The status of the GALILEO project

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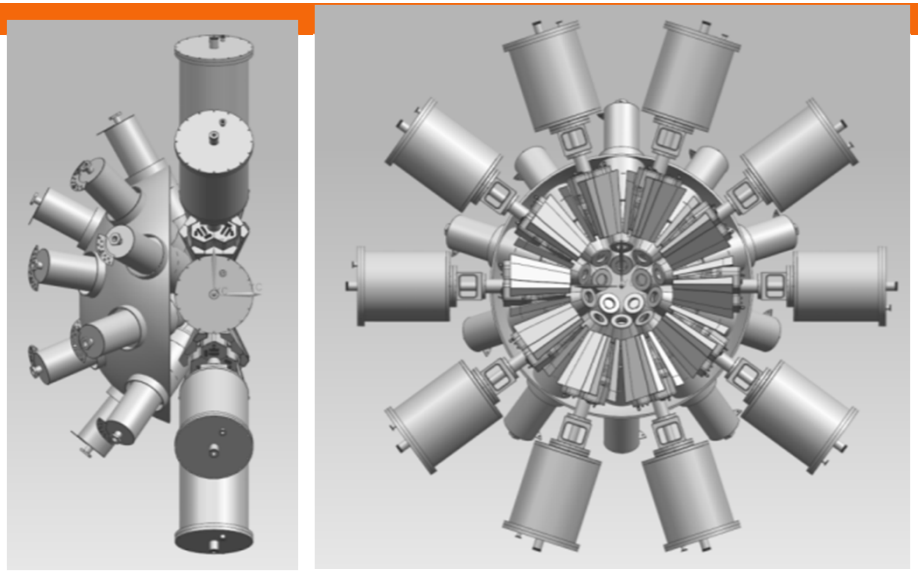
The GALILEO project

GALILEO – a new 4π gamma–ray spectrometer

- takes advantage of the developments made for AGATA
  - preamplifiers
  - digital sampling
  - preprocessing
  - DAQ

- uses the EUROBALL cluster detectors capsules
  - improved efficiency
  - development of a new cluster detector with 3 capsules

