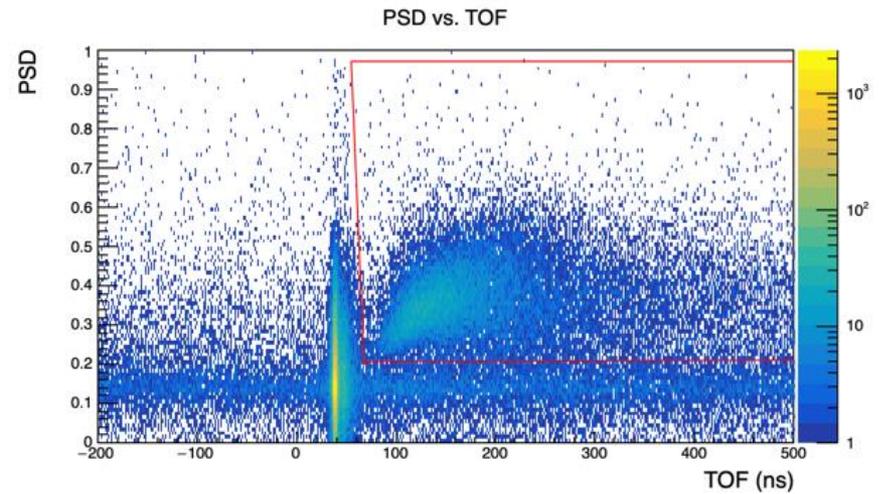
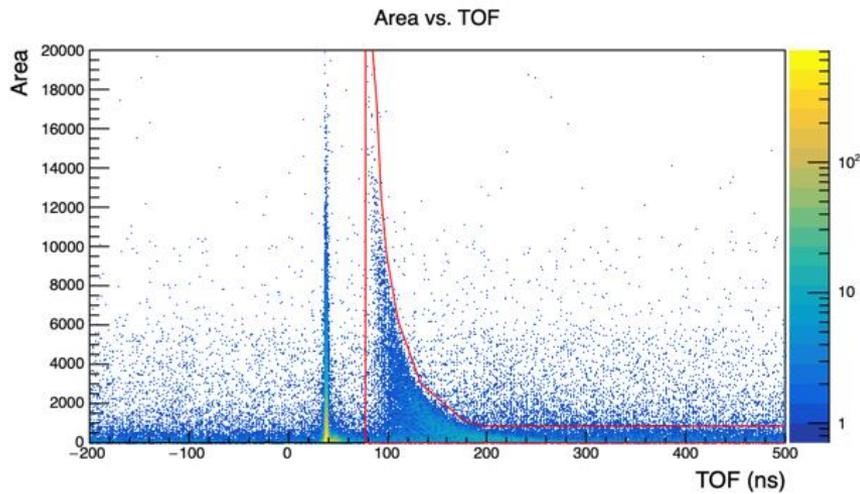
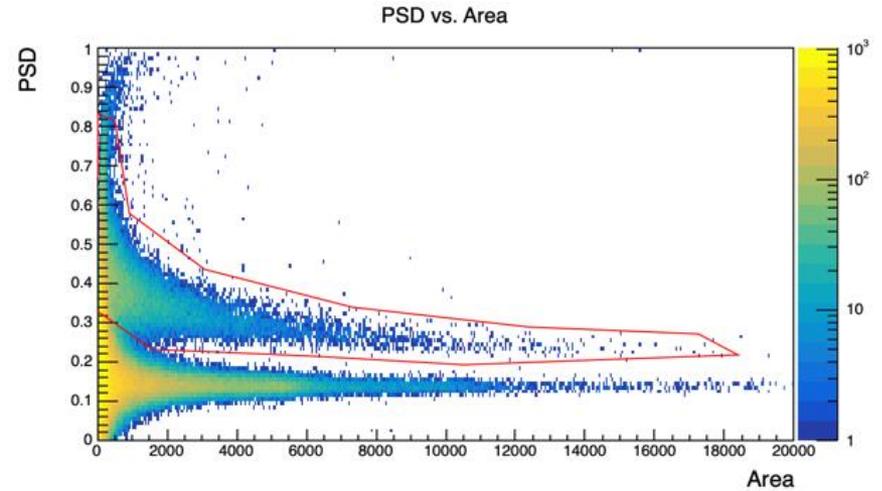
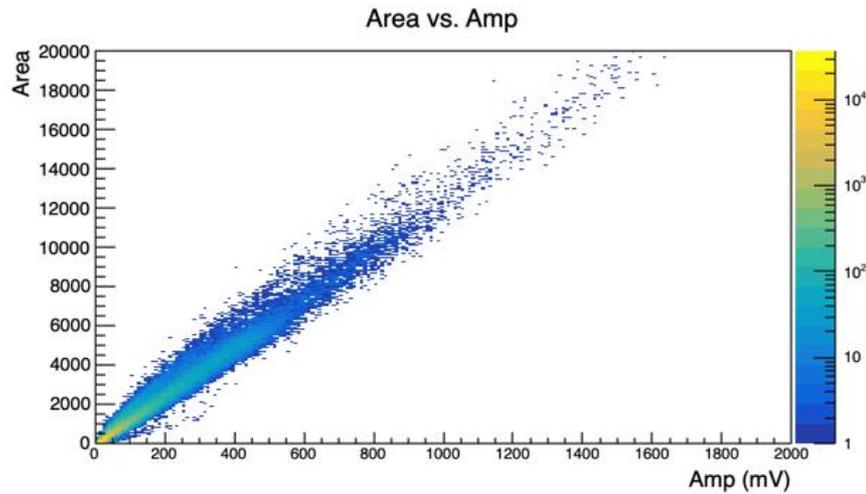
# $^{85}\text{As}$ $\beta$ -delayed neutron emission (I240 – March 2019)



