INFN Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

THE GAMMA COLLABORATION

ALAIN GOASDUFF – INFN LNL

AGATA
ADVANCED GAMMA TRACKING ARRAY

THE NATIONAL COLLABORATION

gamma

- Researchers

46.22 FTE (61 people)

- Technologists

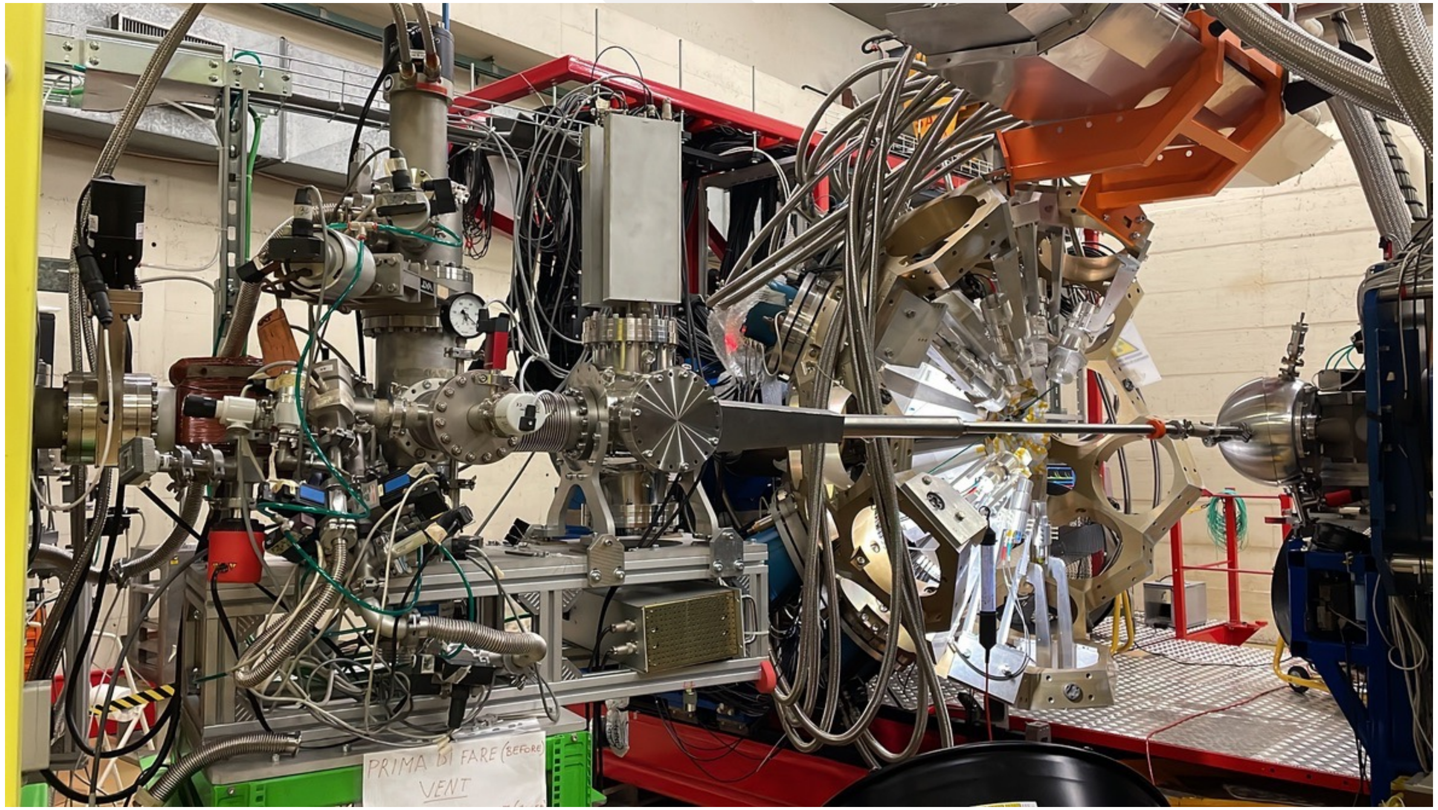
5.25 FTE (12 people)

- 5 sections

Perugia, Firenze, Milano, Padova, LNL

- Consuntivi 2023:
    - 94 Publications
    - 128 Talks
    - 31 Thesis
- National coordinators:

Andrea Gottardo (LNL), Silvia Leoni (MI)



GAMMA @ LNL

- Researchers:

11.25 FTE (16 people including 6 PhDs)

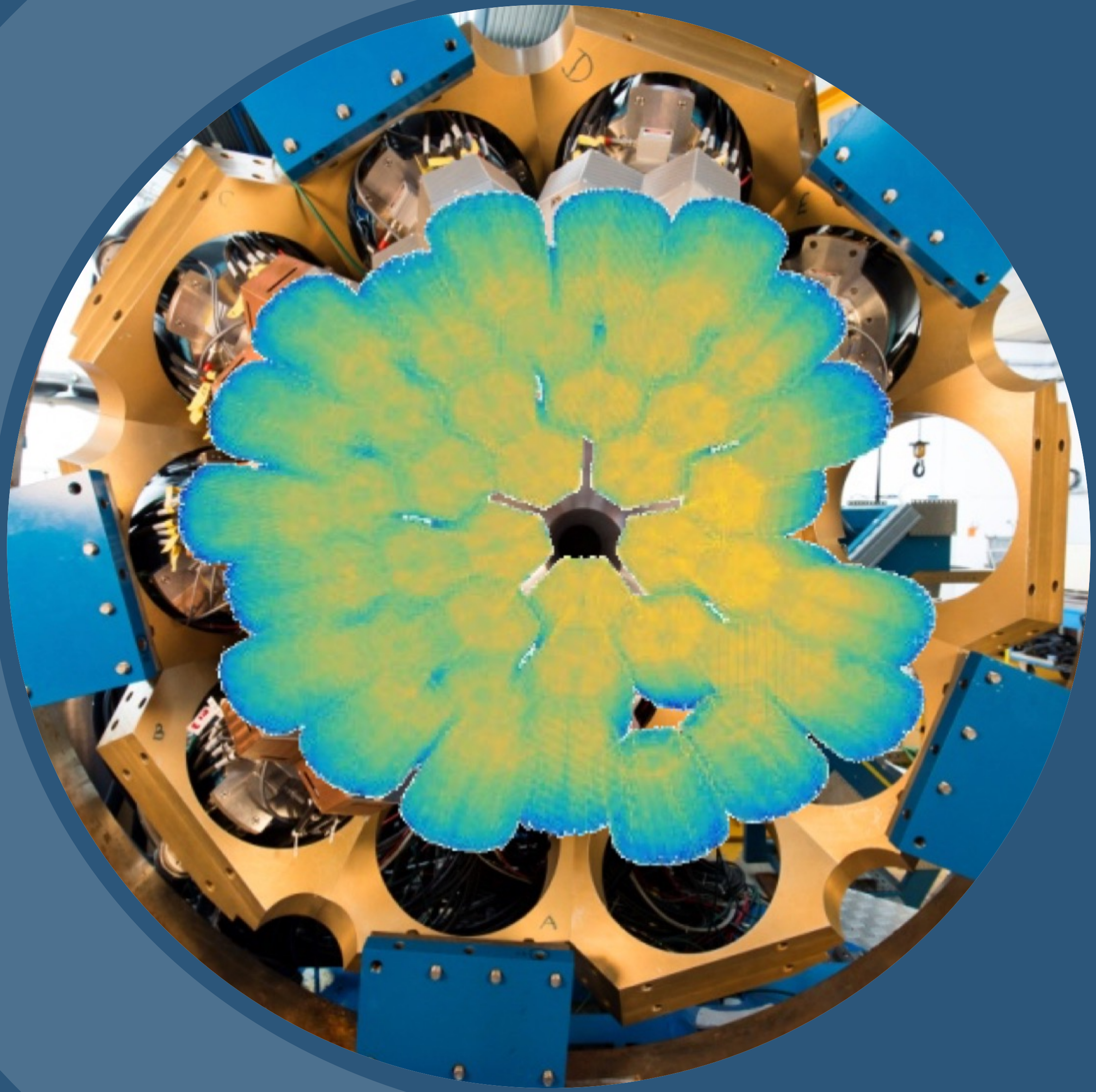
- Technologists:

2.15 FTE (8 people)

- Local coordinator:

Alain Goasduff

- Projects:
  - **GALILEO – Resident HPGe array at LNL**
  - **AGATA – Segmented HPGe detectors**
  - **NEDA – High efficiency neutron multiplicity**
  - **GRIT – Segmented Si detectors**
  - **PARIS – High effiency phoswich detectors**
  - **CTADIR – Cryogenic Target –PRIN2017-2022**
  - **B-DS – b-decay station for SPES**
  - **SLICES – Electron spectroscopy for SPES**

