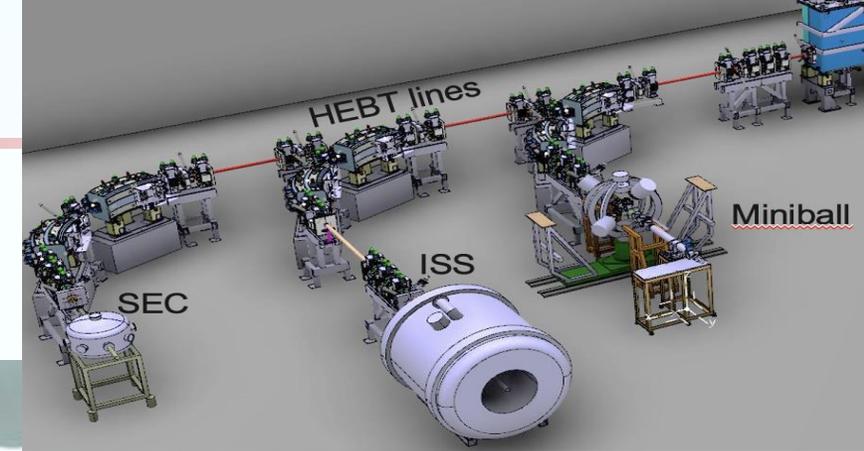
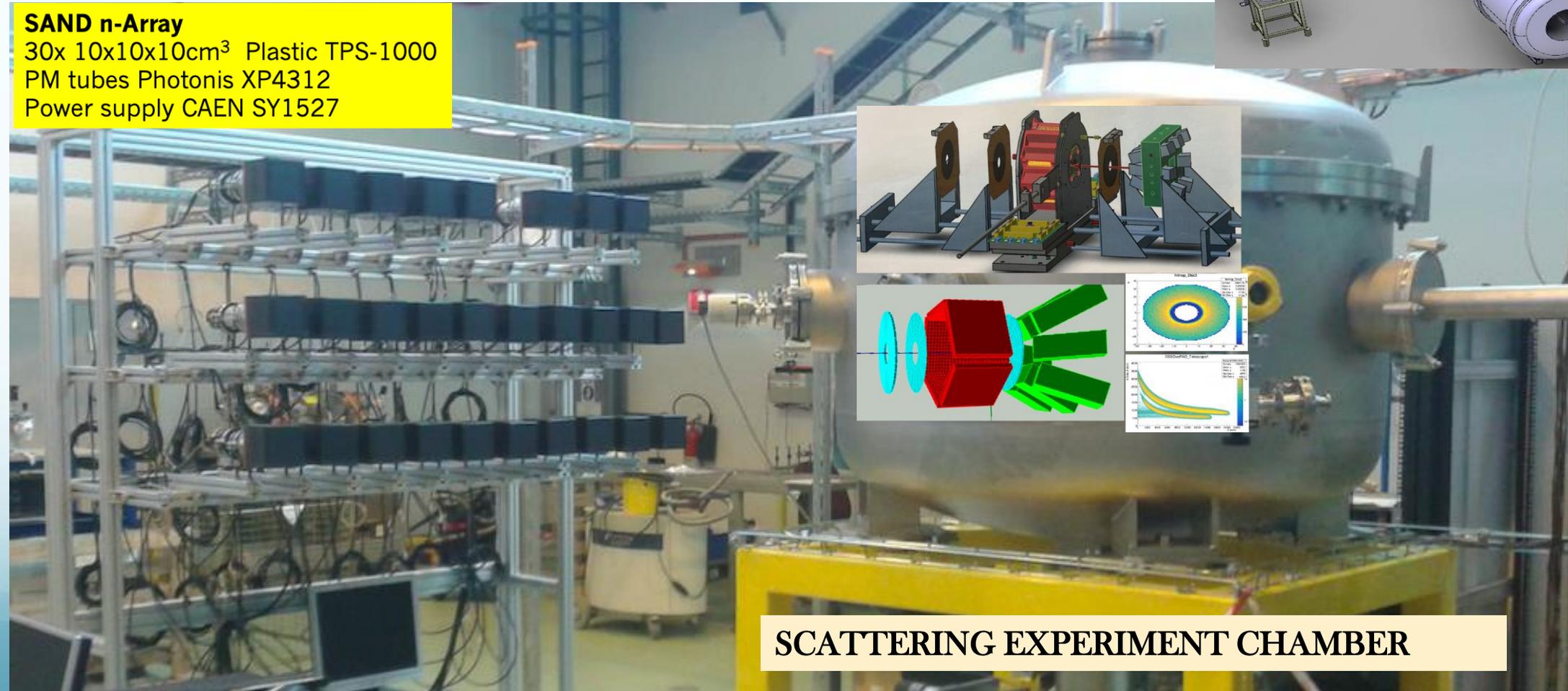


# SEC @ XT03 HIE ISOLDE



**SAND n-Array**  
30x 10x10x10cm<sup>3</sup> Plastic TPS-1000  
PM tubes Photonis XP4312  
Power supply CAEN SY1527



**SCATTERING EXPERIMENT CHAMBER**

# What is there: Beam diagnostics installed

Outgoing beam  
beam

F-cup  
Si-telescope  
Pepperpots  
 $10^3 - 10^4$   
reduction



Incoming  
beam

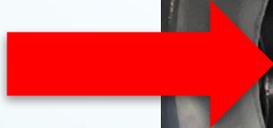
Fluorescence screen  
Collimators



IS698



Target ladder



1m diameter

$5 \cdot 10^{-7}$  mBar

- 2016 IS561 @ XT02.** K. Riisager *MAGISOL* Study of  $^9\text{Li}$  Transfer reactions at the neutron dripline on deuteron target. HIE-ISOLDE comissioning year

MAGISOL setup
- 2017.** IS619 I. Martel O. Tengblad Effects of the neutron halo in  $^{15}\text{C}$  scattering at energies around the Coulomb barrier

**TALK Vicente**

GLORIA setup
- 2018 before the CERN LS2**

  - IS616 A. Di Pietro INFN Catania Reaction mechanisms in collisions induced by  $^8\text{B}$  beam close to the barrier.

