Characterization of a multisegmented HPGe AGATA detector in the SALSA setup

Laboratorio Datación Radiaciones Ionizantes

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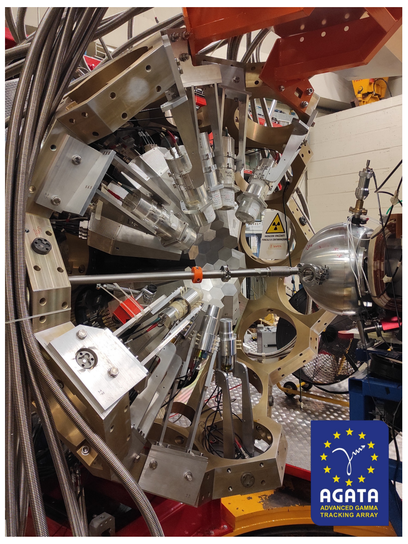
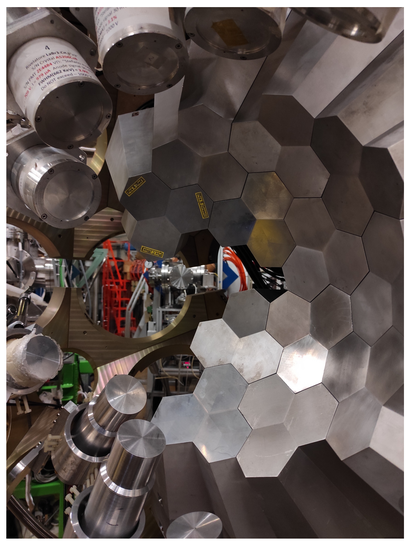
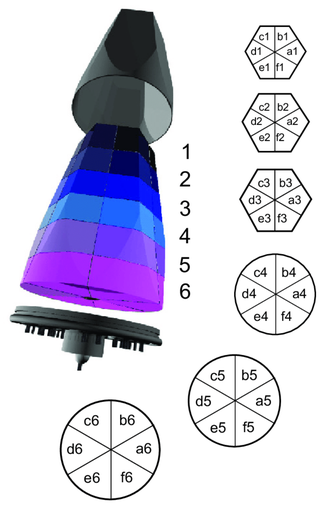
AGATA spectrometer

AGATA is a **4π γ-ray spectrometer** [1]

Advantages over other spectrometer detection systems → **Tracking-based**:
- Better Doppler correction: improved **resolution**
- Background reduction through the selection of full absorption events: increased **sensitivity**
- Greater solid angle coverage: improved **efficiency**

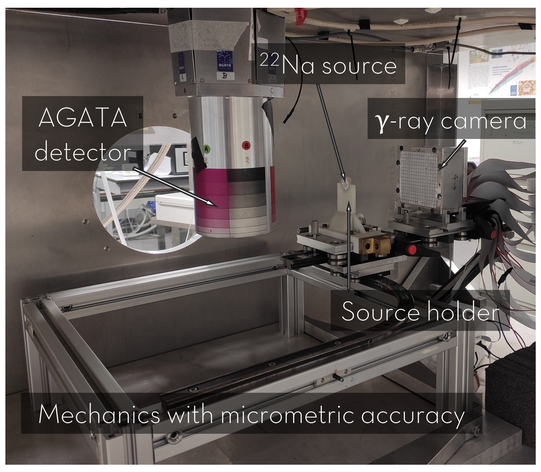


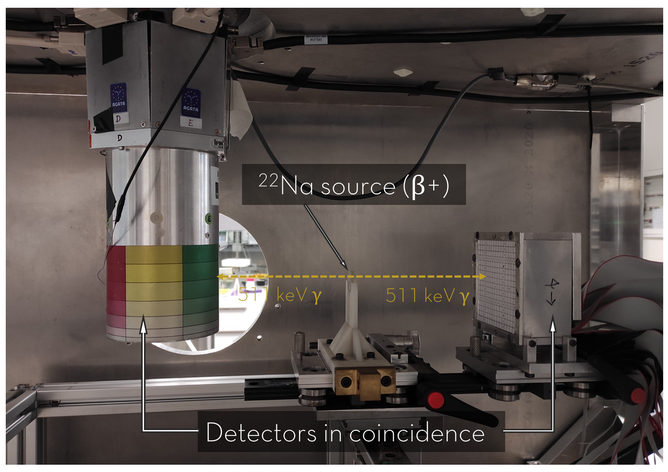




It will be composed of **180 HPGe detectors**:
- **Sensitive to the interaction position** of γ-rays within the crystal
- Introduce **electrical segmentation technology**:
  - Internal contact (core) : n-type
  - External contact : p-type, 36 electrically isolated segments