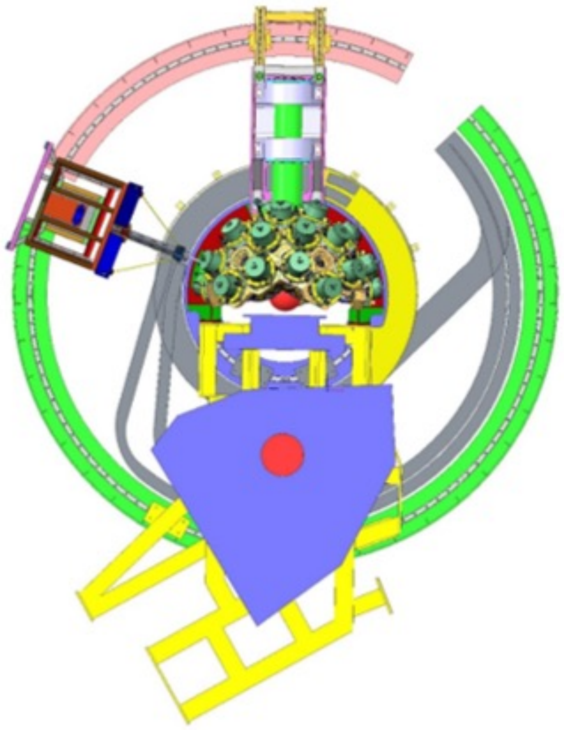


Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

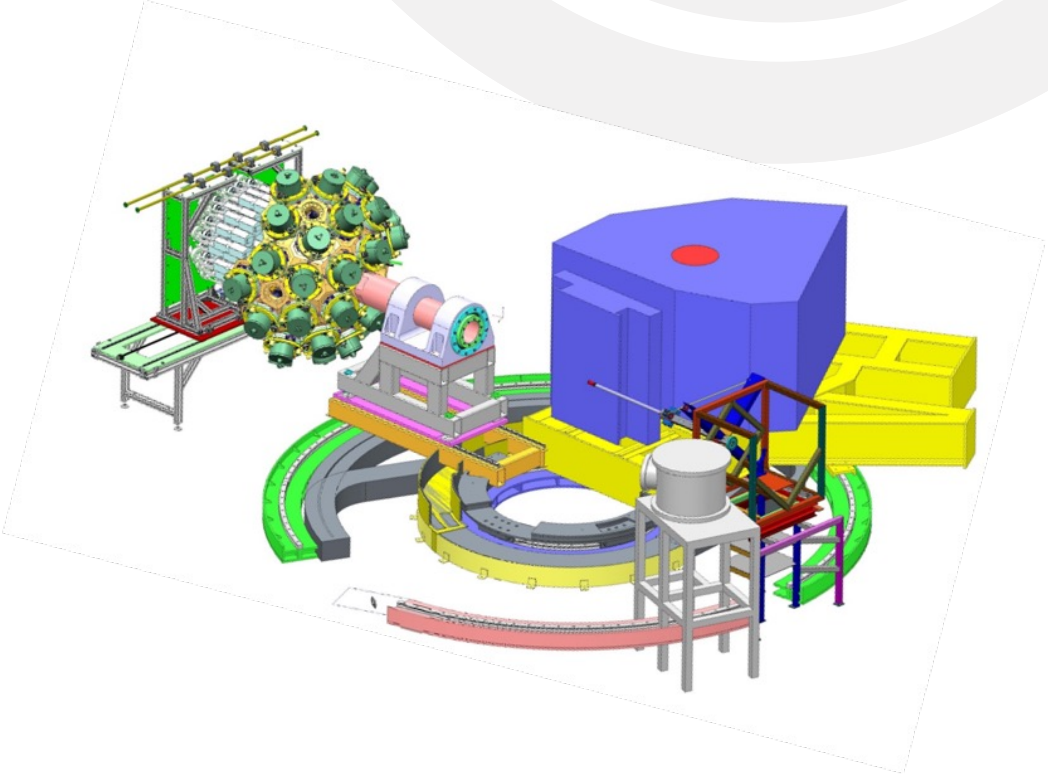
AGATA @ LNL

AGATA CAMPAIGN @ LNL

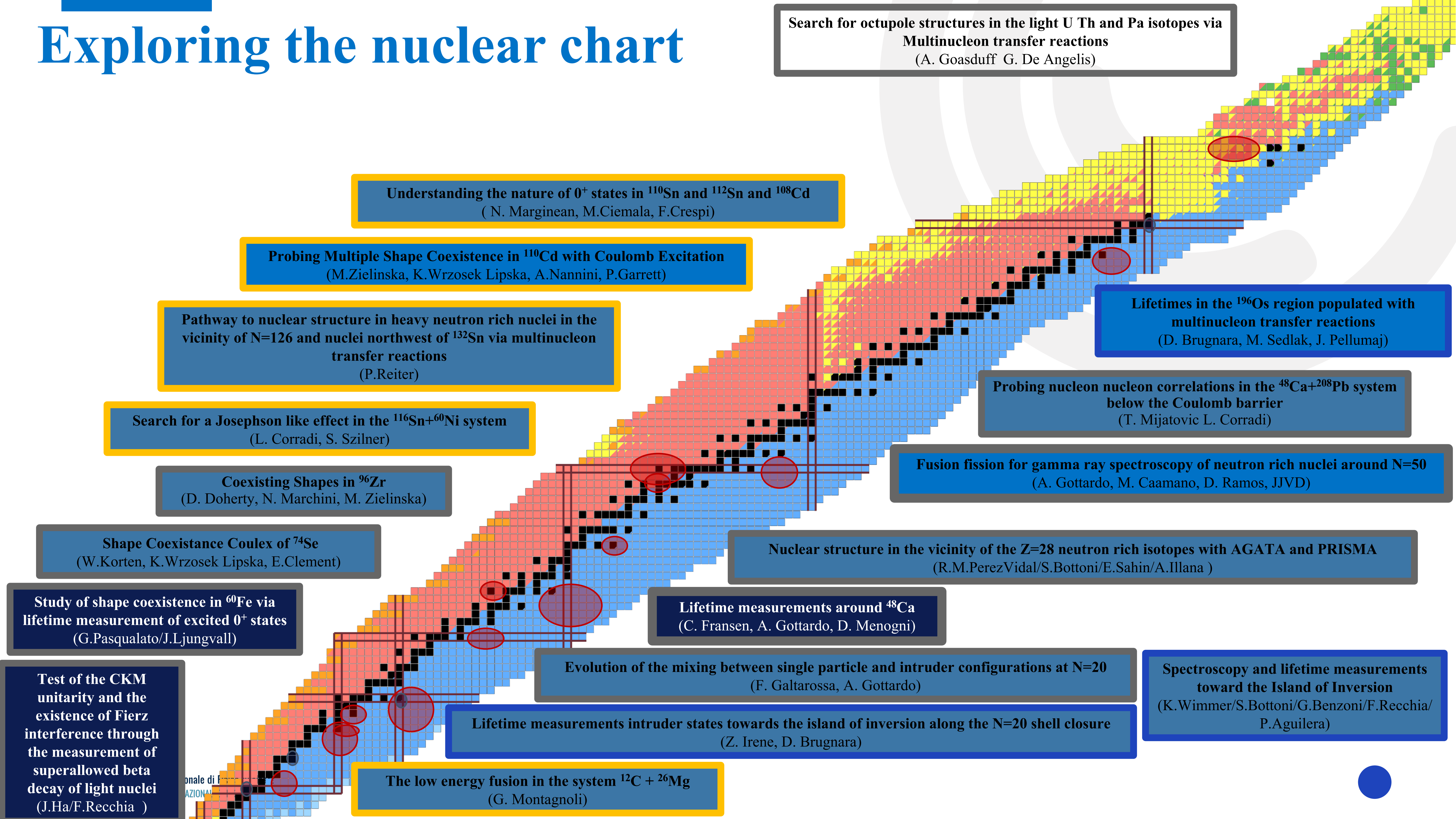
Coupled to PRISMA
(since 2022)



Configuration at “Zero-degrees”
(from 2025)