**TALK Alessia**

GLORIA setup
  - IS561. K. Riisager *MAGISOL* Study of  $^9\text{Li}$  Transfer reactions at the neutron dripline on deuteron target.

MAGISOL setup
  - IS554 D. Gupta Bose Inst. Kolkata Search for higher excited states of  $^8\text{Be}^*$  to study the cosmological  $^7\text{Li}$  problem.  $^7\text{Be}(d,p)$

**$^7\text{Be}$  from ILL TALK Ismael**

MAGISOL setup
  - **IS629 C. Mazzocchi & K. Riisager Warsaw/Aarhus Beta decay of  $^{11}\text{Be}$  (implanted in time projection chamber with optical readout)**

**Warsaw Optical TPC**
  - IS581 M. Veselsky R. Raabe Determination of the fission barrier height in fission of heavy radioactive beams induced by the (d,p)-transfer using the ACTAR TPC

ACTAR TPC
  - IS607 C. Lederer The  $^{59}\text{Cu}(p,\alpha)$  cross section and its implications for nucleosynthesis in core collapse supernovae.

TUDA setup
  - **IS550 S. Heinz & E. Kozulin GSI/Dubna Study of the Dinuclear System  $^{\text{A}}\text{Rb} + ^{209}\text{Bi}$  ( $Z_1 + Z_2 = 120$ ).**

Dubna setup

## 2022 Startup after CERN LS2.

- **IS698** D. Galaviz IP-Lisbon  $\alpha$ -scattering on unstable proton-rich tin isotopes in inverse kinematics for the astrophysical p-process.  $^{112}\text{Sn}+^4\text{He}$  TALK Francisco

NEW DAQ  
MAGISOL

## 2023 -24?

- **IS690** MJ Garcia Borge MAGISOL Reaction studies with neutron-rich light nuclei at the upgraded SEC Device TALK Daniel friday
- **IS716** Y. Ayyad ( Determination of the  $\alpha$  decay width of a near-threshold proton-emitting resonance in 11B. (not SEC)

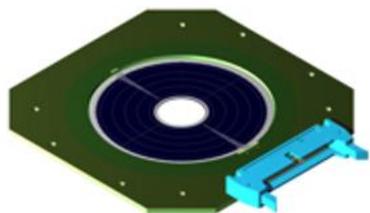
MAGISOL setup

IS716 setup

# What do we have available: charged particle detectors



- **S5** 60 & 300  $\mu\text{m}$



Junction number of elements	4x6 rings
Ohmic number of elements	16 sectors
Active area $\varnothing$ - inner (mm)	22
Active area $\varnothing$ - outer (mm)	70

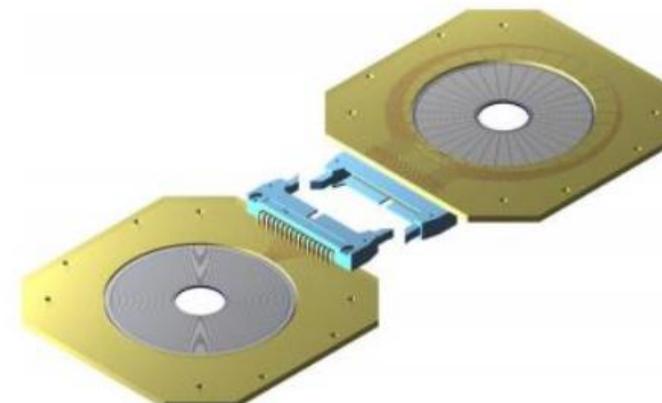
- **W1 DSSD**  
40 , 60 & 300  $\mu\text{m}$