Phase 1: 40 GASP



ε_{ph}~8% P/T~50%

Detector configuration

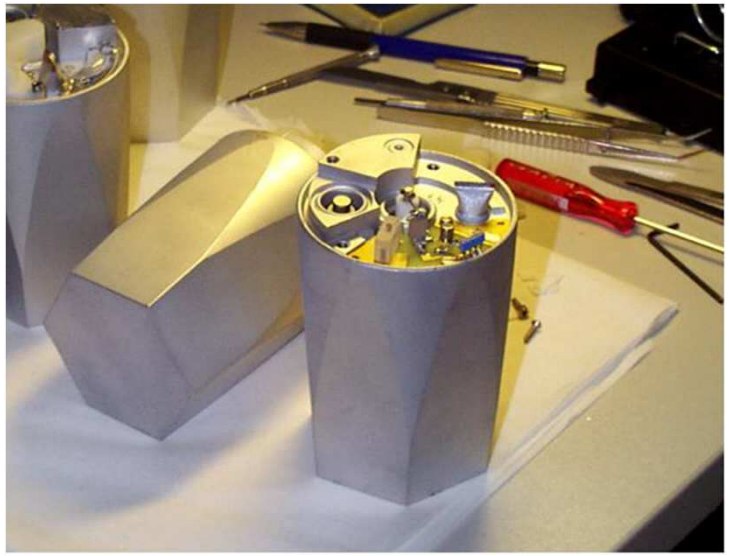
- 30 GASP detectors @ 22.5cm

5	5	5	5	5	5
29°	51°	59°	121°	129°	131°

- 10 triple cluster detectors @ 24 cm: 90°

The GALILEO project

Capsules of the EUROBALL cluster detectors



15 x 7– cluster detectors (GSI–RISING array) encapsulated n–type HPGe detectors

FWHM < 2.4 keV @ 1332.5 keV
ε_{int} ~60% @ 1332.5 keV

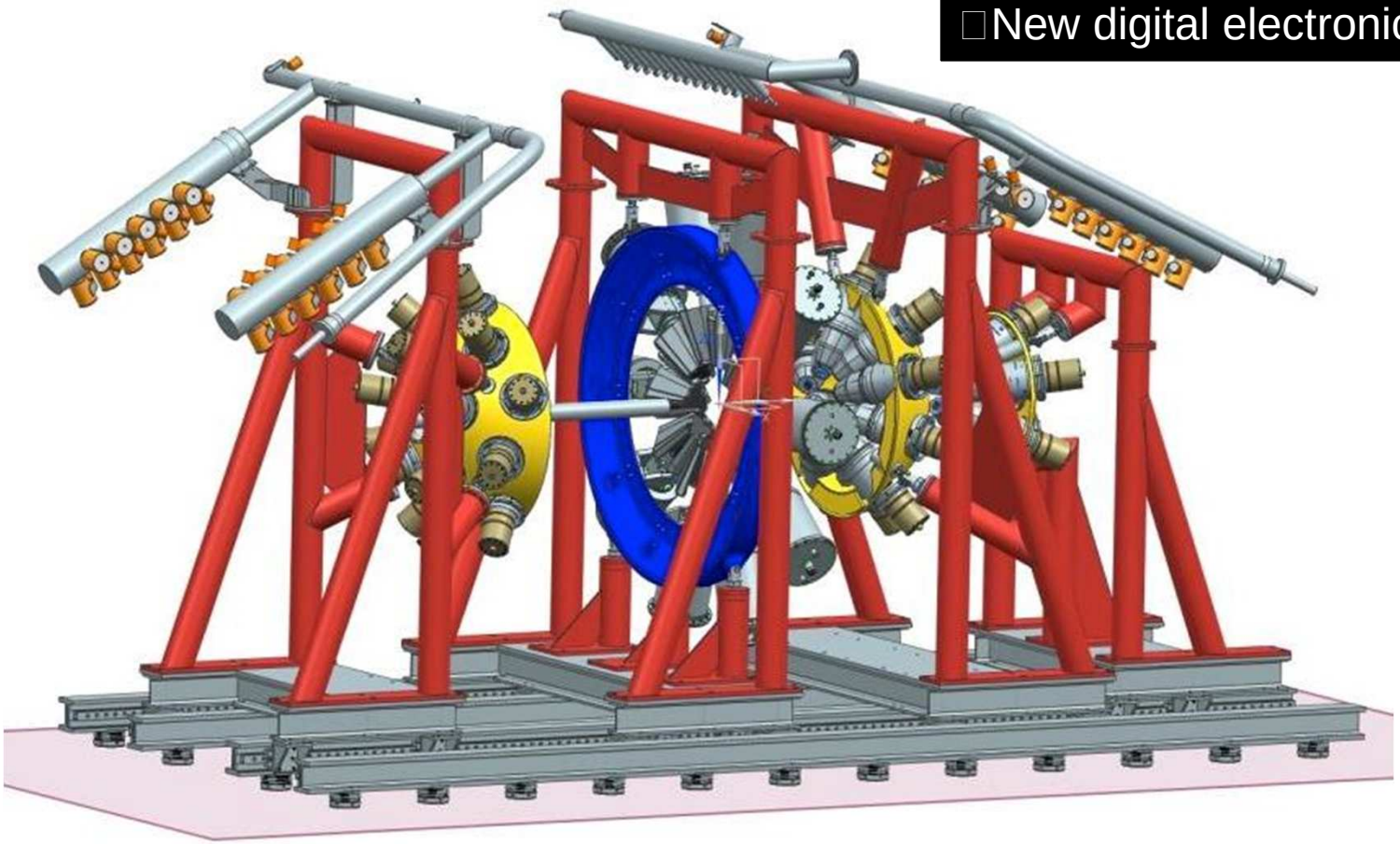
GASP detectors

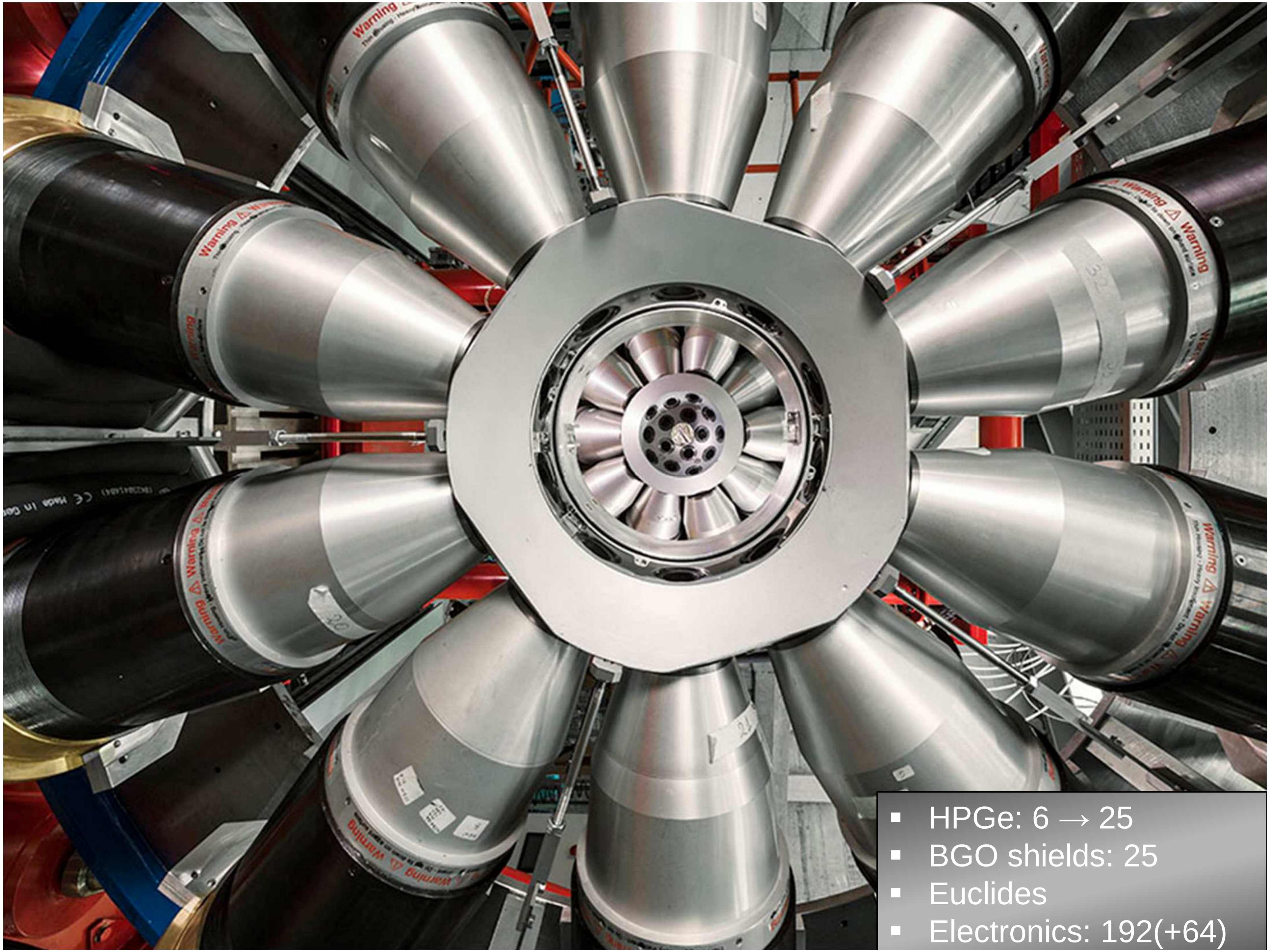
40 n–type HPGe detectors

FWHM < 2.4 keV @ 1332.5 keV
ε_{int} ~80% @ 1332.5 keV

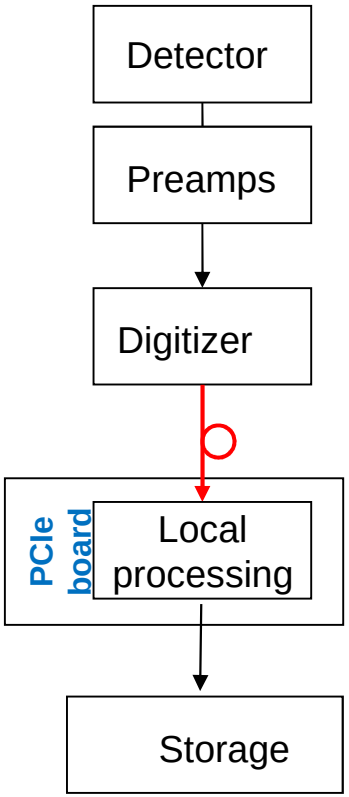
The GALILEO γ-ray array phase 2

- Development of the triple cryostat
- Design of the anti–Compton shield
- Design of the support structure
- New digital electronics

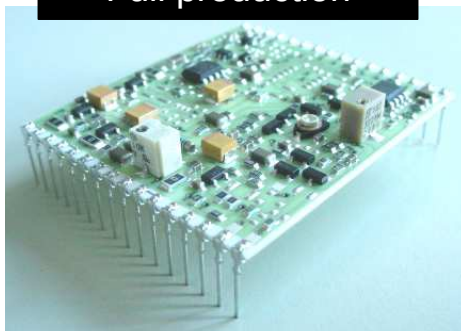



HPGe: 6 → 25
BGO shields: 25
Euclides
Electronics: 192(+64)