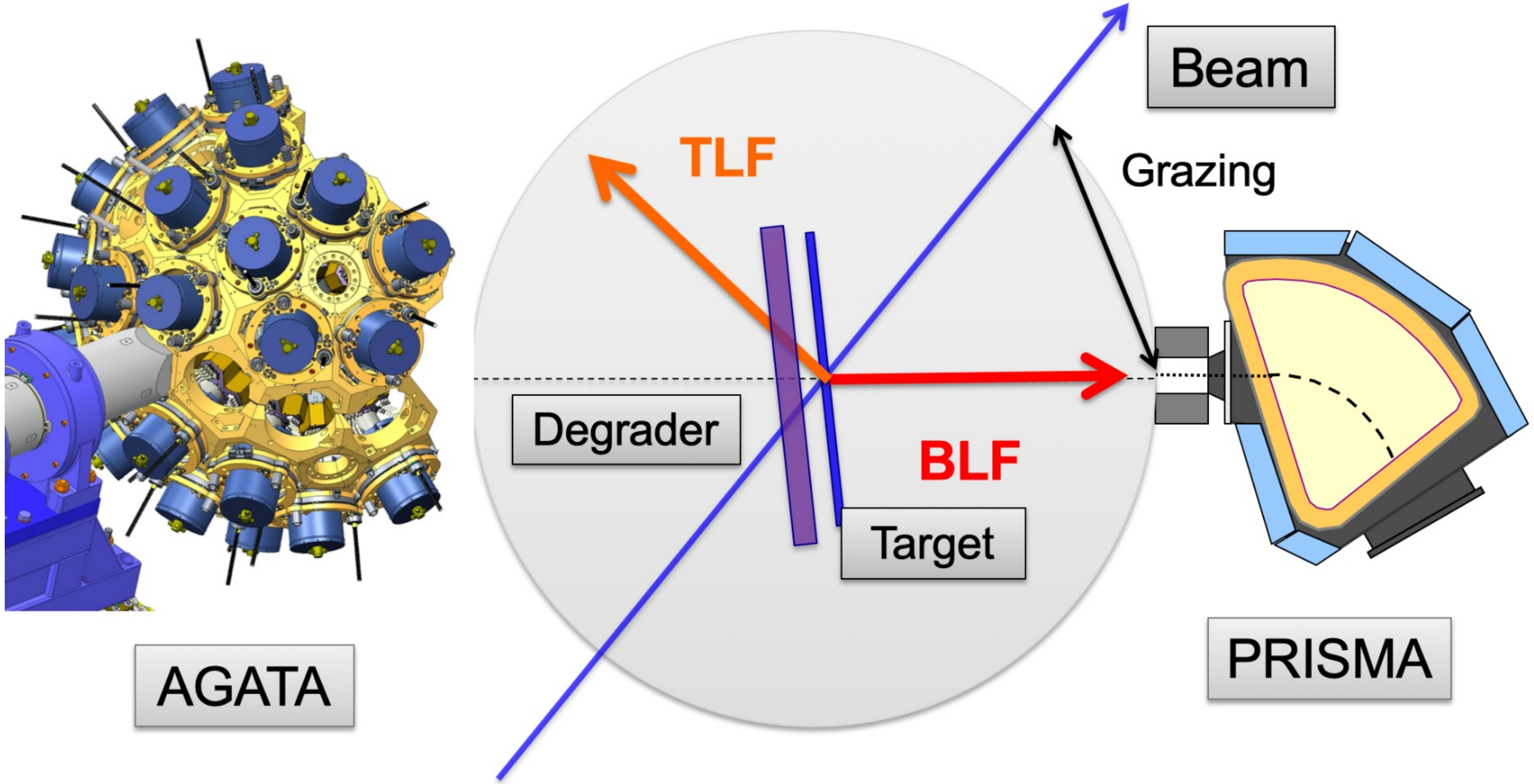


Exploring the nuclear chart

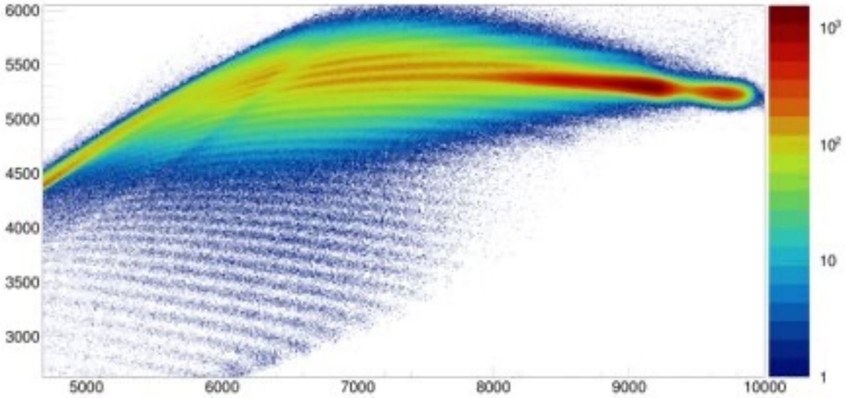


LIFETIME MEASUREMENT IN HEAVY PARTNER

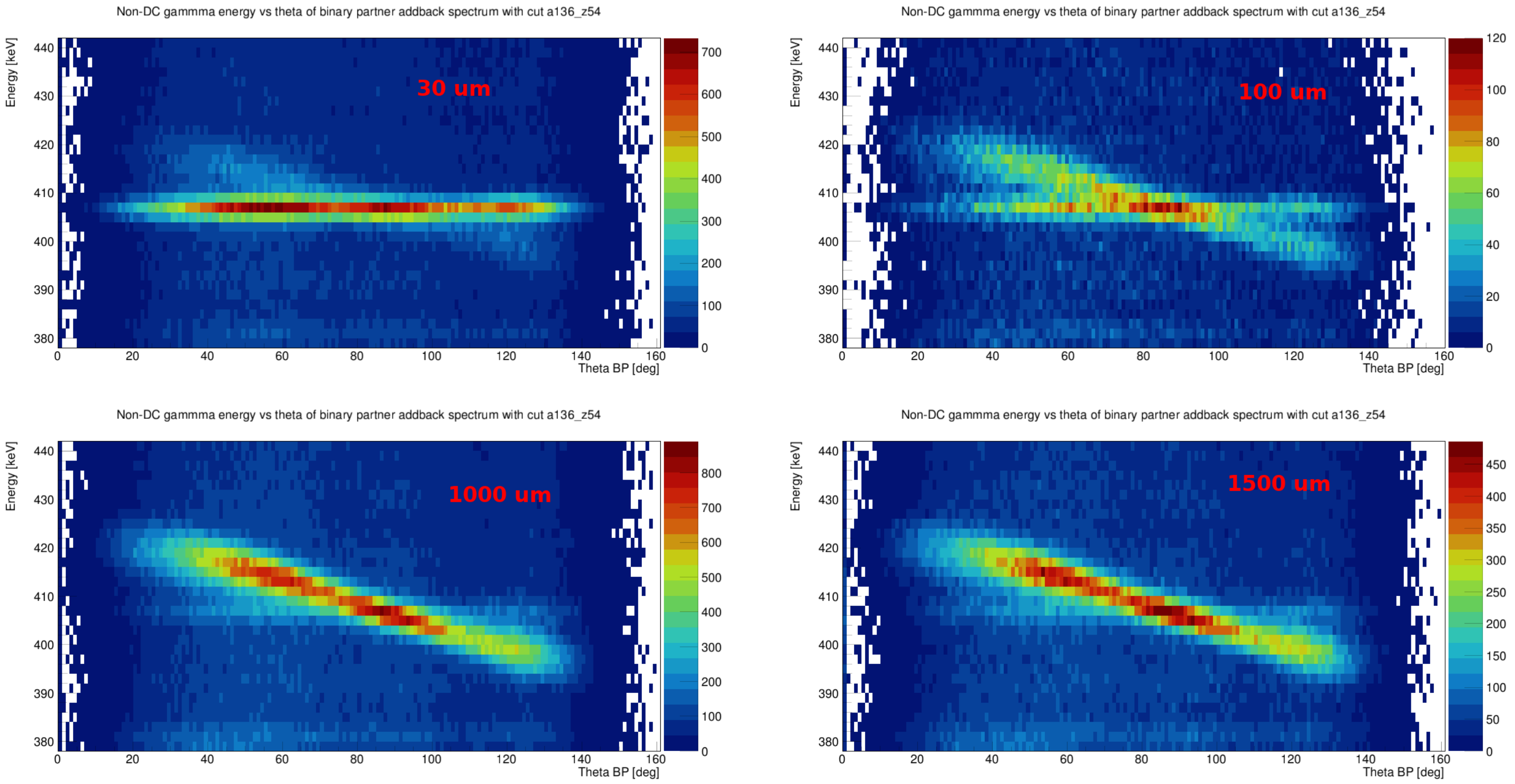
$^{136}Xe + ^{198}Pt$ (1.4 mg/cm^2) at 1.13 GeV