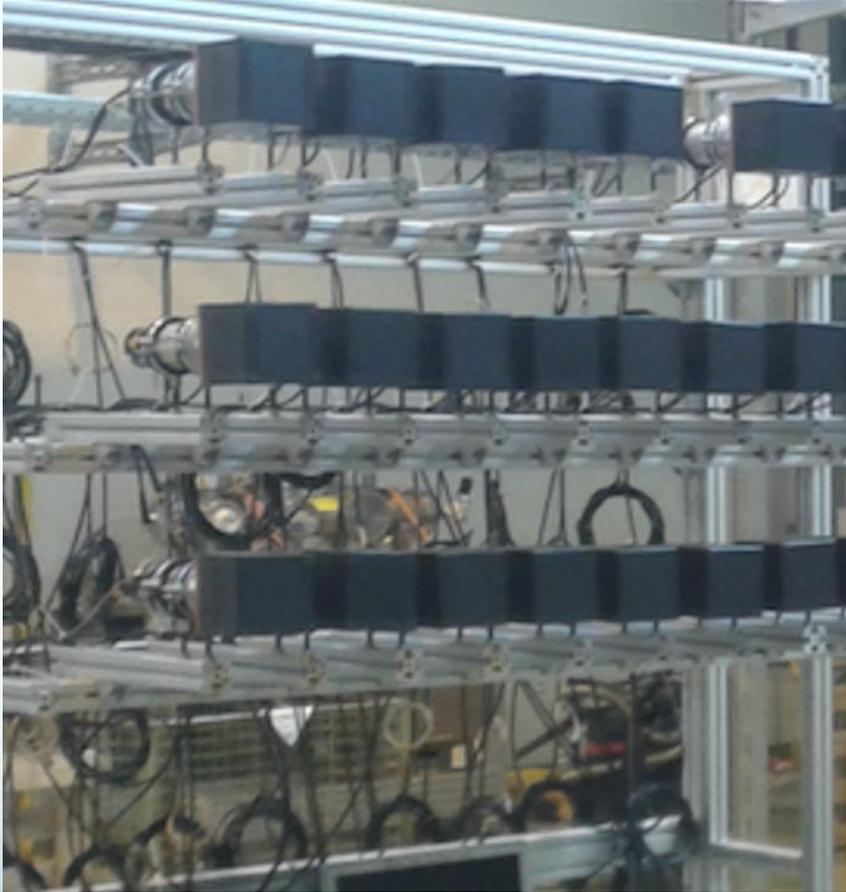
Design W1(DS)-300 7G/2M on a standard FR4 transmission package.

Junction elements 16  
Ohmic elements 16  
Active área 50x50 mm<sup>2</sup>

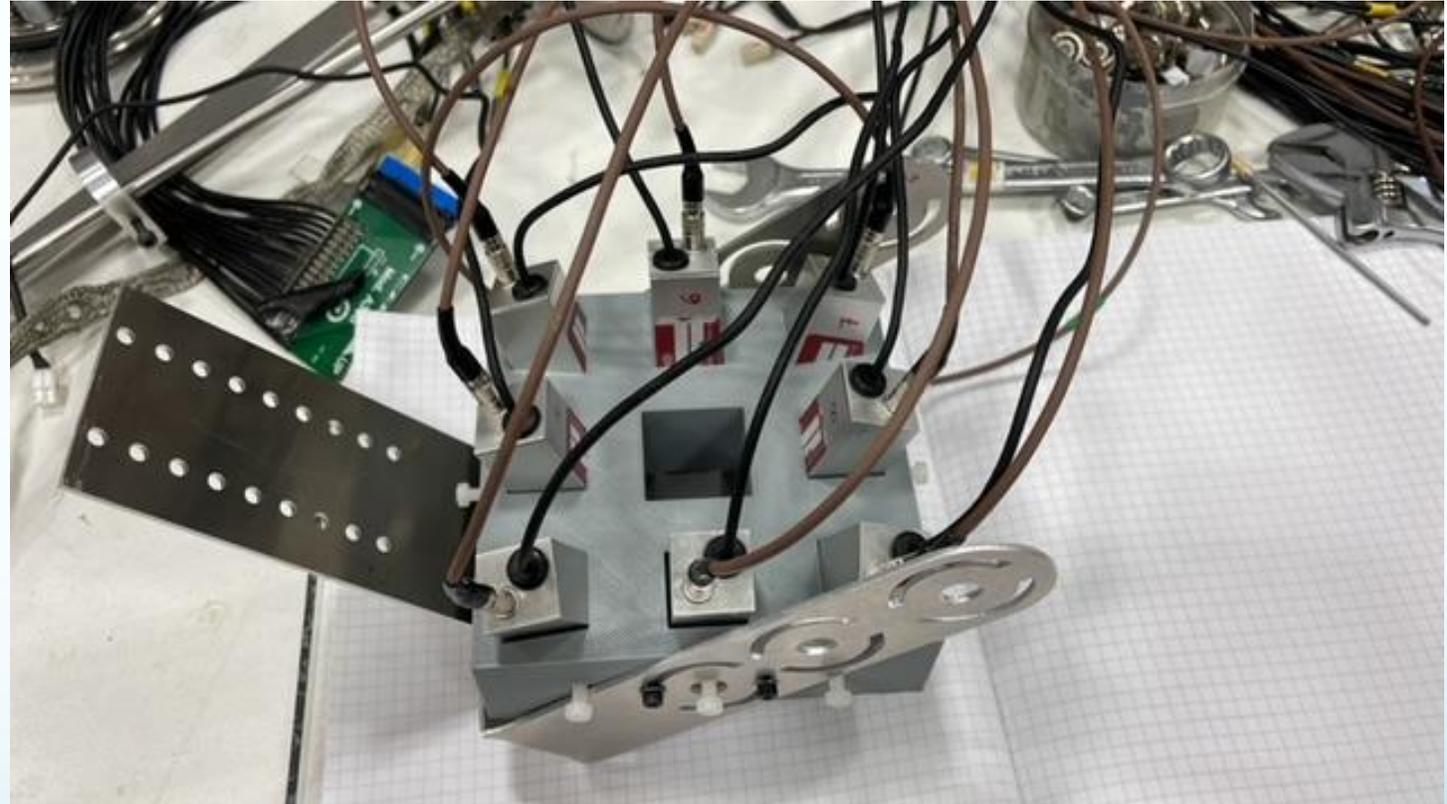
- **S3** 1000  $\mu\text{m}$



Junction number of elements	24 rings
Ohmic number of elements	32 sectors
Active area $\varnothing$ - inner (mm)	22
Active area $\varnothing$ - outer (mm)	70