Update GALILEO electronics

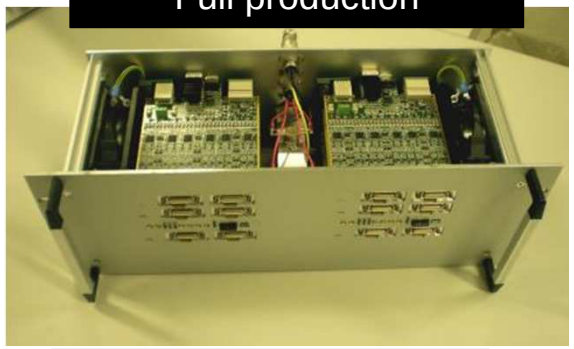


Full production



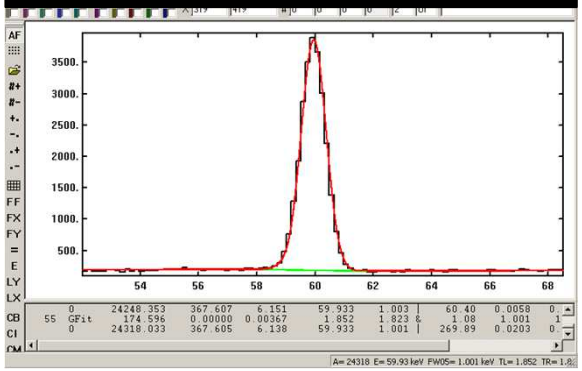
preamplifier

Full production



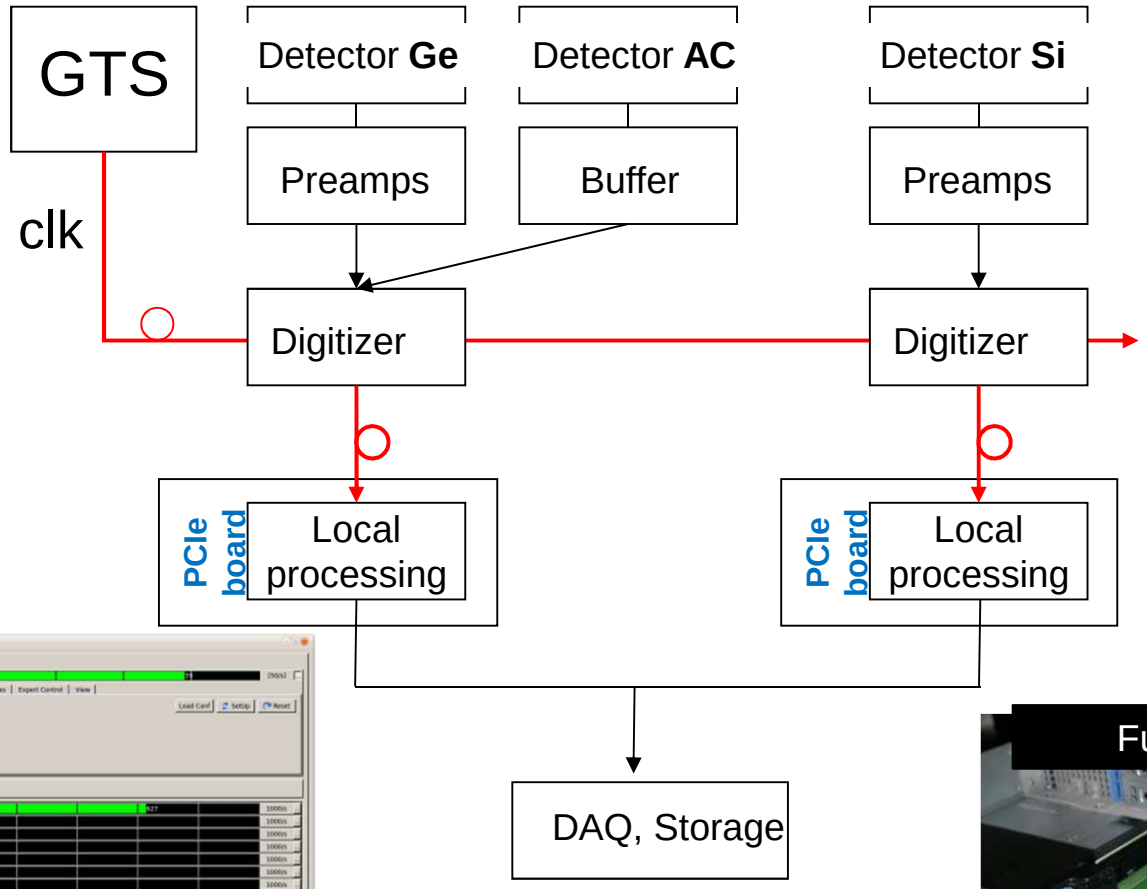
digitizer

FWHM on ^{241}Am line: 1.00 keV



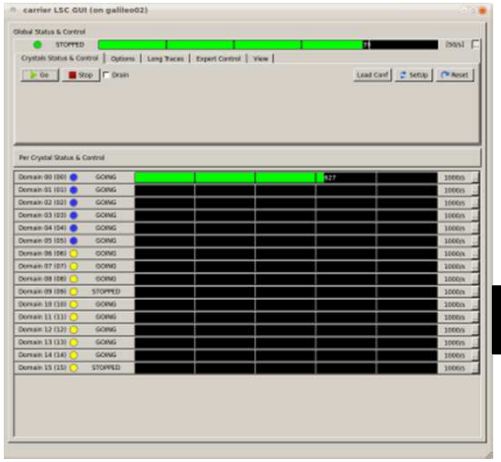
High rate parameters to be addressed

Update GALILEO electronics



BGO readout Prototype, full production on time

Prototype: 36Ge+36AC



GTS

Full production

Ancillary detectors for GALILEO

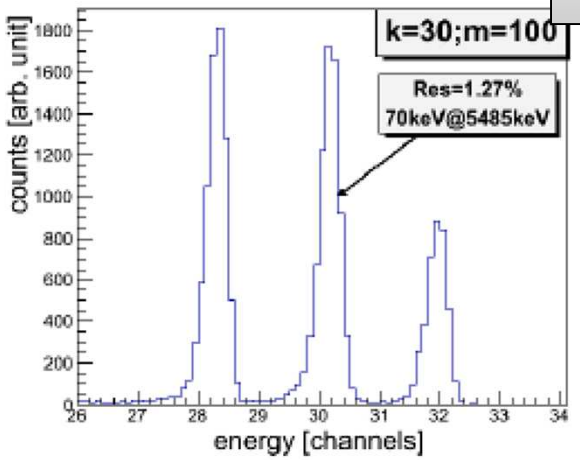
- Lifetime measurements
  - **Plunger** from Cologne
- Light charged particle detectors
  - **EUCLIDES**, LUSIA, TRACE
- Neutron detector
  - n–Ring, **N–Wall**, NEDA
- Binary reaction products detection
  - DANTE, MW-PPAC
- Recoil detectors
  - **RFD**, SPIDER
- High–energy gamma–rays detector
  - **HECTOR+**, PARIS
- Fast timing
  - **LaBr3** detectors

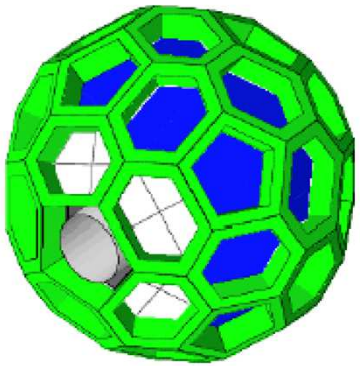
Study of weak reaction channels stable beams

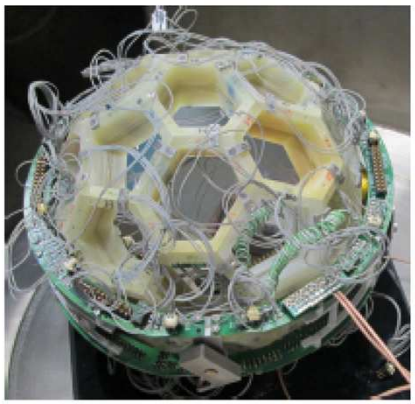
- High efficiency
- High resolving power