Z identification in PRISMA



LIFETIME MEASUREMENT IN HEAVY PARTNER



^{198}Pt

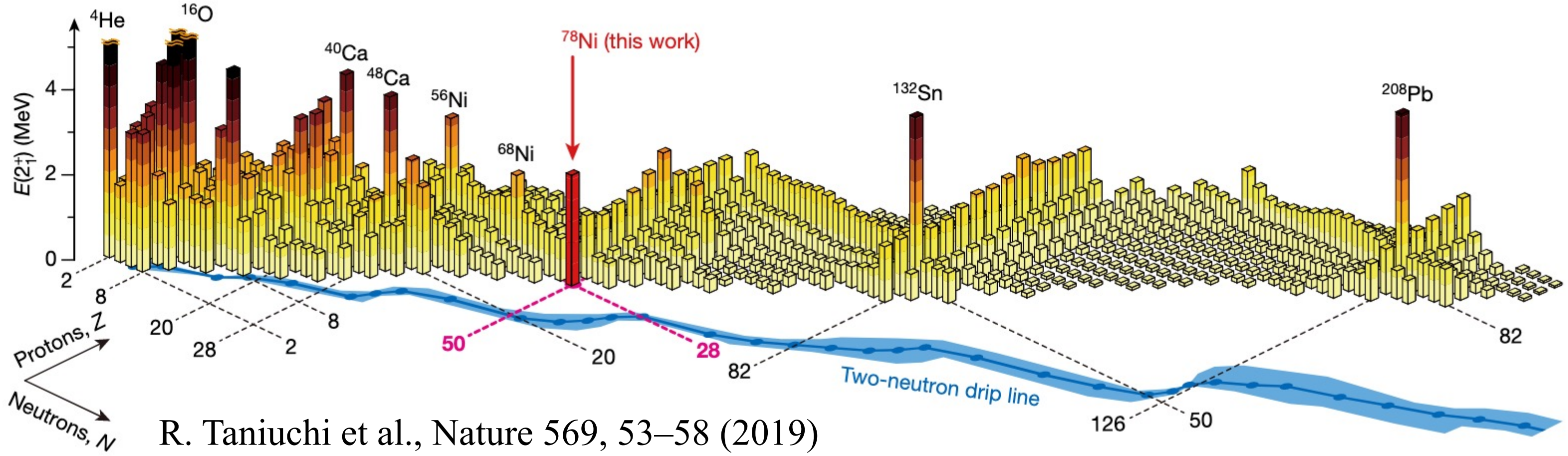
$E(2^{+}) = 407$ keV

$t_{1/2} = 22$ ps

Fusion-fission for N=50 studies

(A. Gottardo, M. Caamaño, J. J. Valiente-Dobón, D. Ramos)

The N=50 closure in neutron rich nuclei

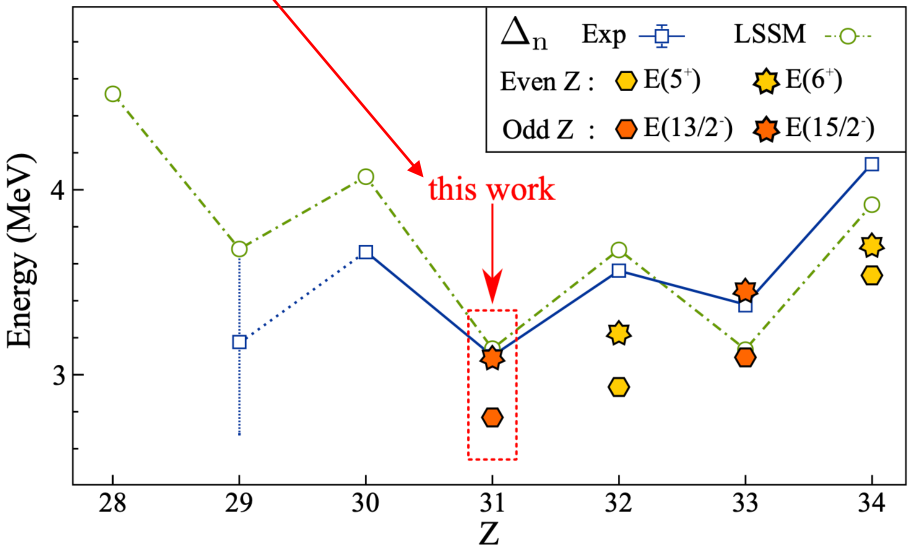


Proton knockout technique: **low spin** levels, **proton s.p.** wave function
Prediction (and observation?) of a well deformed 4p-4h intruder structure

R. Taniuchi et al., Nature 569, 53–58 (2019)

F. Nowacki et al., Phys. Rev. Lett. 117, 272501 (2016)

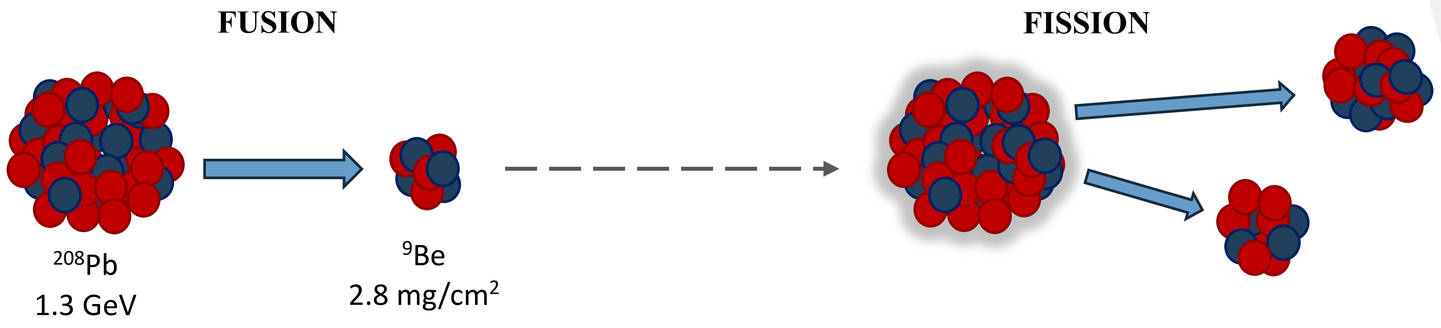
J. Dudouet et al. PRC 100, 011301(R) (2019)

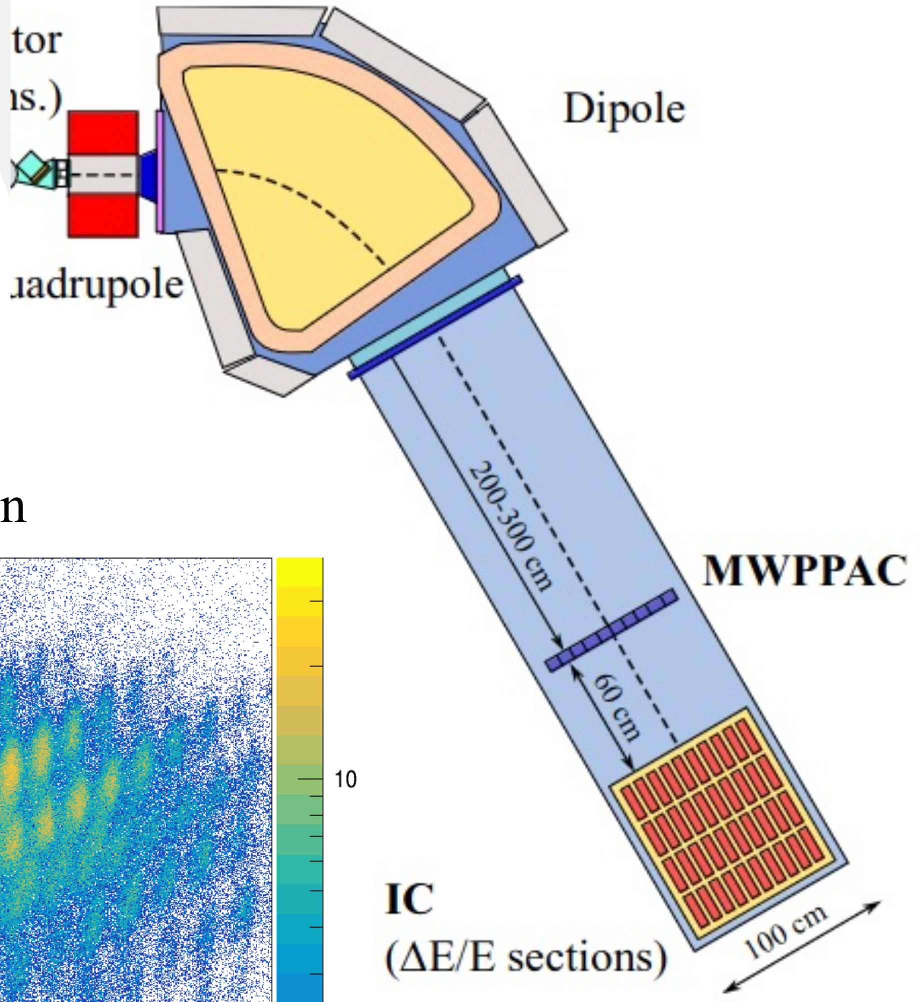


Energy gap reduction in N=50 isotones towards ^{78}Ni.
Increase in 80Zn from mass measurements.
5^+, 6^+ states in even-even nuclei come from core excitations and provide a measurement of the gap.