# The $\beta$ -n- $\gamma$ detection setup



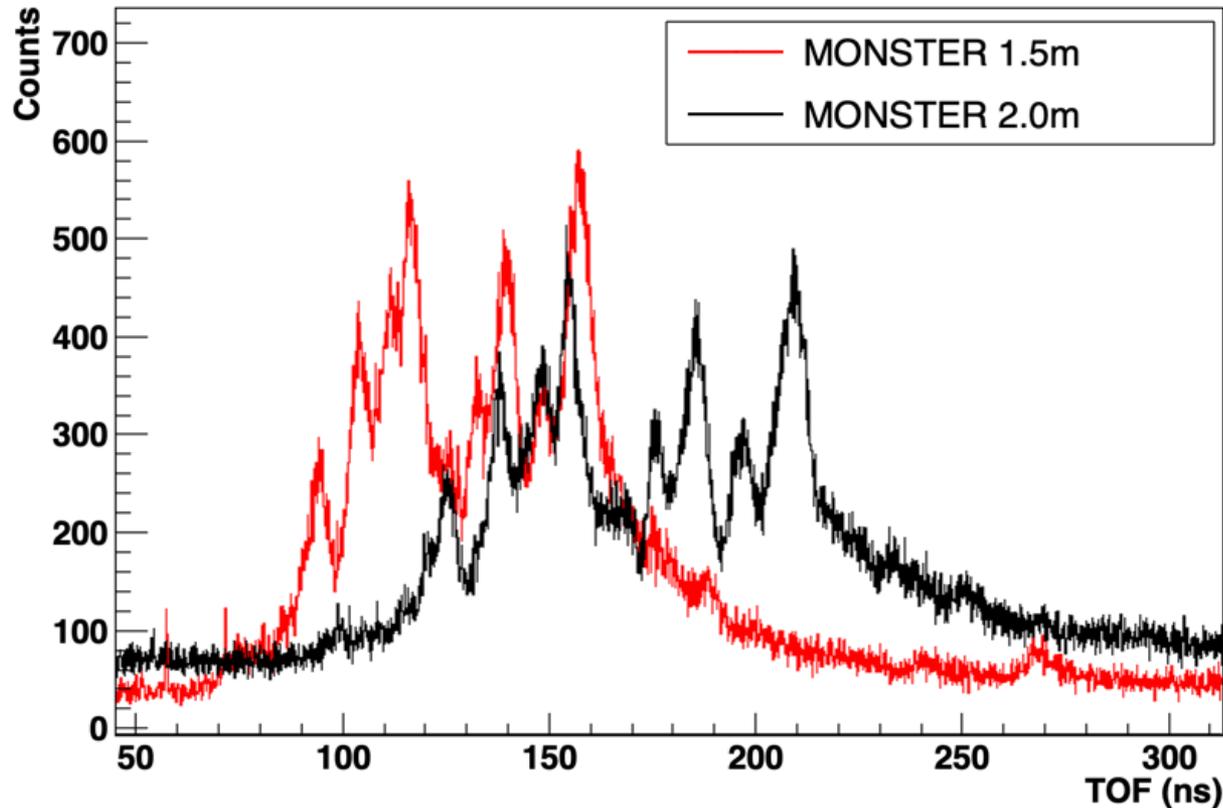
# Event selection via conditions in 2D spectra



## Comparison of the two arrays

Counts in the 150 cm array: 262000  $^{85}\text{As}$   $\beta$ n counts +  $\sim 90000$  background counts

Counts in the 200 cm array: 223000  $^{85}\text{As}$   $\beta$ n counts +  $\sim 180000$  background counts



Data analysis in progress (A. Perez PhD thesis)

# Future measurements

**Tests with a few modules (4) at GSI/FAIR. When? How long?**

## **Approved experiment at the ALTO facility**

- Measurement of  $^{83,84}\text{Ga}$ ,  $^{81}\text{Zn}$
- Foreseen dates: first half of 2020
- Duration: 2 weeks ( + preparation = 1 month)

## **Under discussion, JYFL facility**

- Proposal on Isotopes of interest in nuclear technology, structure and astrophysics
- Duration: 1-2 months (campaign)
- New beam line MR-TOF available at IGISOL until Summer-2020 (Fall 2020)

We are going to organise a MONSTER workshop at CIEMAT open to everybody who is interested (DESPEC, HISPEC?, ALTO, ISOLDE, JYFL, other facilities...) in late 2019 or early 2020

# MONSTER at GSI

Run test in Nov-Dec 2019

- Beta decay with neutron emission (background measurement?)
- Correlation with the implantation system (AIDA?) and other running subsystems.
- few MONSTER detectors included

- Setup for the MONSTER test.

- Where? Positions available for setting up the MONSTER modules (TOF distance, height...).
- Who? Modification of the CIEMAT supports (extra platform).

- DAQ.

- Integration of MONSTER DAQ + Subsystem DAQs?
- FAIR (despec) DAQ ?
- Requirements for the MONSTER DAQ (synchronisation and timestamping method) for the operation at GSI/FAIR Phase-0