Update Integration with ancillary detectors

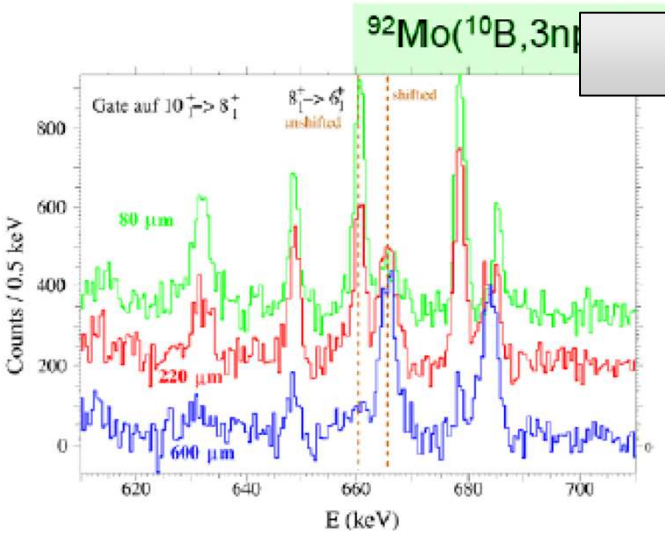
EUCLIDES



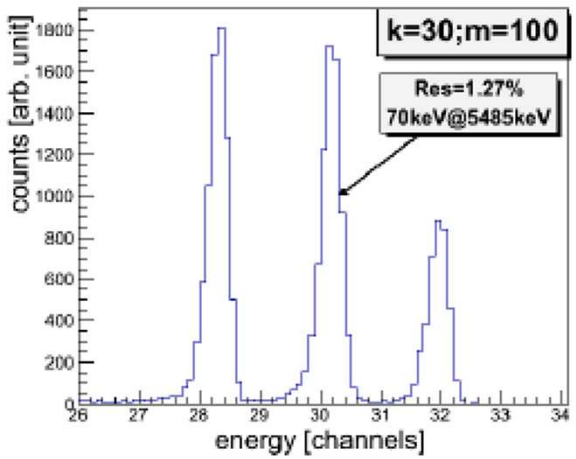


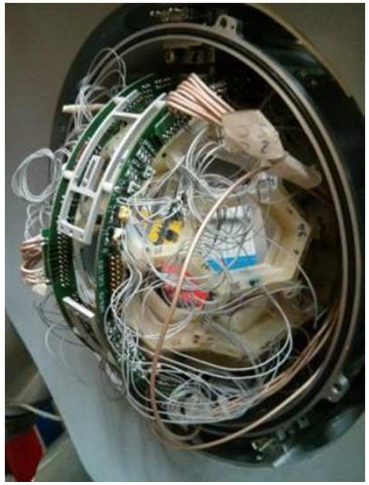


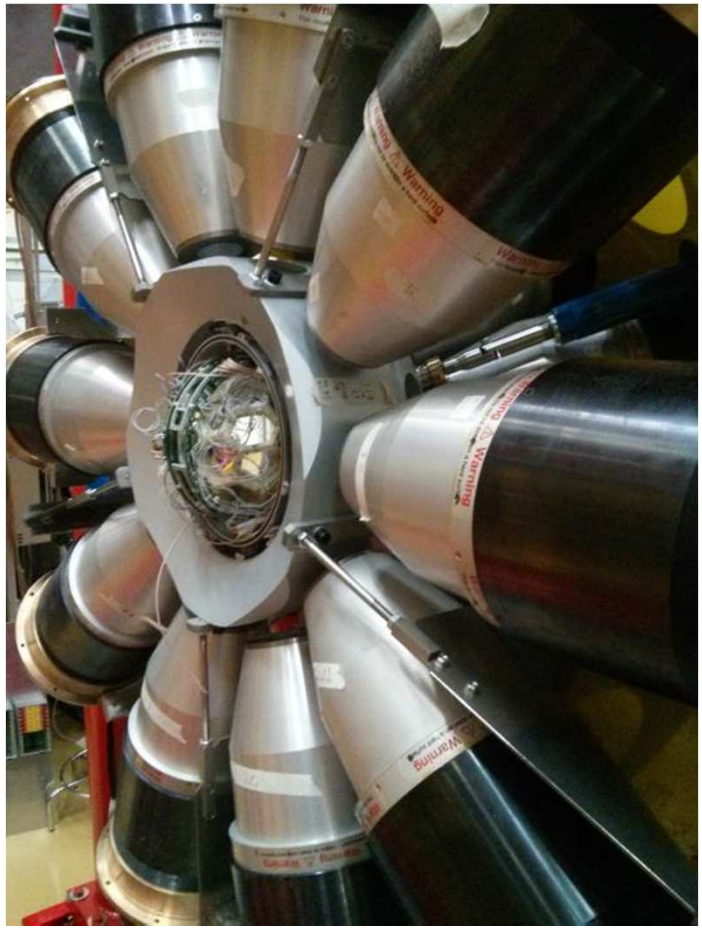
Plunger Koln



Update Integration with ancillary detectors: EUCLIDES







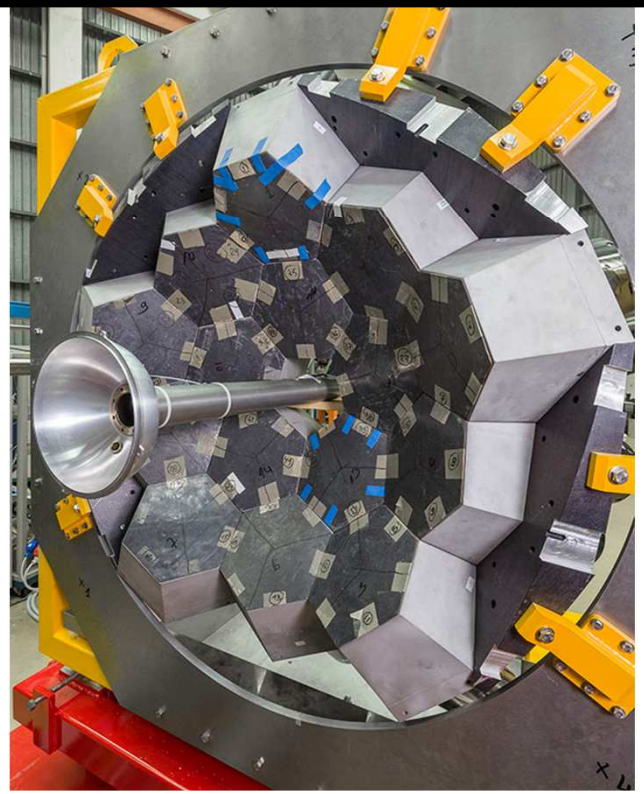
- 110 Silicon detectors (80%4π)
- ε_{α}~30%; ε_{p}~60%;
- ~85% working, ~ 80keV FWHM
- New compact preamps
- Digital electronics
- Trigger-less mode

II commissioning Dec 2014

Update Integration with ancillary detectors: NWALL

- Experimental efficiencies: ε(1n) = 28(2)%,ε(2n) = 2(1)%
- 50 (45) detectors
- Three types of signals for each of them: QVC, TOF, ZCO
- Preselected neutron condition provided to the tigger.