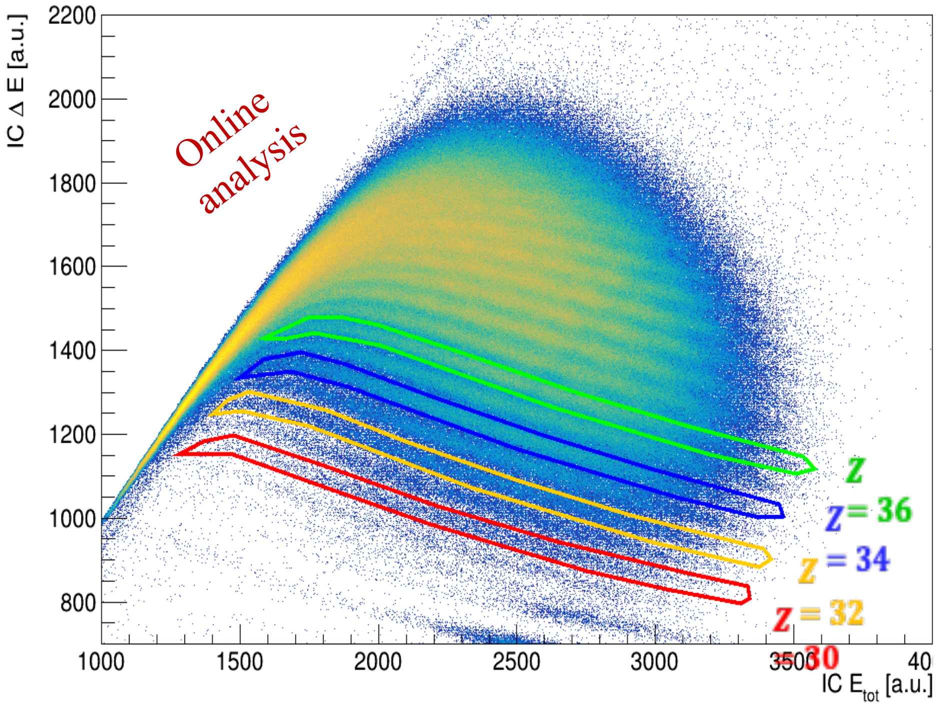
Yrast states in ^{80}Zn, ^{79}Cu

Fusion-fission for N=50 studies

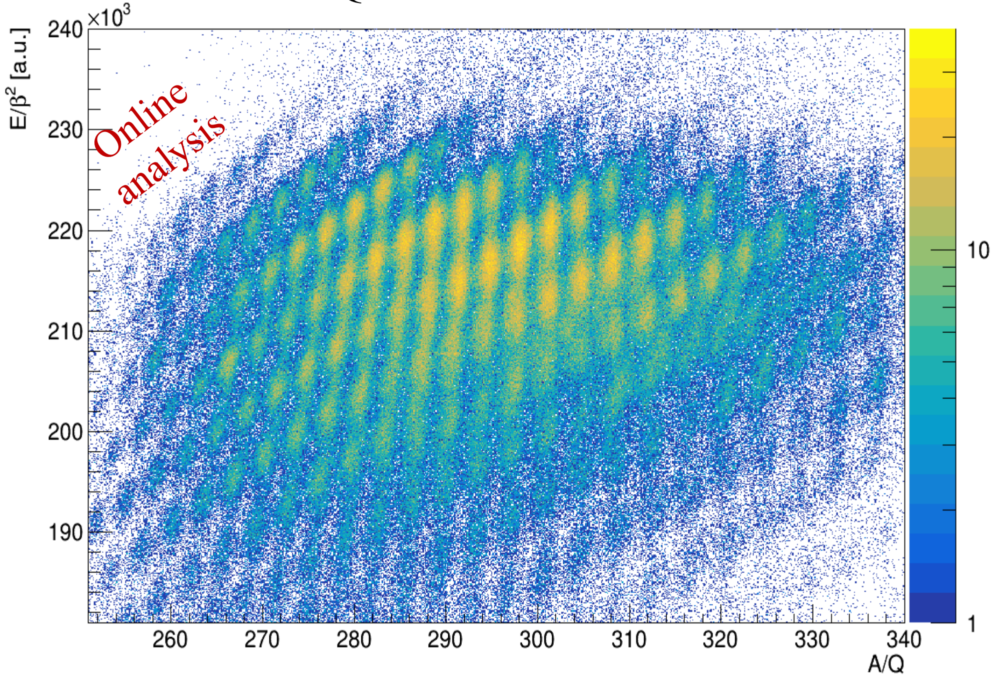




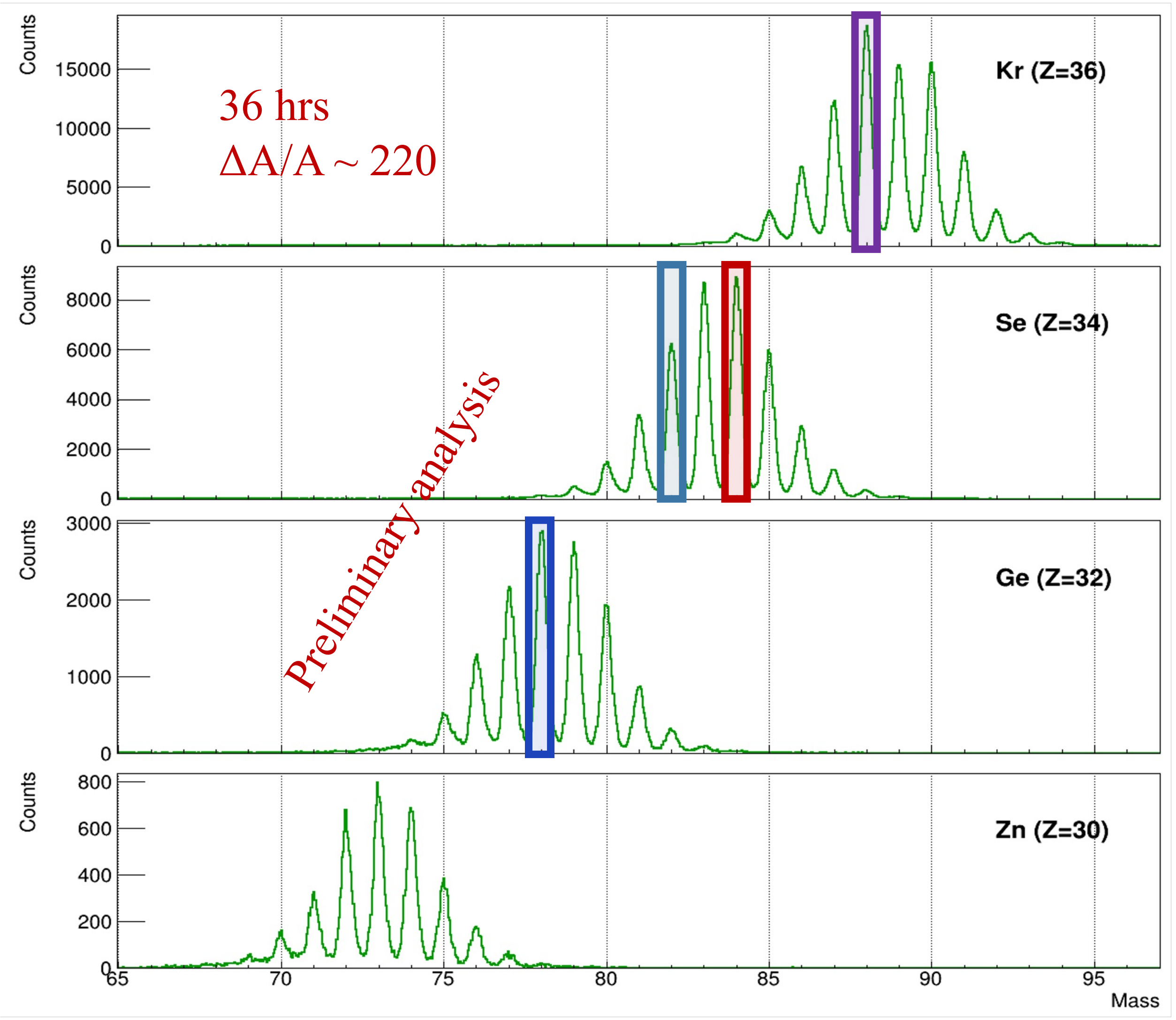
Z identification

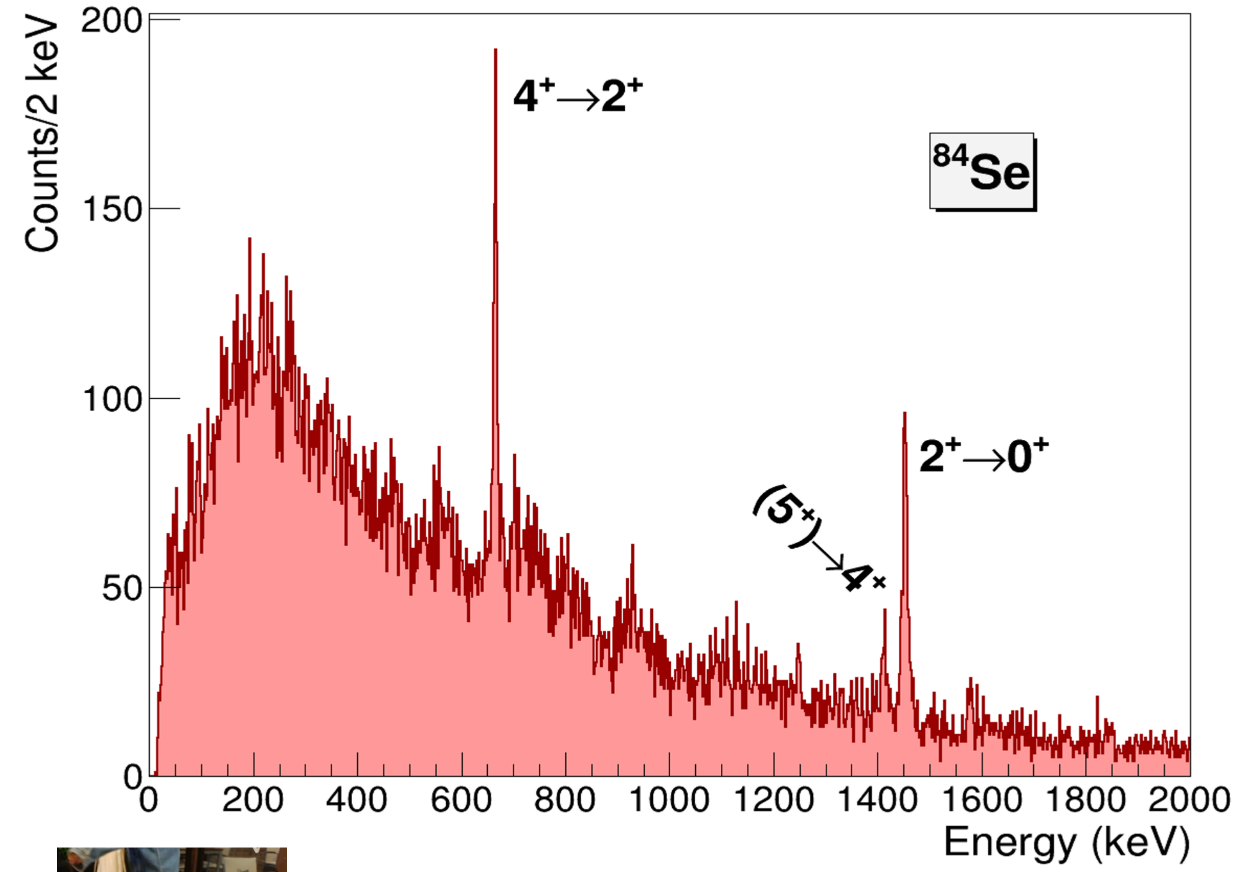


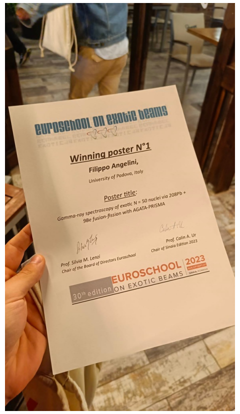
A/Q identification



Preliminary data







PhD Thesis of F. Angelini (University of Padova)

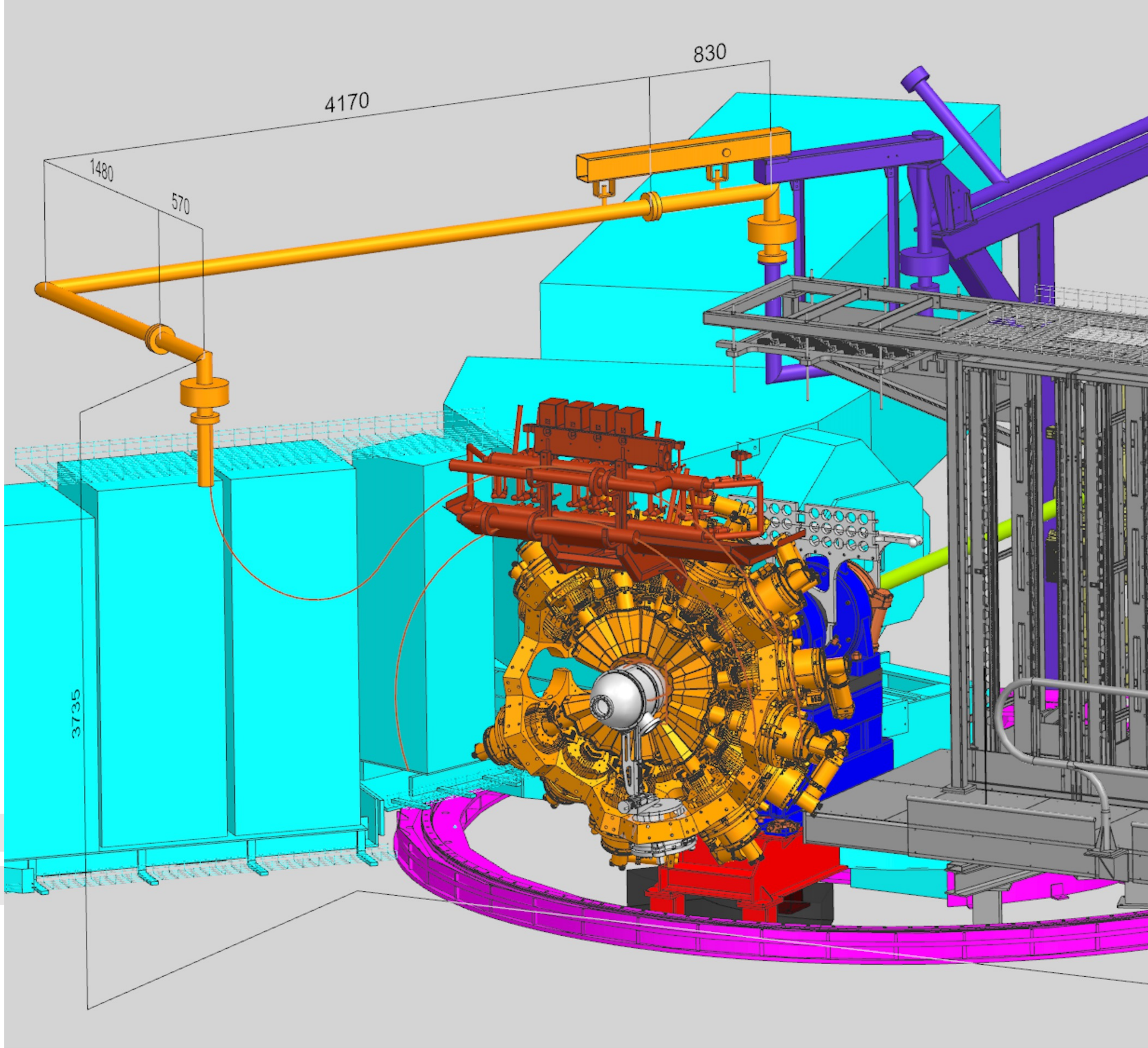