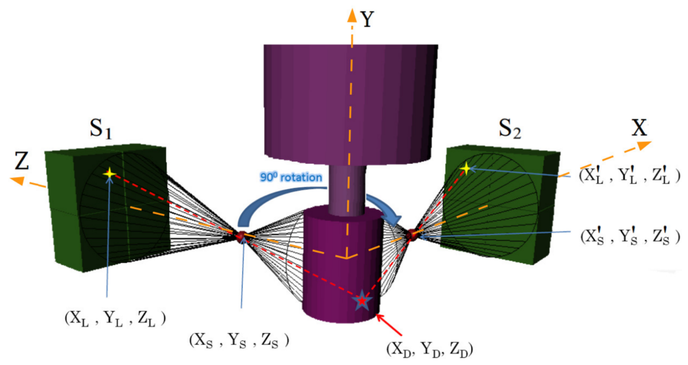
SALSA (SAlamanca Lyso-based Scanning Array)



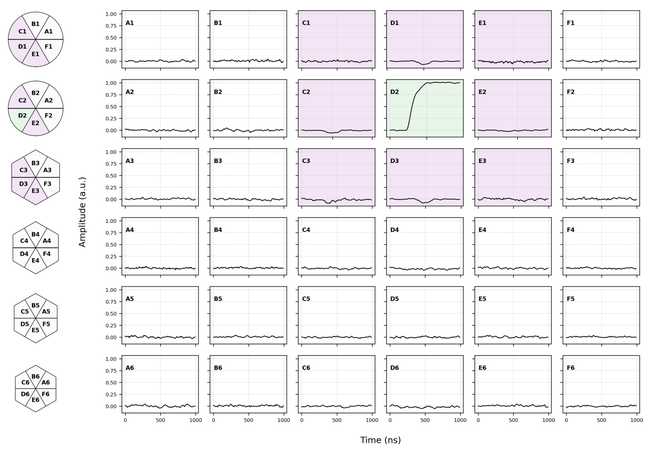


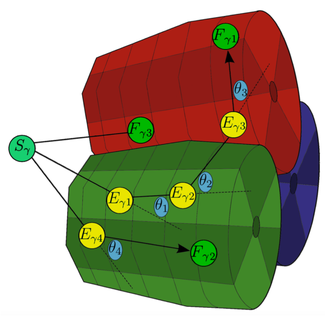
SALSA enables the **experimental characterization of AGATA detectors** (relation between the radiation interaction position in the detector and its electrical response) [2,3]
- 3D scanning
- **Active collimation** based on source properties

  ^{22}Na: $e^+ + e^- \rightarrow \gamma + \gamma$ (180º emision)
- Measurement in **coincidence** with a γ-ray camera: 256 pixels



PSA (Pulse Shape Analysis) and tracking





<u>PSA (Pulse Shape Analysis)</u>

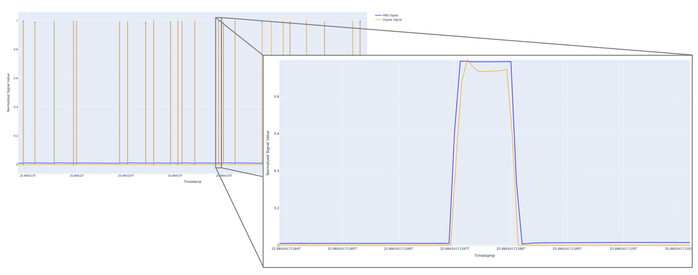
The **position and energy** deposited in each interaction are determined by the **analysis** of the **pulse shape**