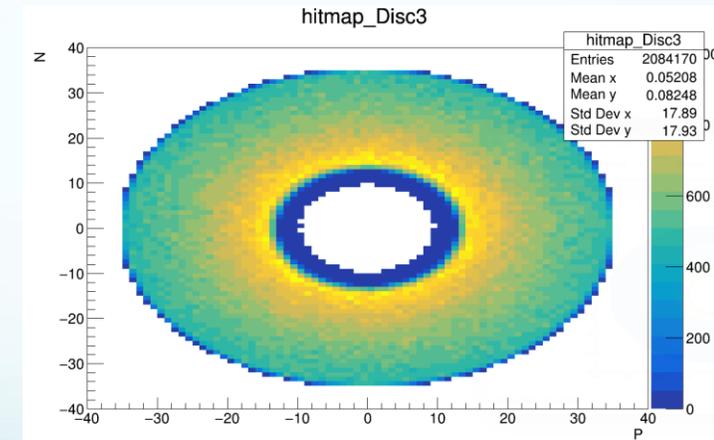
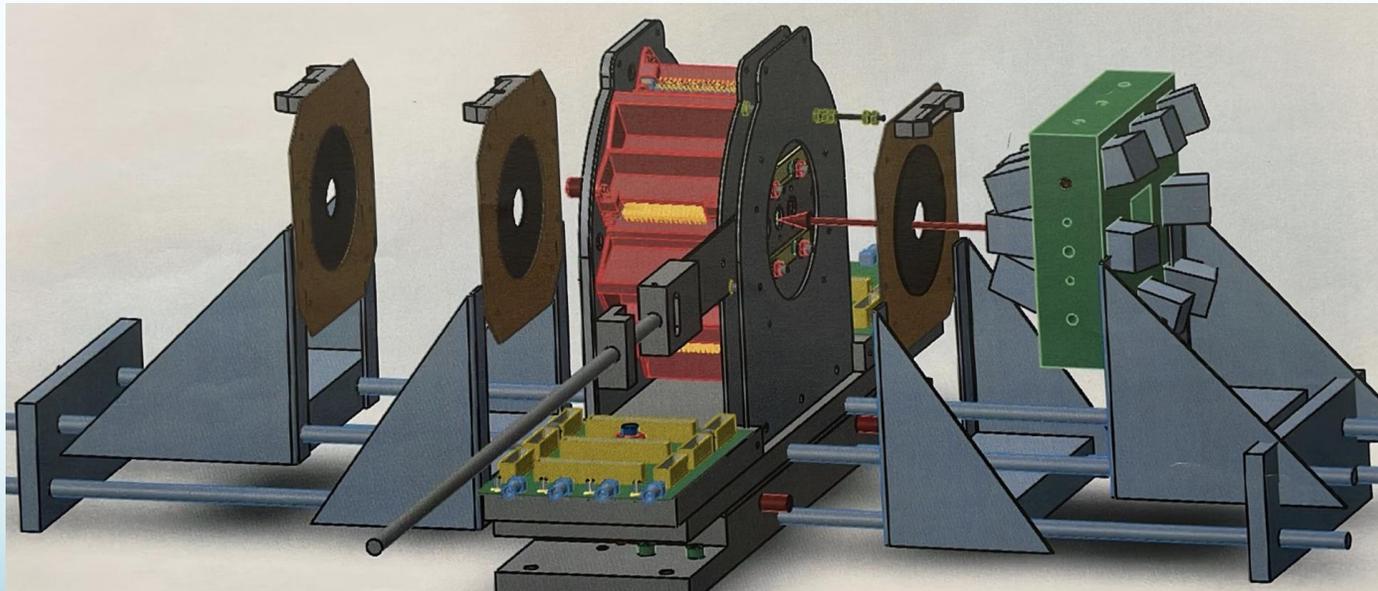
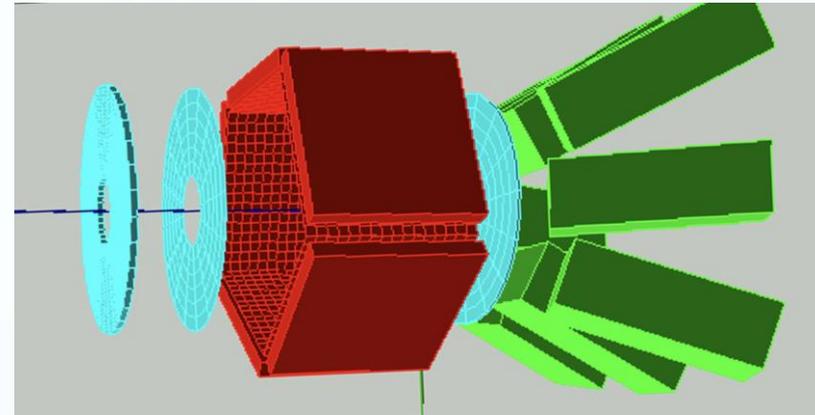
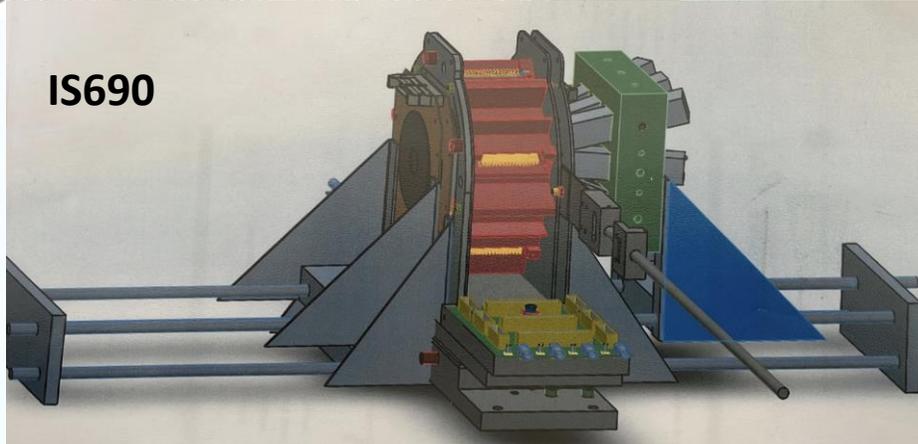