AGATA ZERO DEGREES

AGATA at zero-degrees

- Hot rotating nuclei, GDR, super deformation, high spin states
- Isospin symmetry, protron-neutron pairing and spectroscopy of N~Z nuclei
- Direct reactions, Coulex and lifetime measurements, near-threshold states
- Reactions relevant for astrophysics, structure of ^{12}C, three-body force

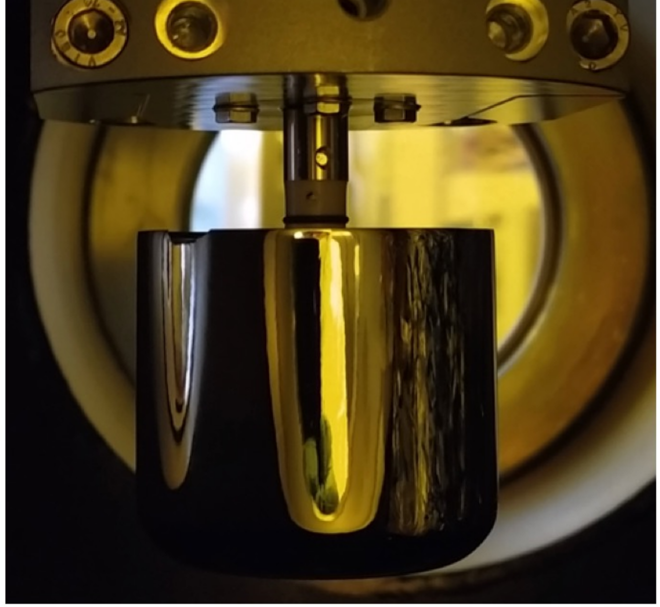
Complementary instrumentation:

