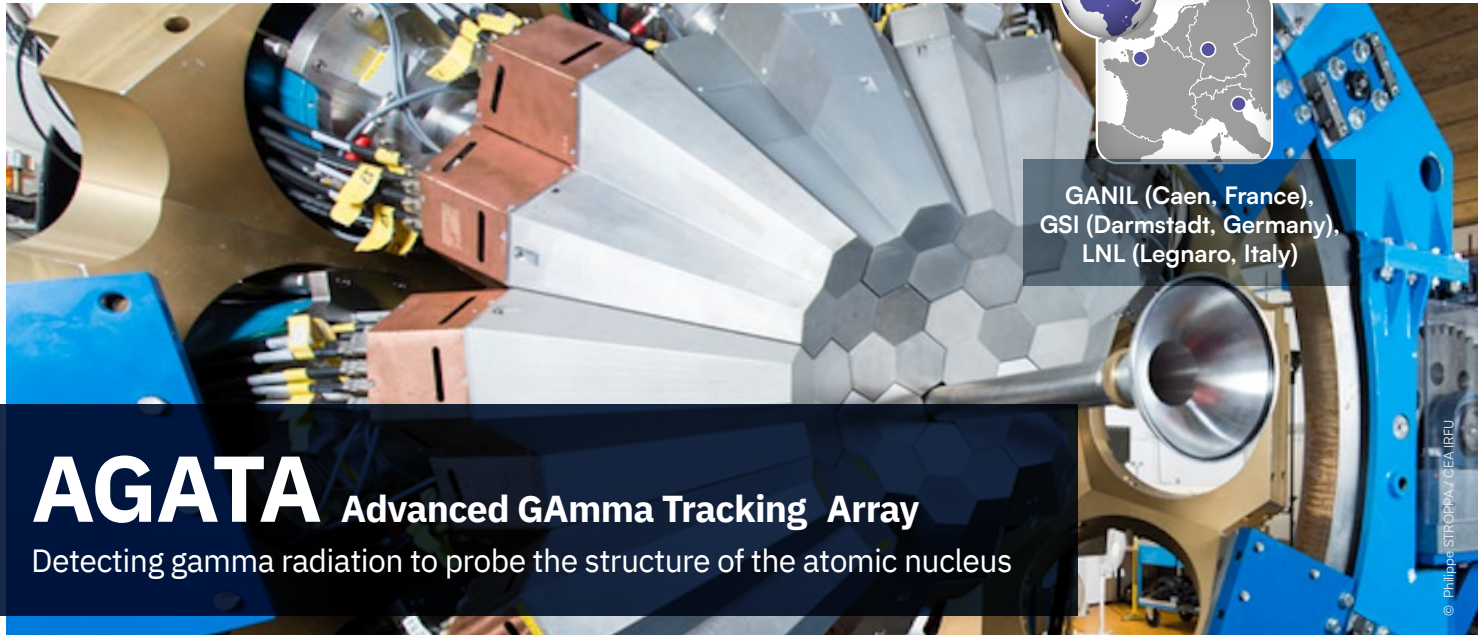


Properties of atomic nuclei



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

Scientific leader: Emmanuel Clément (GANIL) *

Laboratories involved: CC-IN2P3 (Lyon), GANIL (Caen), JCLab (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.

40To research institutes	40 research institutions
€ 60M budget	12 participating countries
180 Germanium crystals, 362 kg total weight	

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	2022 Relocation of the instrument to the LNL in Italy
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* Since 2021