30 x plastic scintillators  $10 \times 10 \times 10 \text{ cm}^3$



8x GAGG scintillators  $2 \times 2 \times 3 \text{ cm}^3$

# SEC upgrade

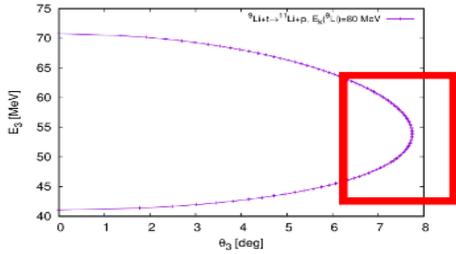


1x S3 dssd 24p+32n = 56 ch  
 1x S5 dssd 24p+16n = 40 ch  
 1x S5 dssd 24p+16n = 40 ch  
 5x telescopes (W1 dssd +PAD) 165 ch:

→ 1x MPR64-1 forward E Dynamic: 200 MeV  
 → 1x MPR64-2 forward  $\Delta E$  Dynamic: 100 MeV  
 → 1x MPR64-3 backward Dynamic: 20 MeV  
 → 3xMPR64 -4,5,6 pentagon Dynamic: 100 MeV

6 – 25° telescope  
identify ions  ${}^9\text{-}^{11}\text{Li}$  vs p, d, t

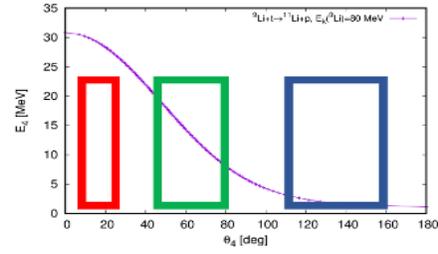
Forward cover 6 - 25°



$E_p < 35$  MeV

telescopes  
separate p, d, t

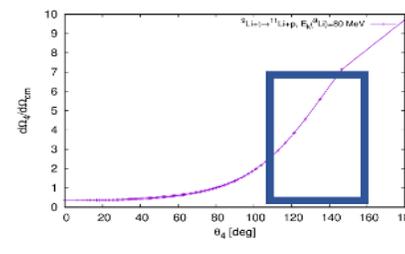
PENTAGON 45 – 80°



$E_p < 20$  MeV

backwards  
p

Backwards 110 – 160°



$E_p 1 - 5$  MeV

${}^9\text{Li}(t, p){}^{11}\text{Li}$  @ 7 Mev/u