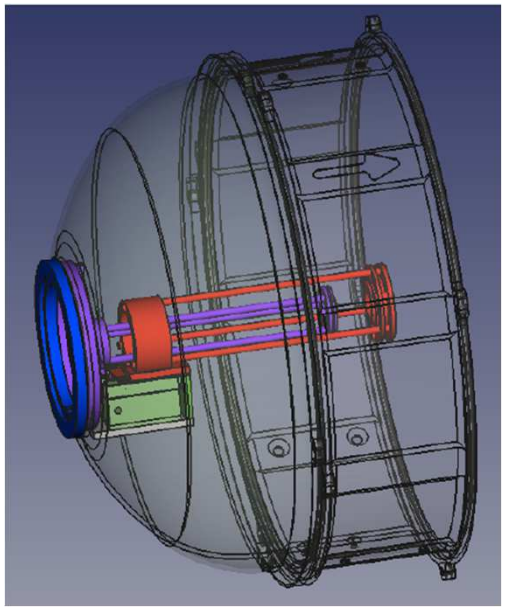
13 Nov 2014, LNL

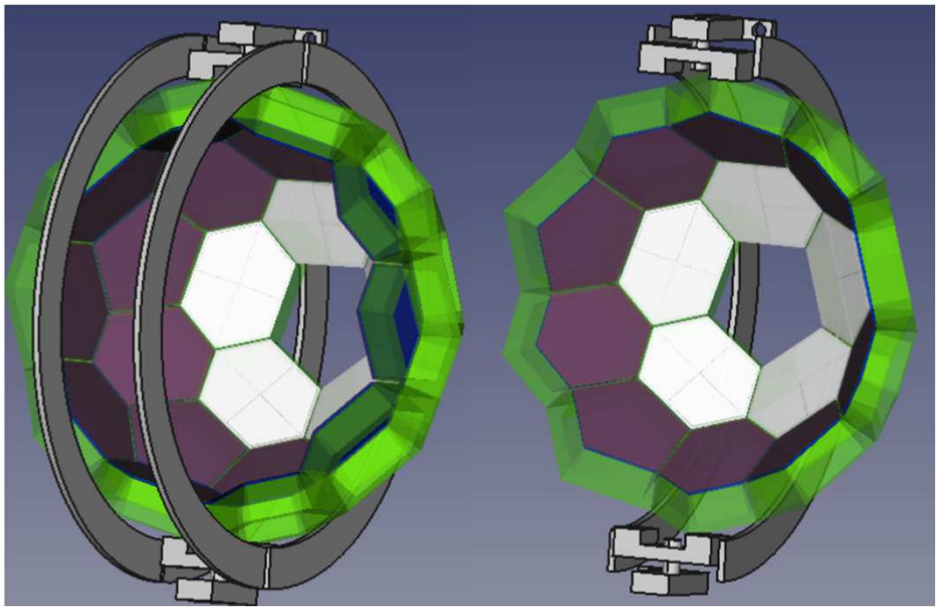


NWALL collaboration

May2015

Update Integration with ancillary detectors: PLUNGER



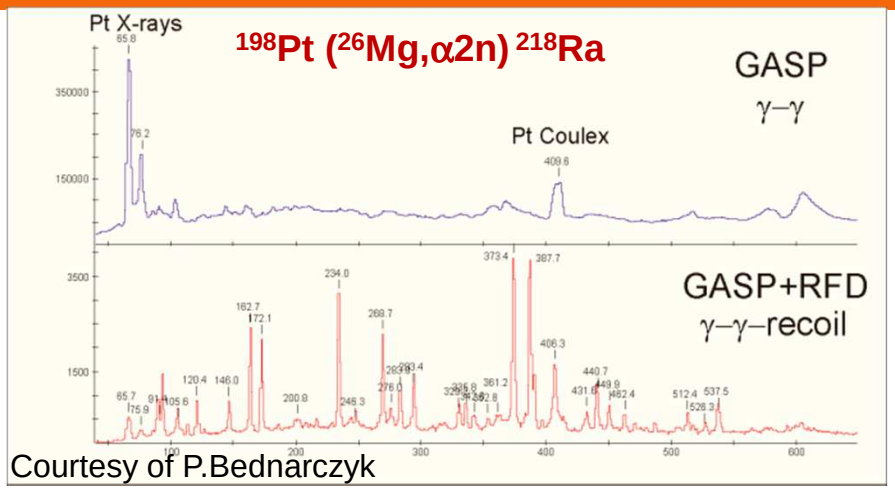


- Compact plunger: inside the reaction chamber
- Constraints: mechanics, complementary dets (shadowing)

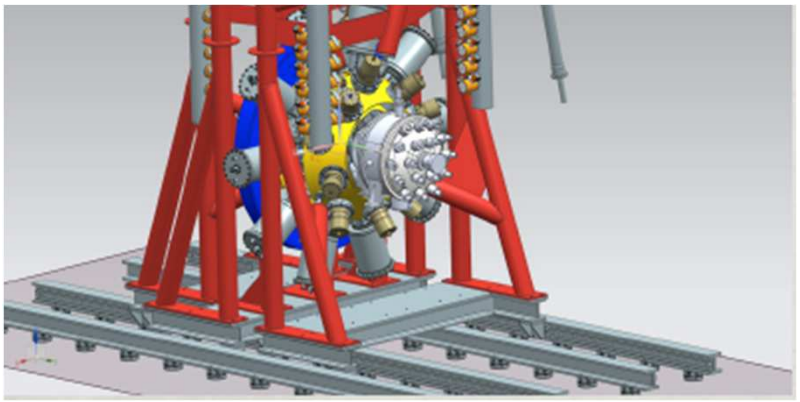
IKP Cologne collaboration

TIMELINE: September 2015

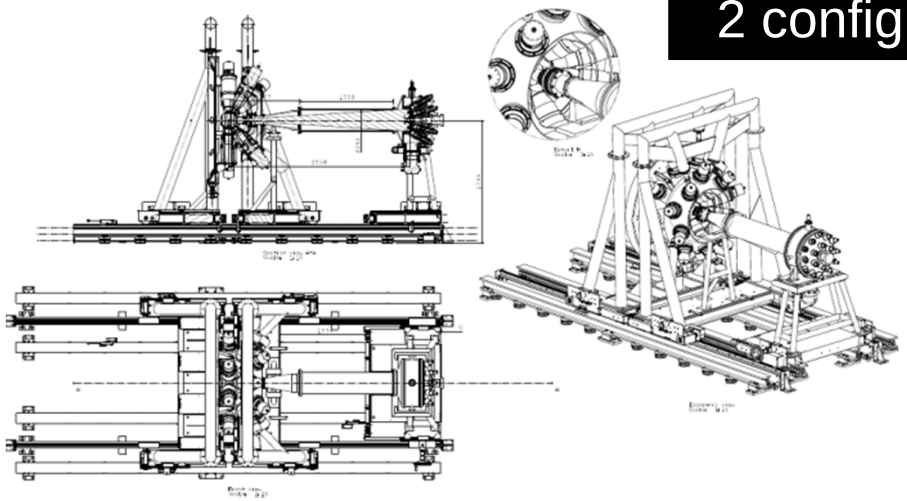
Update Integration with ancillary detectors: Recoil Filter Detector