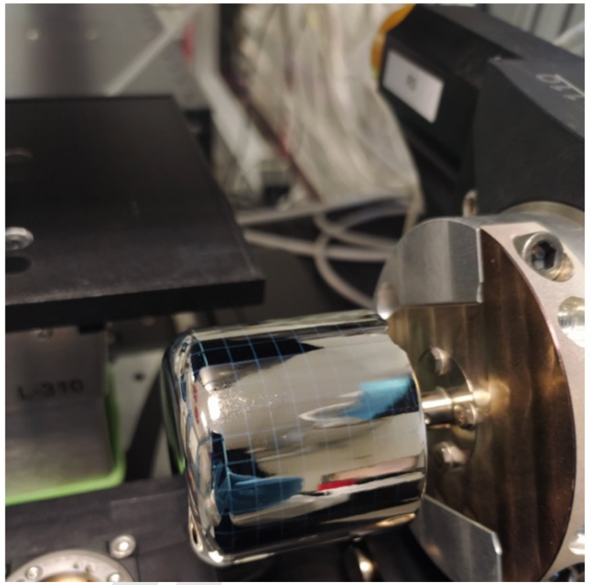
NEDA, PARIS, EUCLIDES, TRACE, …



N3G – HPGE DETECTOR DEVELOPMENT

- Development of front-end electronic
- New coating method for p-type segmented coaxial HPGe crystal
- Technology extensively tested under n-fluxes from the CN up to $4 \cdot 10^9$ neutrons/cm^2
- Research Agreement between the LNL-N3G team and MIRION Technology (CANBERRA) is highly relevant





Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

GALILEO @ LNL

AGATA
ADVANCED GAMMA TRACKING ARRAY

COLLABORATION WITH PANDORA

- New high rates pre-amplifier for GALILEO detectors (A. Pullia, S. Capra)
- First tests at LNL, production done
- Refurbishment of the 16 detectors in progress
- DAQ developed at LNL

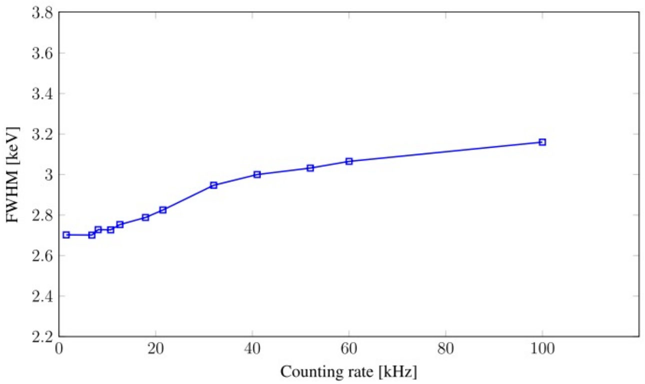


FIGURE 6
Measured FWHM of a GALILEO HPGE single crystal as a function of the counting rate using the V1725 CAEN digitizer. The HPGE detector was equipped with the new pre-amplifier. A 150 kBq ^{60}Co source placed at 10 cm from the detector, generating a fixed counting rate of 1.5 kHz. A stack of sources, composed of ^{241}Am, ^{133}Ba and ^{137}Cs, was placed on a movable vertical plate in order to simulate different low energy background counting rates. All the measurements were taken over 10 min runs.

Design study of a HPGe detector array for β-decay investigation in laboratory ECR plasmas

Eugenia Naselli[1]*, Domenico Santonocito[1], Simone Amaducci[1], Luigi Celona[1], Alessio Galatà[2], Alain Goasduff[2], Giorgio Sebastiano Mauro[1], Maria Mazzaglia[1], Bharat Mishra[1], Daniel R. Napoli[2], Angelo Pidatella[1], Giuseppe Torrisi[1] and David Mascali[1]

frontiers | Frontiers in Physics
TYPE Original Research
PUBLISHED XX XX 2022
DOI 10.3389/fphy.2022.936081

Check for updates

OPEN ACCESS

EDITED BY
Marialuisa Aliotta,
University of Edinburgh,
United Kingdom

REVIEWED BY
György Gyürky,
Institute of Nuclear Research (ATOMKI),
Hungary
Jack Henderson,
University of Surrey, United Kingdom

A high resolution γ-ray array for the pandora plasma trap

A. Goasduff[1], D. Santonocito[2]*, R. Menegazzo[3], S. Capra[4,5], A. Pullia[4,5], W. Raniero[1], D. Rosso[1], N. Toniolo[1], L. Zago[1,6], E. Naselli[2] and D. R. Napoli[1]

[1]Laboratori Nazionali di Legnaro, INFN, Legnaro, Italy, [2]Laboratori Nazionali del Sud, INFN, Catania, Italy, [3]Sezione di Padova, INFN, Padova, Italy, [4]Dipartimento di Fisica, Università degli Studi di Milano, Milano, Italy, [5]Sezione di Milano, INFN, Milano, Italy, [6]Dipartimento di Fisica e Astronomia, Università degli Studi di Padova, Padova, Italy

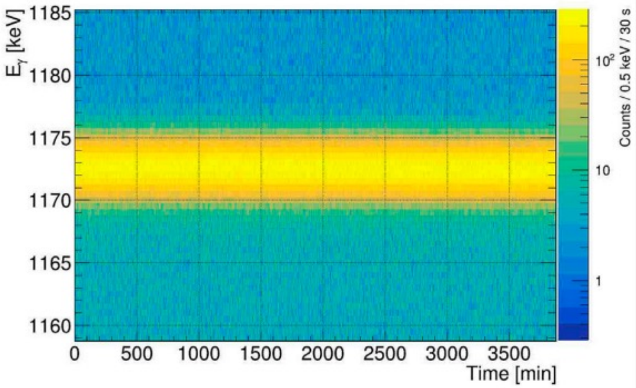
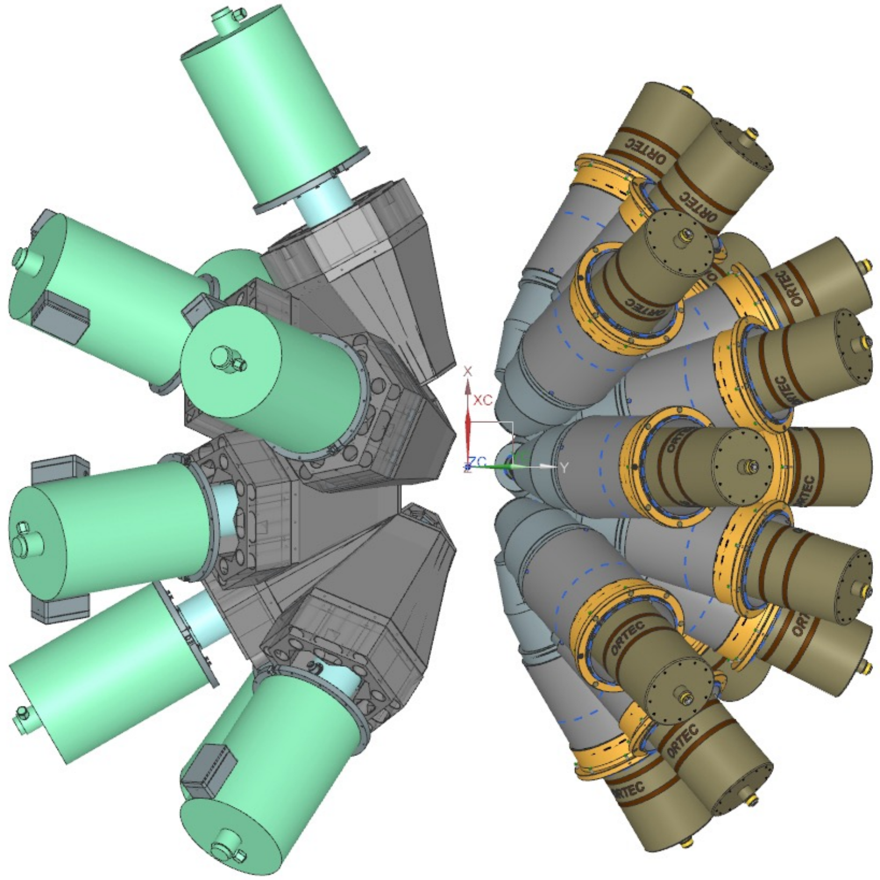


FIGURE 8
Energy vs. Time measured of 60 h using the multi-source with a total rate of 50 kHz. The energy axis has been zoomed on the 1172-keV transition coming from the ^{60}Co source.