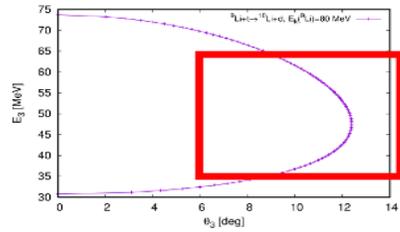
p < 180 degrees

${}^9\text{Li}(t, d){}^{10}\text{Li}$

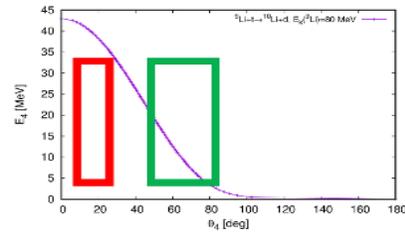
d < 90 degrees

${}^9\text{Li}(t, t){}^9\text{Li}^*$

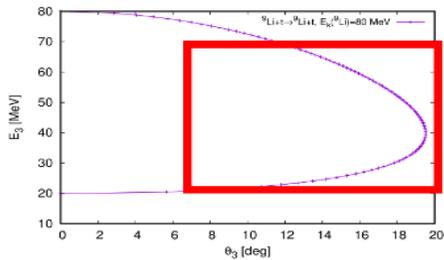
t < 90 degrees



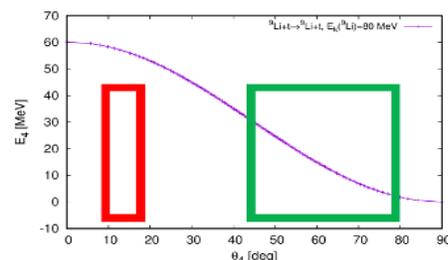
$E_d < 45$  MeV



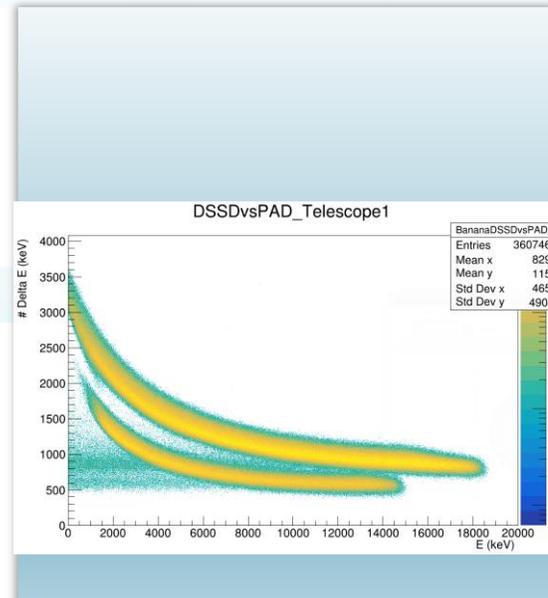
$E_d < 20$  MeV



$E_t < 60$  MeV



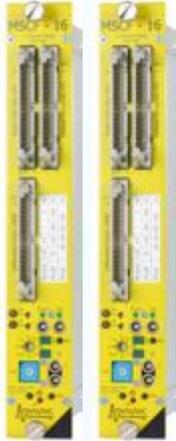
$E_t < 30$  MeV



# Moving towards fully digitized system

Analogue system

Amp



PreAmp



DSSD



Digitized system

MDPP32 Digitizer

PreAmp

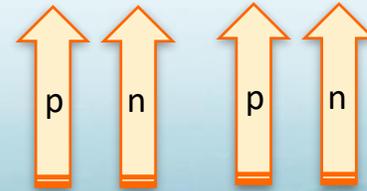


DSSD

Fully digitized system

VMMR-8

MMR-64

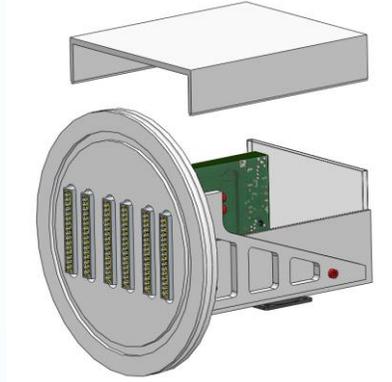
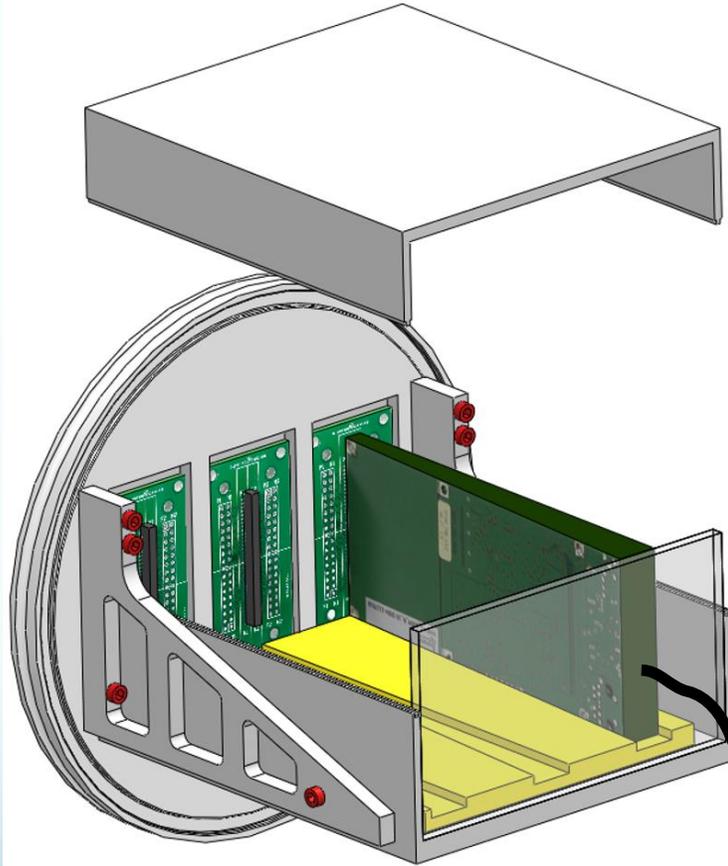


DSSD

DSSD



# NEW Feedthroughs



Only 2 cables (optic link + power) per card  
(in comparison to 64 for previous DAQ)  
More robust housing than existing one.