<u>Tracking</u>

Reconstruction of the γ-ray: position and energy

Data analysis - Main stages

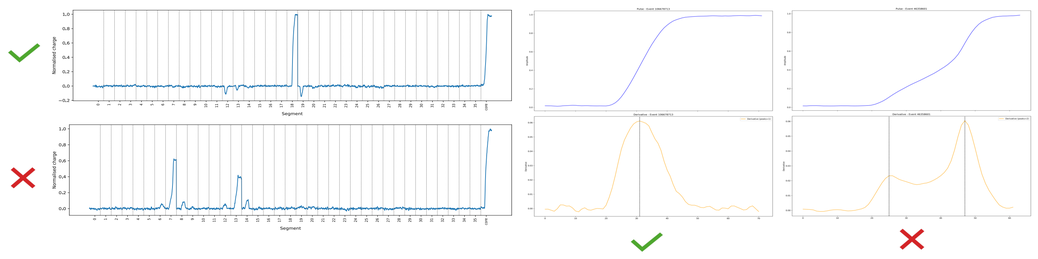
1. Timestamp matching (AGATA – γ-ray camera)



Iterative method
Time alignment < 40 ns
Sampling rate: 100 MHz

2. Filtering and signal processing

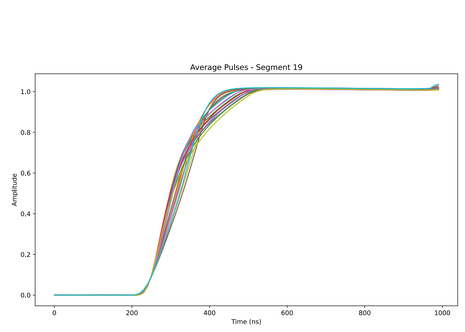
   Fold 1, energy gate, single interaction according to signal derivative, etc

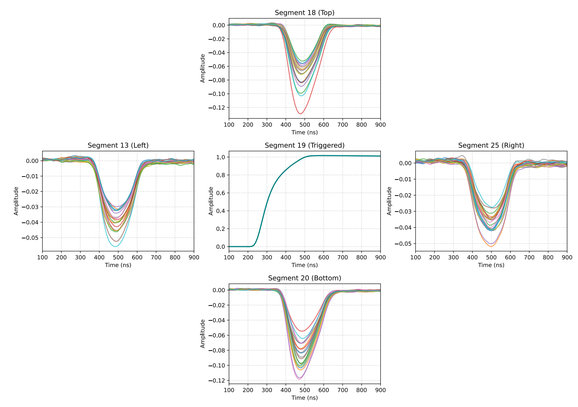


   Baseline to zero, gain calibration, time alignment and signal smoothing

3. Pulse shape analysis

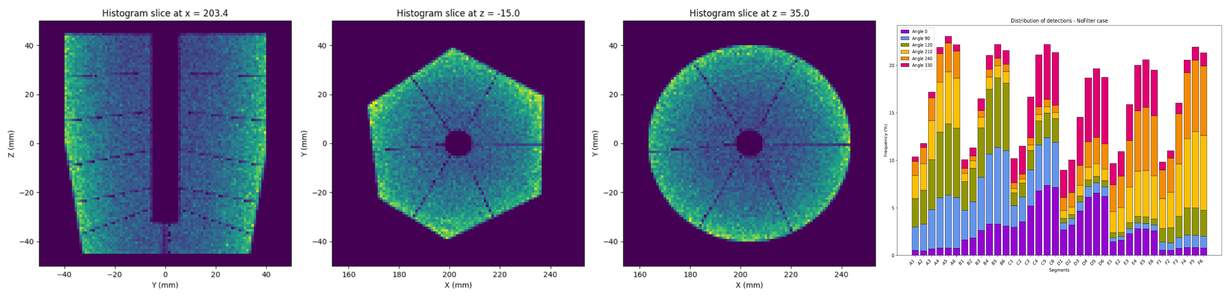
   Classification based on the **net and transient** signals (**Wilcoxon test** [4])





4. Geometric determination → Database construction

Simulation



Bibliographical references

[1] doi:10.1016/j.nima.2011.11.081
[2] http://dx.doi.org/10.1016/j.nima.2012.10.028
[3] http://dx.doi.org/10.1016/j.nima.2016.03.103
[4] http://dx.doi.org/10.1016/j.nima.2016.03.094

Ayuda RED2024-153684-T financiada por MICIU/AEI/10.13039/501100011033

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