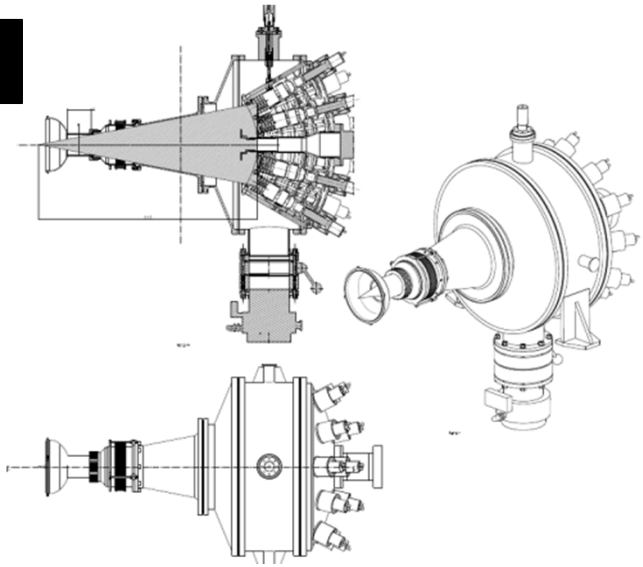


Courtesy of P.Bednarczyk



2 configurations





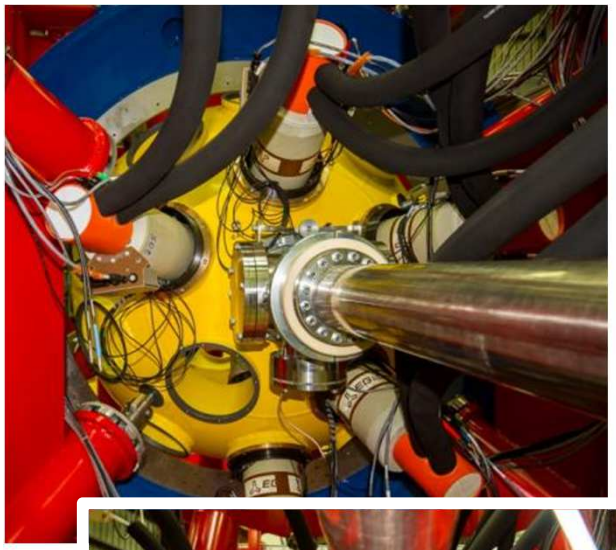
IFJ PAN Kraków collaboration

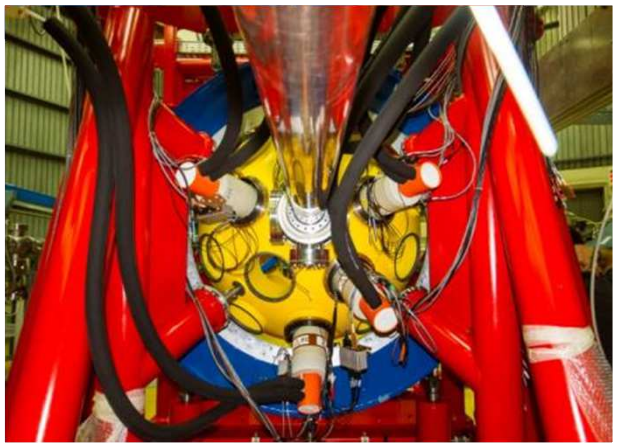
TIMELINE: 2016

COMMISSIONING I: July 2014

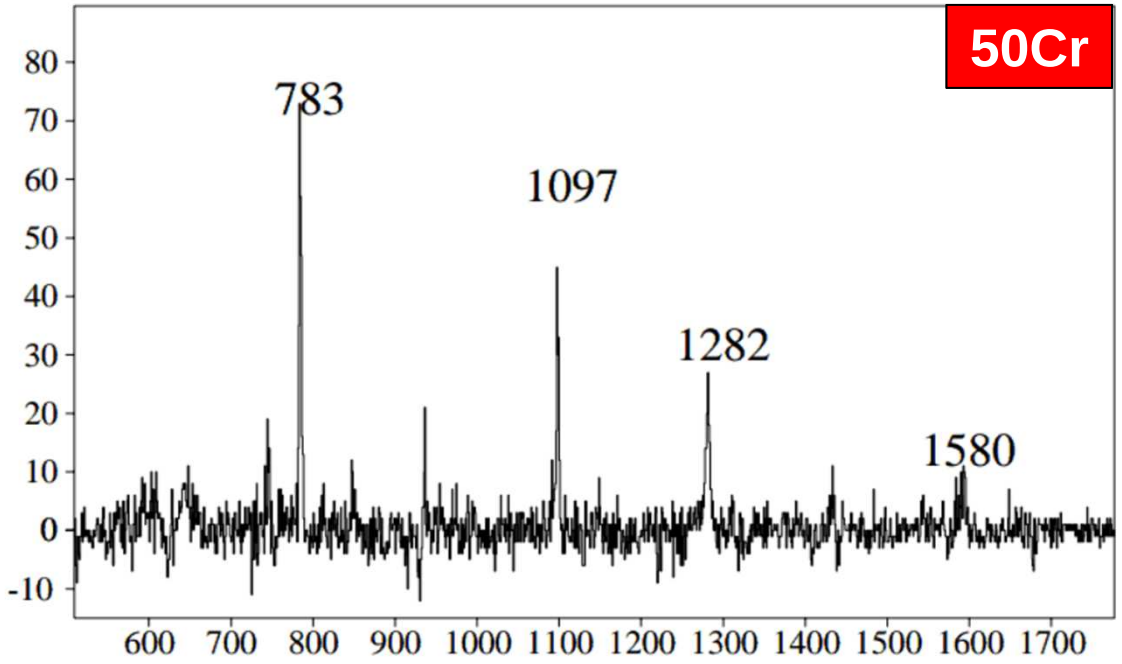
GALILEO stand alone

^{32}S at 130 MeV impinged into a ^{58}Ni target (1 mg/cm^2) backed with 15 mg/cm^2 of Au





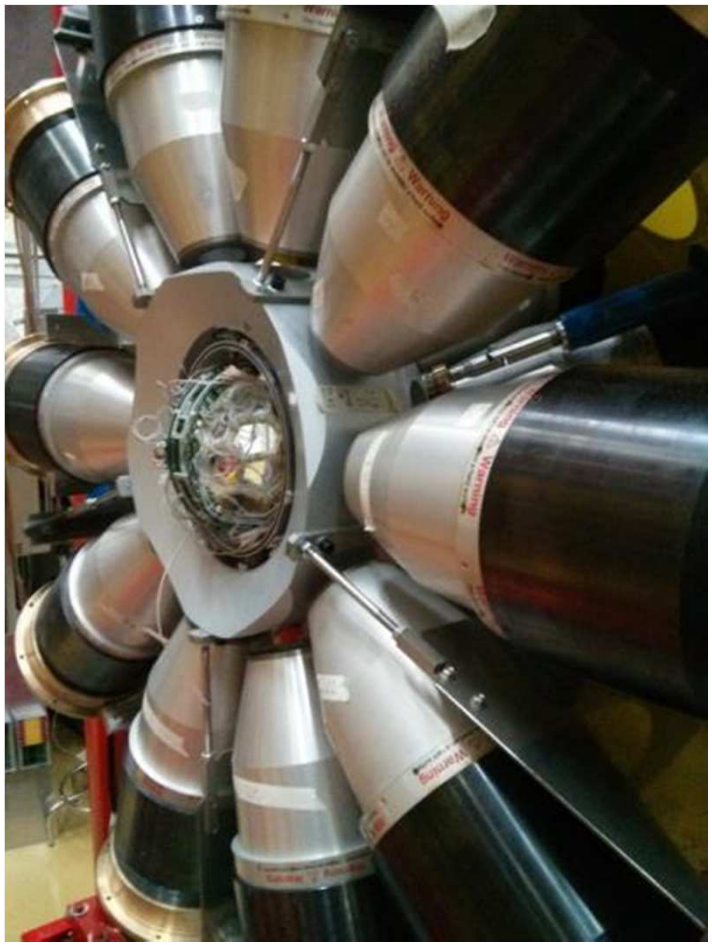
- Infrastructure & LN_2
- 5 HPGe dets + 5 BGOs
- GTS, trigger less mode
- Digital Electronics

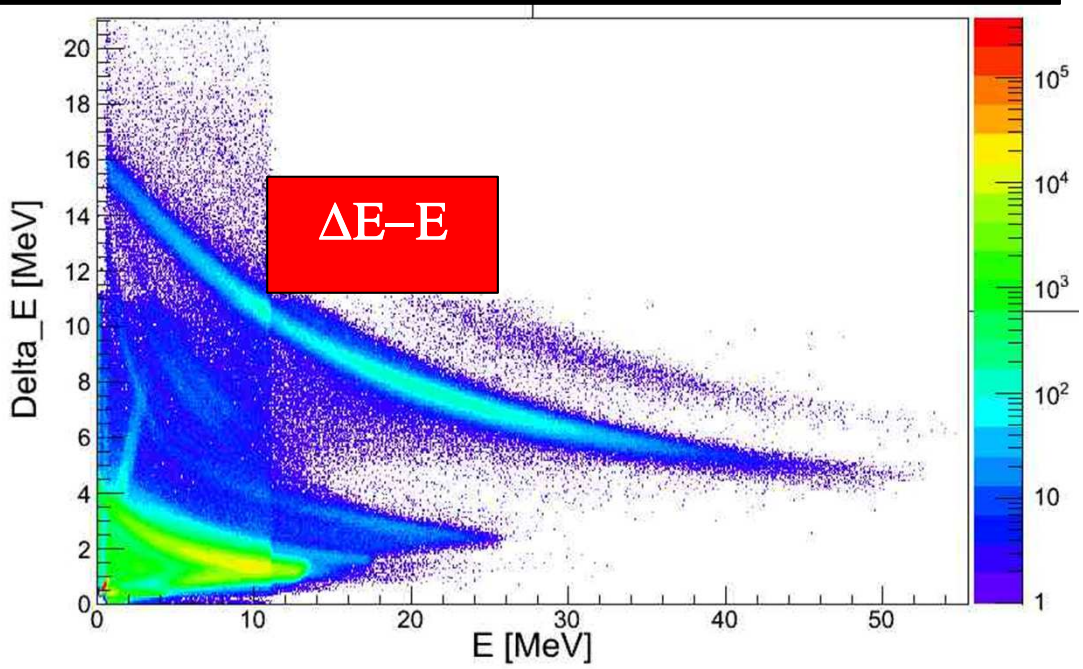


COMMISSIONING II: December 2014

GALILEO + EUCLIDES

^{58}Ni at 210 MeV impinged into a ^{58}Ni target (0.5 mg/cm^2)