GALILEO PHASE III

- Discussion within the GAMMA collaboration started to prepare the phase III of the GALILEO array
- Short term:
  - refurbishment of the pre-amplifier for high rates capabilities for high intensity stable beams
- Long term:
  - Increasing the detection efficiency
  - Increased flexibility of the geometry
    - Stable / radioactive beams
    - Measurement with PRISMA / standalone

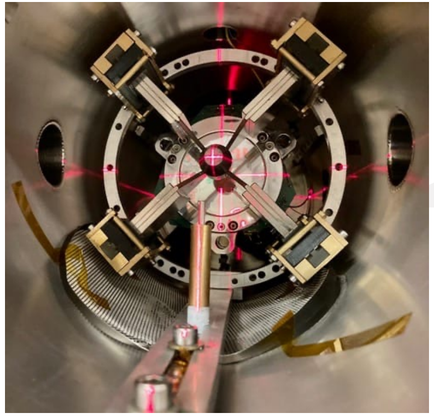


INFN
Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

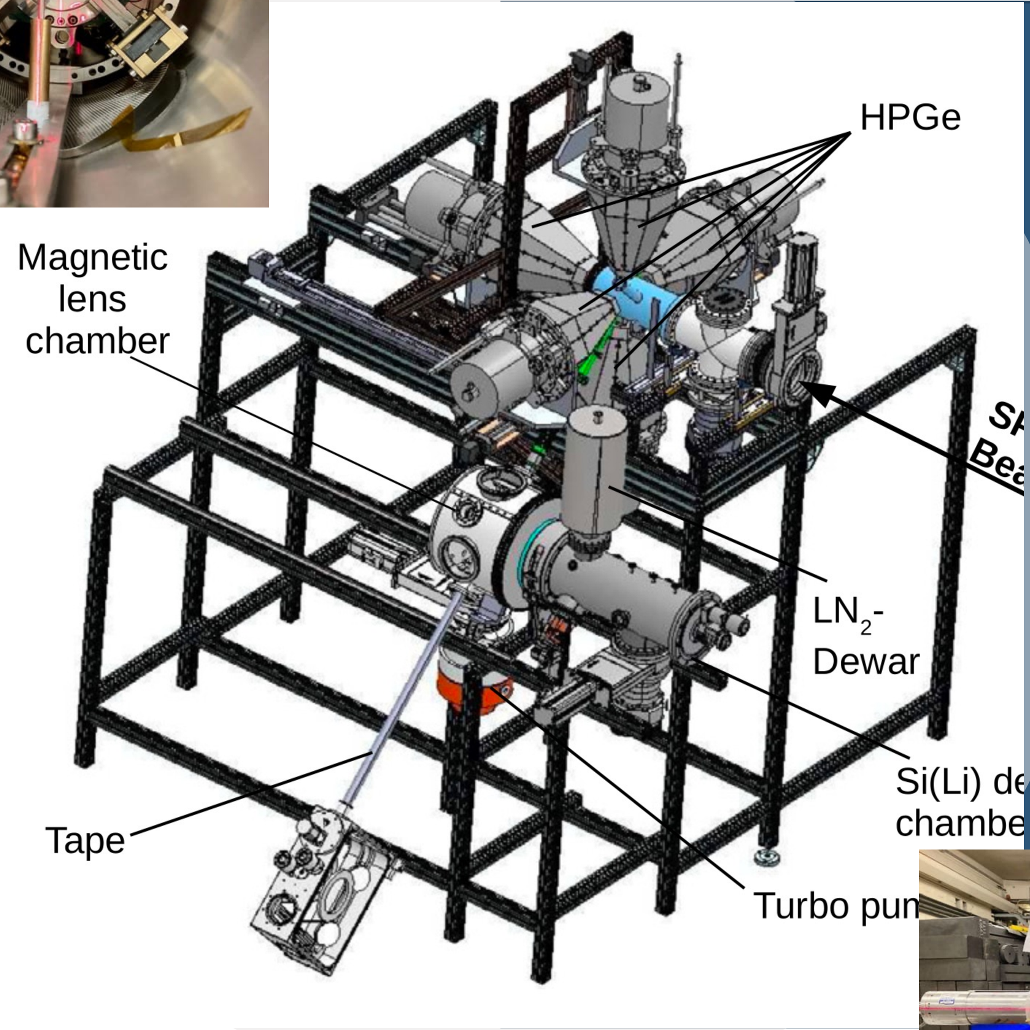
SPES 1^+ BEAMS

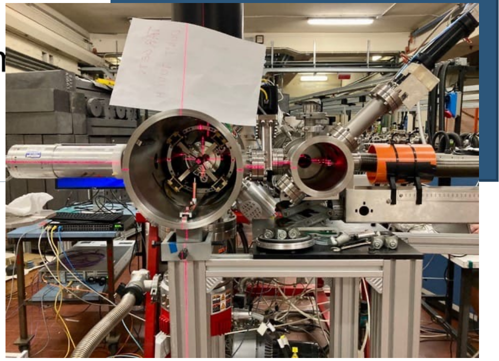
DECAY STUDIES

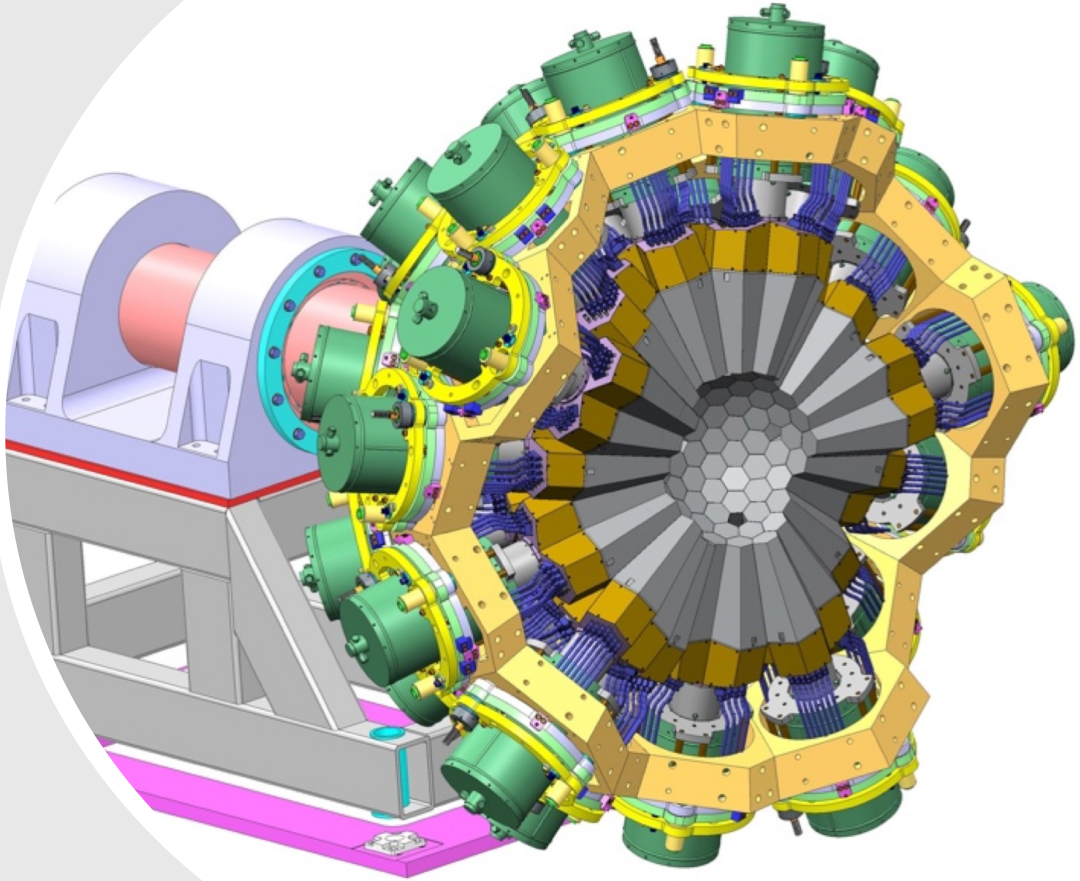
SPES LOW ENERGY



- Two measurement points:
  - Beta-decay:
    - 5 GALILEO Triple Cluster + Anti-Compton
    - New plastic for $4\pi\beta$ tagging
  - Delayed electron spectroscopy:
    - Segmented silicon 7 mm-thick detector
    - β-tagging
    - Tested at CN and available for experiments (ICE118Sn)







INFN Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

THANK YOU

ALAIN.GOASDUFF@LNL.INFN.IT

HTTP://GAMMA.LNL.INFN.IT