

Properties of atomic nuclei



GANIL, Caen, Normandy

FAZIA

Study the properties of atomic nuclei far from their fundamental states

Scientific leader: Nicolas Le Neindre (LPCC) *

Laboratories involved: GANIL (Caen), LPCC (Caen), IJCLab (Orsay), L2IT (Toulouse), Subatech (Nantes)

Nature: research instrument

Status: European project in operation, bringing together French (IN2P3), Italian (INFN), Polish, Spanish and Korean institutes.

Website: <http://fazia.in2p3.fr>

Scientific objectives

FAZIA is a detector that simultaneously measures the charge and isotopic composition (number of protons and neutrons) of fragments resulting from collisions between nuclei. It allows the study of the properties of the nuclear "fluid" and also the dynamics of colliding nuclei, i.e. when they are placed in extreme conditions of temperature and density, such as in neutron stars or supernovae. In particular, FAZIA will study how protons and neutrons rearrange themselves under these extreme conditions.

Resources deployed

FAZIA uses three-stage detectors (telescopes) to identify nuclei in a speed range of 0.05 to 0.5 times the speed of light (secondary particle speed at GANIL). Two stages are made of silicon and a third stage of a thicker scintillator to detect the fastest particles. FAZIA's innovation is the digitisation of the signal and its analysis in a shape to identify charged ions with a single silicon. The ultimate goal is to observe particles in 90% of directions with a spatial resolution of less than one degree.

192 telescopes	5 participating countries
€ 750M cost of the detector	17 researchers in France
80cm and 15kg size and weight for a 16-telescope module	

IN2P3 CONTRIBUTIONS

- Design of the signal acquisition electronics (integrated electronics operating in a vacuum).
- Definition of the command and control protocol, data acquisition system, installation in the experiment room.
- Construction of the support mechanism and characterisation of the scintillating crystal detectors.
- Participation in the purchase of equipment and detectors.
- Participation in construction, assembly and testing.

Other french laboratories involved

IRFU (CEA Saclay)

- 2000-2011**
AZ4π projet R&D
- 2011**
MoU initiating the FAZIA group
- 2013**
Implementation phase. First block tested in Catania (Italy)
- 2014 – 2018**
Assembly of 2 to 6 blocks tested in different configurations
- 2019**
Installation of the final demonstrator (12 modules of 16 telescopes) at GANIL
- Since 2019**
Campaign of experiments coupled to the INDRA detector

* Since 2018