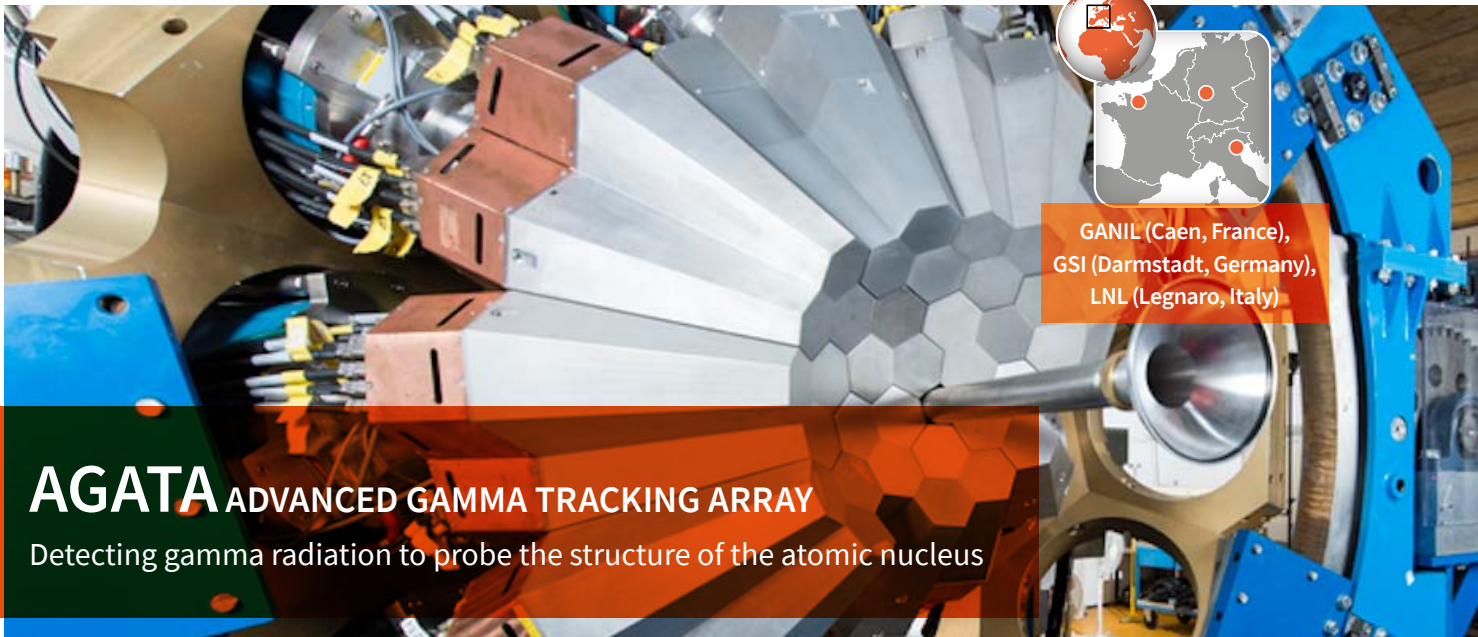


## Properties of atomic nuclei



GANIL (Caen, France),  
GSI (Darmstadt, Germany),  
LNL (Legnaro, Italy)

# AGATA

## ADVANCED GAMMA TRACKING ARRAY

Detecting gamma radiation to probe the structure of the atomic nucleus

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- **Scientific leader:** Araceli Lopez-Martens (IJCLab) \*
- **Laboratories involved:** CC-IN2P3 (Lyon), GANIL (Caen), IJCLab (Orsay), IPHC (Strasbourg), IP2I (Lyon)
- **Nature:** research instrument
- **Status:** European research project in operation, led by an international collaboration
- **Website:** <http://agata.in2p3.fr/> and <https://www.agata.org/>

### SCIENTIFIC OBJECTIVES

AGATA is a gamma photon detector capable of measuring the energy and emission angle of radiation with a very high degree of accuracy. It is used to study exotic nuclei: the number of their protons and/or neutrons, their angular momentum, their temperature, etc. The precise analysis of the emitted gamma photons makes it possible to extract information on the energy of the nuclear states, their wave function, their stability and their spatial extension. It also provides information on how nuclei are produced in the laboratory, in stars and other astrophysical sites. These studies provide useful experimental data to test and develop nuclear models.

### RESOURCES DEPLOYED

The detector is composed of large, ultra-pure Germanium crystals. The final detector will have 180 interlocked detectors such as to form a spherical shell capable of detecting gamma rays emitted in all directions. The Germanium serves as a reaction medium for the gamma photons, which produce an electrical signal. High-speed electronics allows the analysis of signal shapes and the reconstruction of trajectories and energies of the emitted photons with great precision. The detector is intended to operate at the various stable and radioactive heavy ion beam facilities in Europe.

**40** research institutes

**180** Germanium crystals,  
362 kg total weight

**12** participating countries

**40** Terabytes of  
data per week

**60** million euros (budget)

### IN2P3 CONTRIBUTIONS

- Hosted the detector from 2014 to 2021 at GANIL.
- Management of a capsule verification and integration site.
- Design and development of the Germanium crystal segment charging preamplifiers.
- Participation in the design and development of the digital signal processing electronics.
- Responsible for the electromagnetic compatibility of the detector.
- Development of the data acquisition system and software for data inspection and analysis as well as for reconstruction or tracking of photon trajectories.

### OTHER FRENCH LABORATORIES INVOLVED

Irfu (CEA Saclay)

**2003**

Initiation of the collaboration

**2005**

First prototype tested at the University of Cologne

**2010-2011**

LNL campaign (INFN Italy) with 15 detectors coupled to the PRISMA spectrometer

**2012-2014**

GSI campaign with 21 detectors coupled to LYCCA

**2015-2021**

GANIL campaign with more than 40 detectors coupled to VAMOS and NEDA

**2021**

Relocation of the instrument to the LNL in Italy