Need to provide simple feedthroughs, not  
Incoming to the card

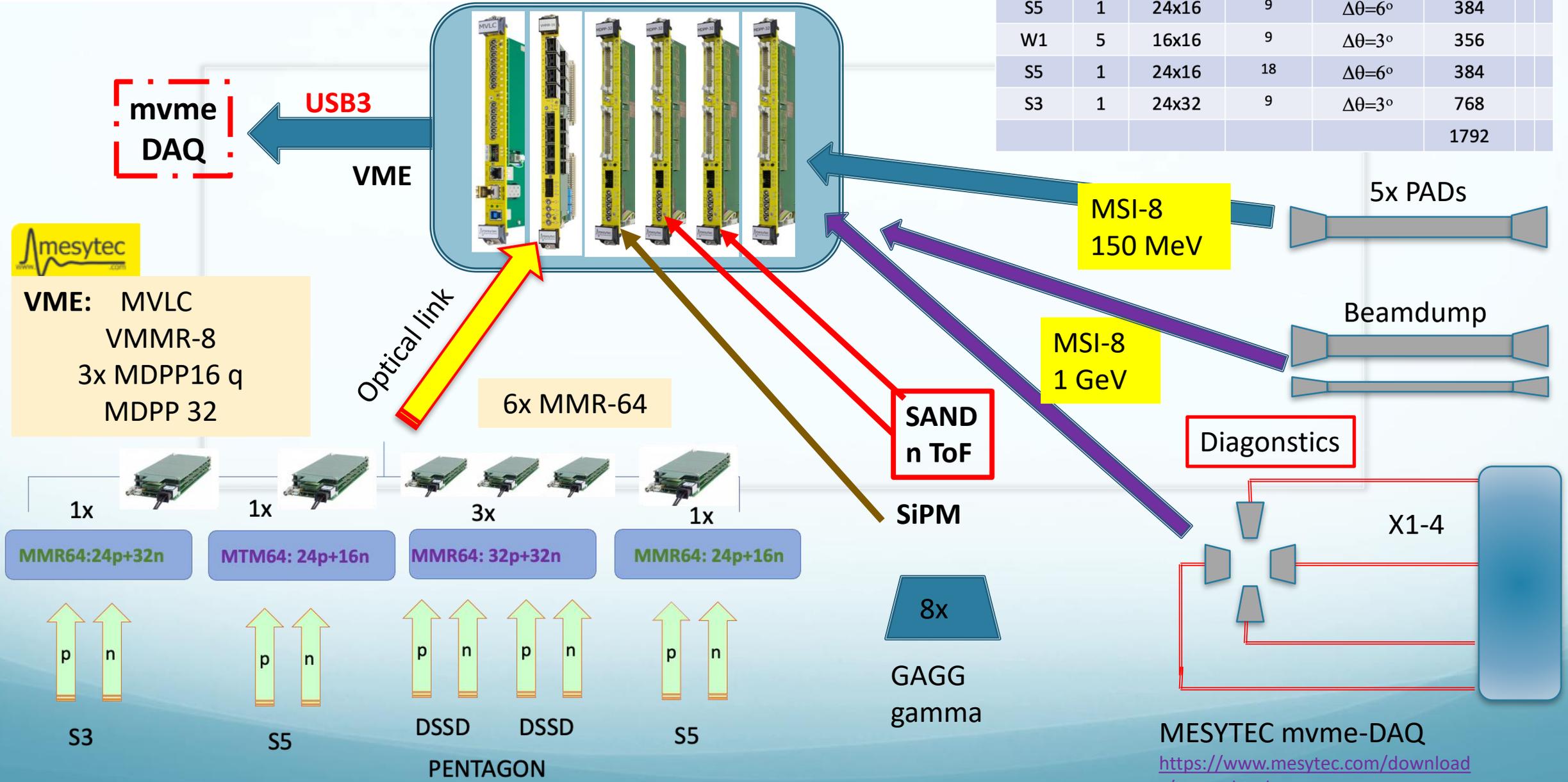
**Optical fiber connection**



# SEC electronic & DAQ

CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

Detector	#	strips	Pixel área (mm <sup>2</sup> )	Angular resolution	Pixel/det
S5	1	24x16	9	$\Delta\theta=6^\circ$	384
W1	5	16x16	9	$\Delta\theta=3^\circ$	356
S5	1	24x16	18	$\Delta\theta=6^\circ$	384
S3	1	24x32	9	$\Delta\theta=3^\circ$	768
					1792



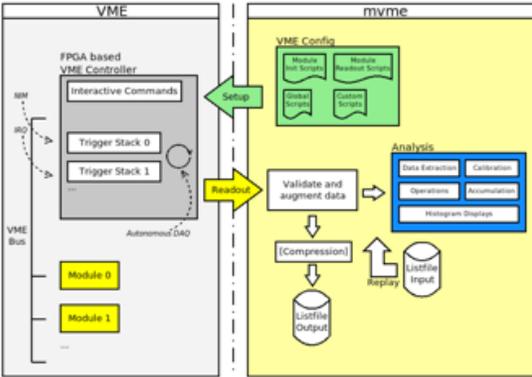
**mesytec**  
**VME:** MVLC  
 VMMR-8  
 3x MDPP16 q  
 MDPP 32



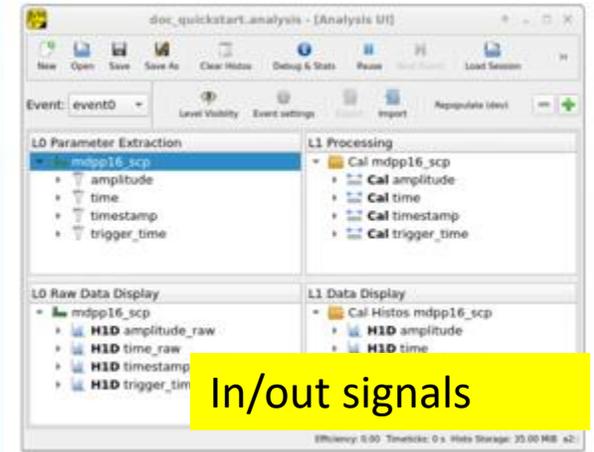
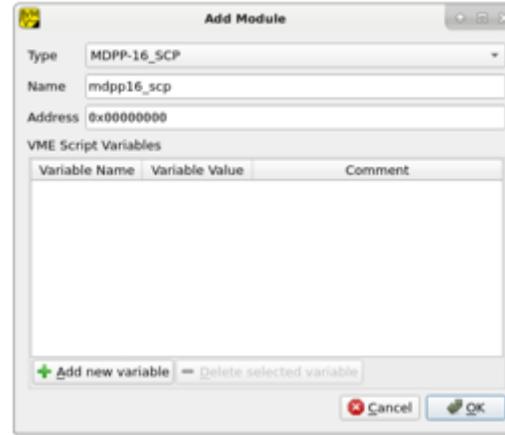
MESYTEC mvme-DAQ  
<https://www.mesytec.com/download/mvme.html>