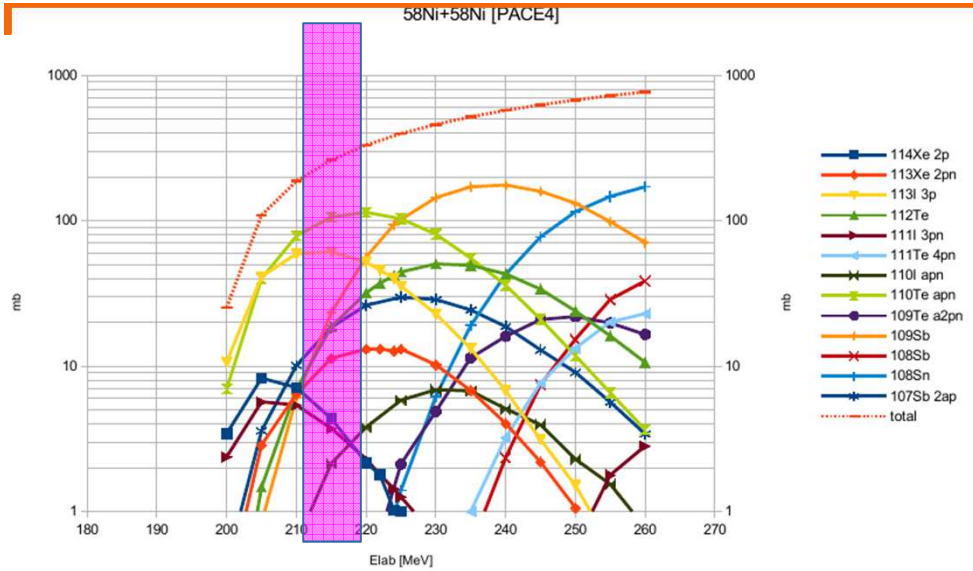


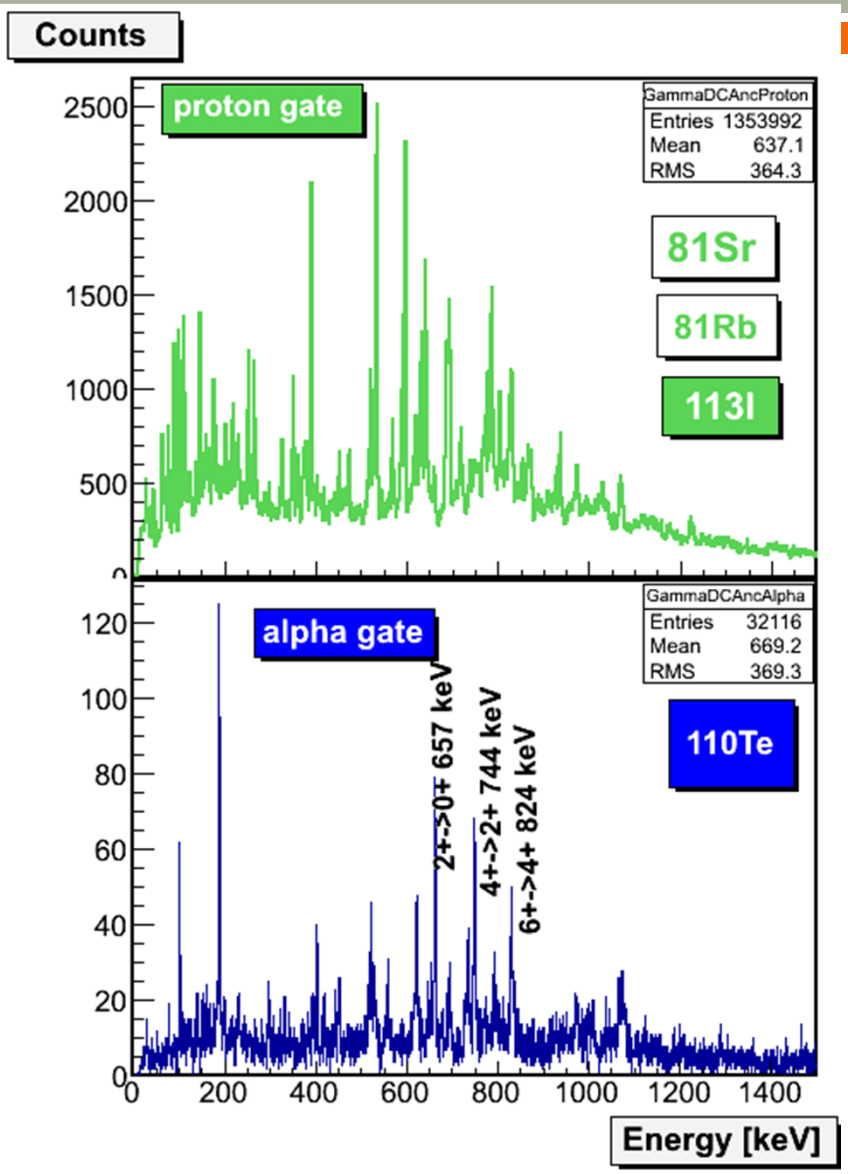


- Beam-line grids & collimator
- 6 HPGe dets + 6 BGOs
- 10 EUCLIDES dets
- GTS, trigger less mode
- XDAQ

COMMISSIONING II: December 2014

GALILEO + EUCLIDES: channel selection

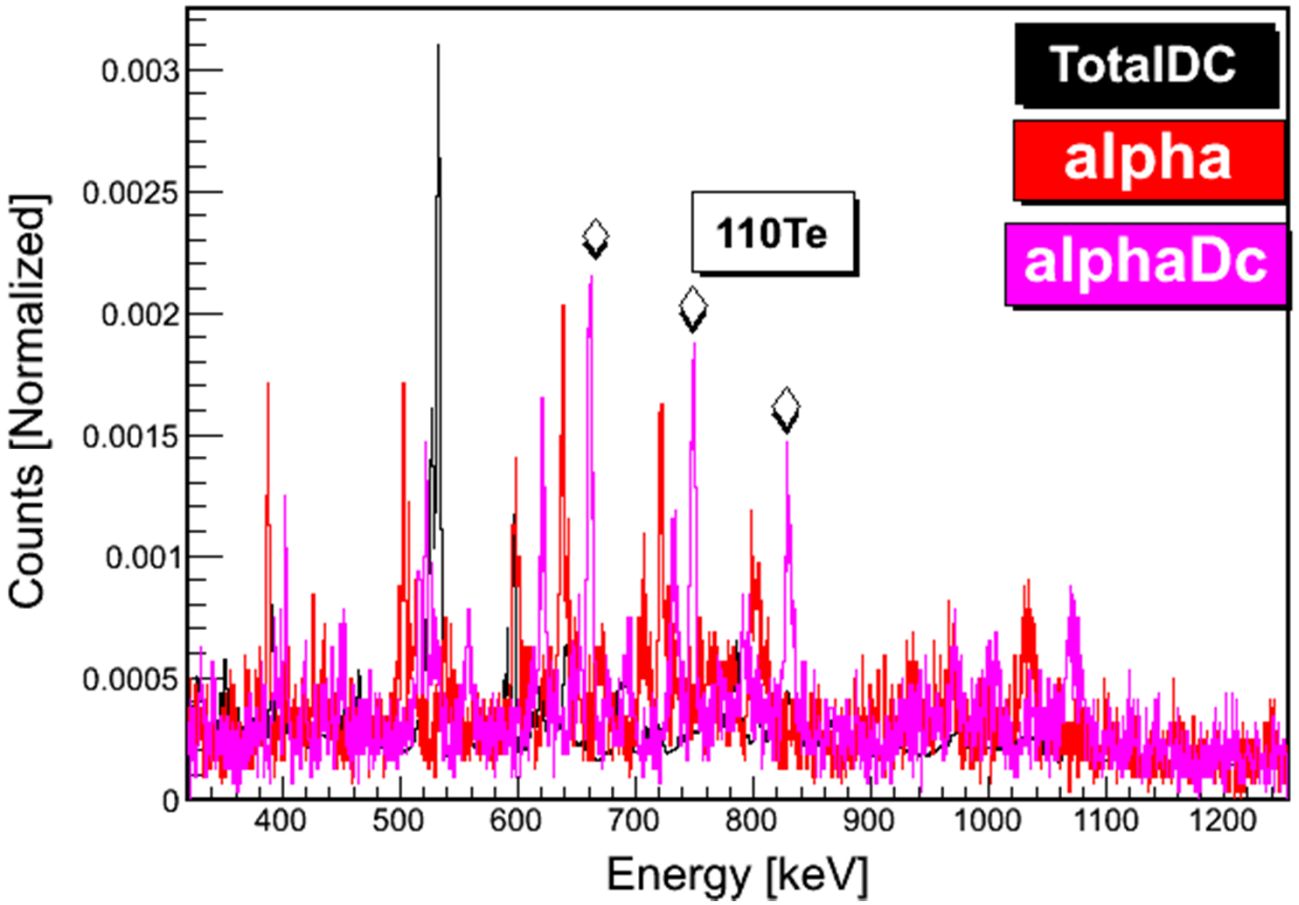




- p channel: 113I(3p), 81Sr (3p1n), 81Rb ...
- α channel: 110Te (αpn)