MESYTEC ADC, QDC, TDC +  
V785, V1190, V830 in library

Analysis setup



**mvme DAQ system  
open access**

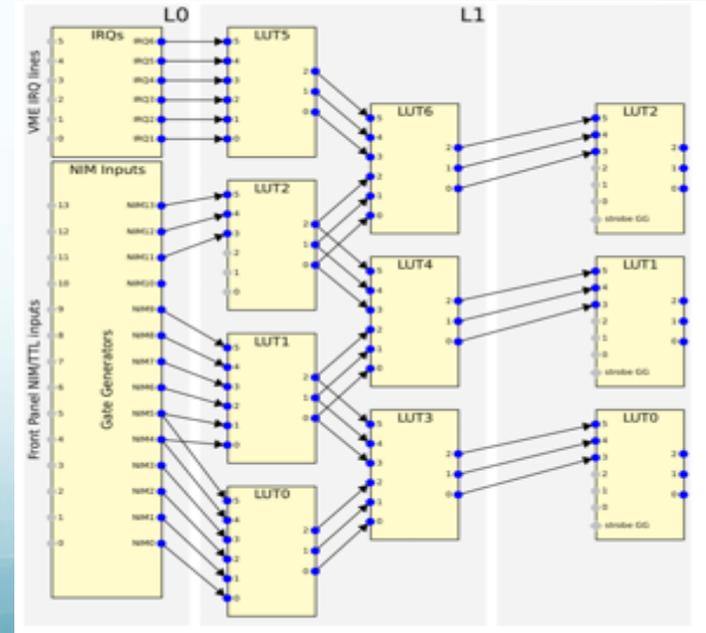
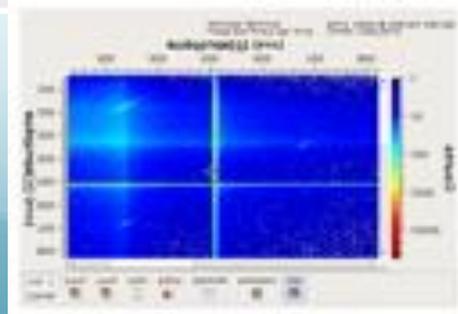
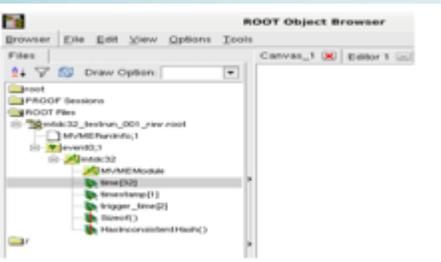
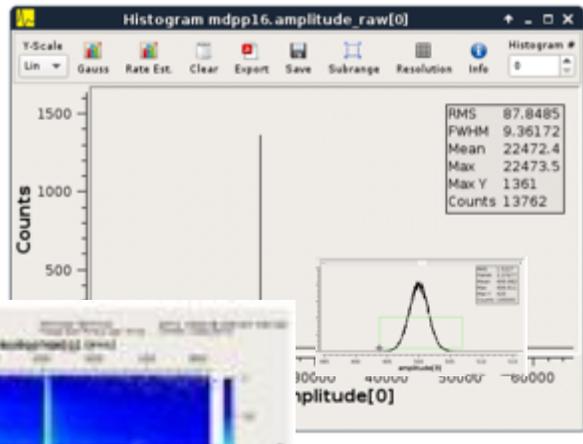
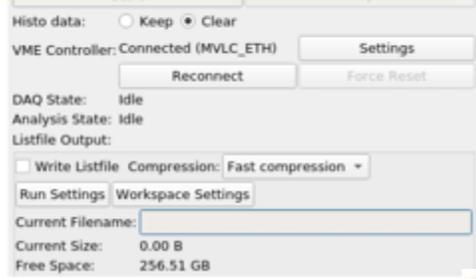


**In/out signals**

Start / stop / write  
/ preset

Histogram / gausfit / calibrate / 3D

Trigger Logic / scaler /  
oscilloscope



## Contributing institutes

- Sweden [Nuclear Physics Univ. Lund](#) chamber / pumps / electronics  
[Subatomic Physics Chalmers Göteborg](#) electronics
- Spain [FNEXP IEM CSIC Madrid,](#) detectors / electronics / DAQ  
[GEM Univ. de Huelva](#) SAND n-detector  
[GFN Univ. Complutense Madrid](#) detectors
- Denmark [Physics and Astronomy Aarhus University](#) detectors / electronics / DAQ
- Romania [IFIN-HH Bucharest](#) pumps
- Italia [INFN-Laboratori Nazionali del Sud, Catania](#) beam diagnostics

SEC supports all experiments performed and to be performed at the XT03 beamline of HIE - ISOLDE.



The SEC chamber is a versatile chamber for reaction experiments

The chamber is equipped with vacuum system, beam diagnostics, target Ladder.

The chamber can host different detector setups

Support can be given with Detectors, electronics and DAQ

.

## Thank you for listening