COMMISSIONING II: December 2014

GALILEO + EUCLIDES: Doppler correction

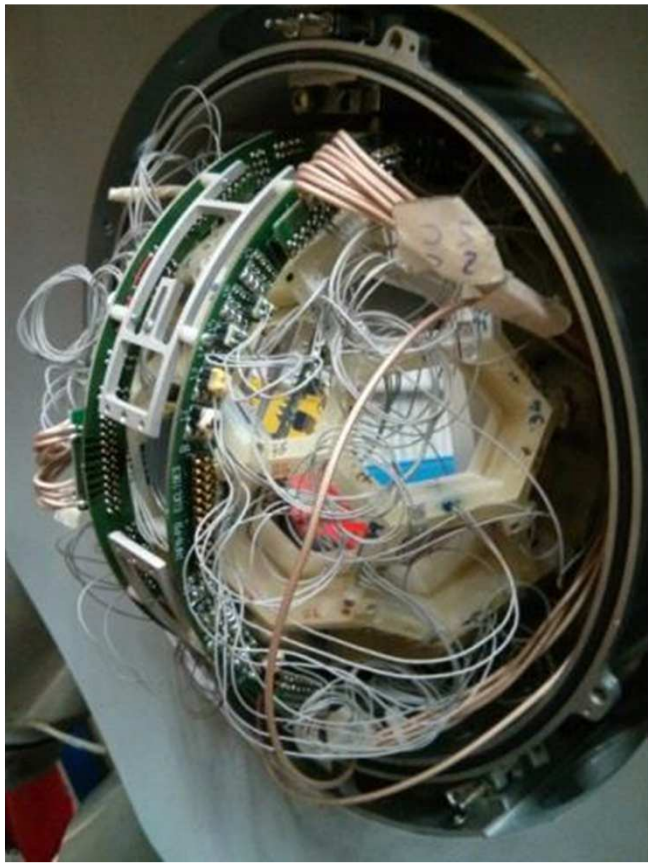


- Doppler Correction in progress
- Average velocity 4.2% c
- (Full) kinematic reconstruction

COMMISSIONING III: March 2015

GALILEO + EUCLIDES

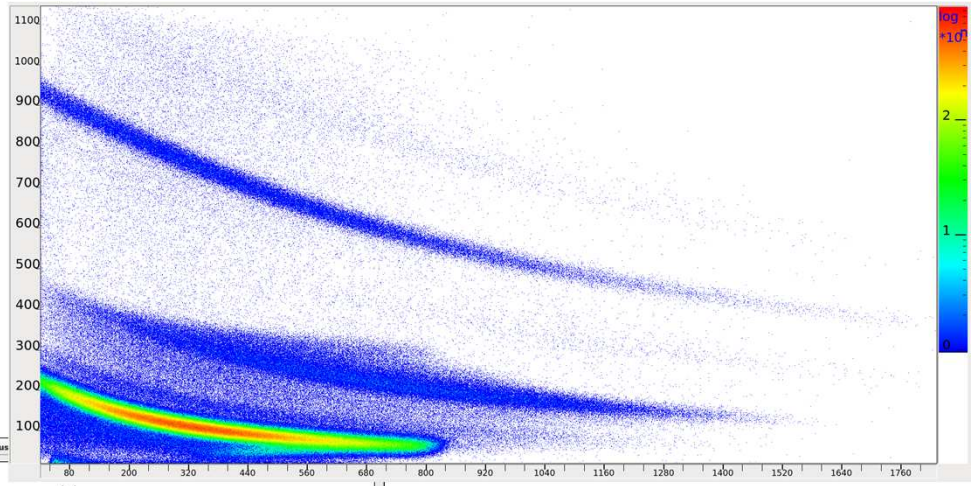
- ✓ 9 HPGe detectors
- ✓ 25 BGO detectors
- ✓ Full Euclides
- ✓ Run control (early implem.)
- ✓ All FADCs: 192 (+64) channels
- ✓ DAQ fully implemented: 3 Event-builders, event selection capability
- ✓ On-line and near-line analysis

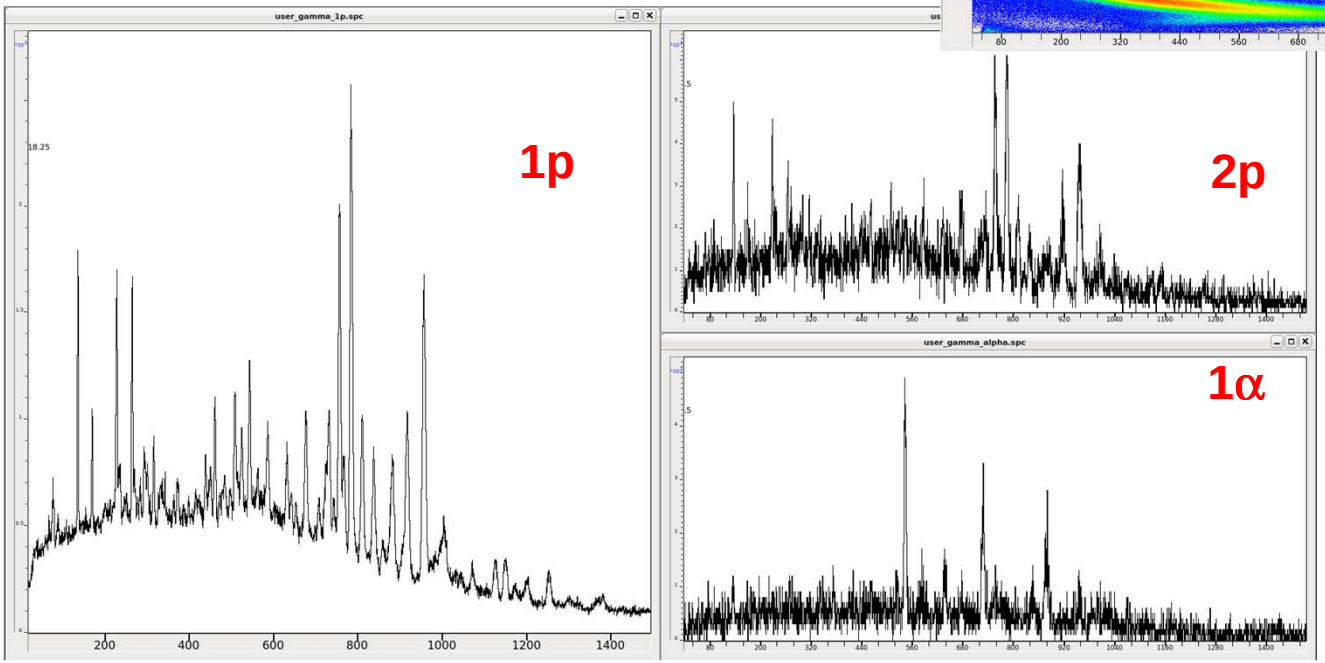


COMMISSIONING III: March 2015

GALILEO + EUCLIDES

- ^{32}S@ 80 MeV on ^{58}Ni (thin)
  - ^{58}Ni (^{32}S, 2p) ^{88}Mo
  - ^{58}Ni (^{32}S, pn) ^{88}Tc
  - ^{58}Ni (^{32}S, ap) ^{85}Nb





Courtesy of
Alain Guasduff

Summary

GALILEO will make use of GASP detectors as well as TC from EUROBALL.
Phase-1: **2015** with 25 detectors. The efficiency will be 4.5%.
GALILEO will make use of a variety of ancillary detectors managed at national and international collaborations.

- ✓ Commissioning I: July 2014
  - HPGe
- ✓ Commissioning II: December 2014
  - HPGe + EUCLIDES
- ✓ Commissioning III: March 2015
  - HPGe + **full EUCLIDES** + all FADC channels **+ DAQ**
- *Commissioning IV: May 2015*
  - *All (?) HPGe + full EUCLIDES + all FADC channels + DAQ* ***+ NWALL***

- The Triple Clusters development will go along 2015-2017
- First campaign GALILEO Phase I in 2015 : NW + Euclides (+ plunger)
- Other campaigns will follow: RFD, HECTOR+, SPIDER, …

Thank you

Have a nice workshop!