GANIL NEWSLETTER

JULY 2025

GANIL is delighted to have been awarded exceptional grants for joining a new consortium of accelerators that provide access to Space industry. The Region Normandie is funding the accelerator consortium Normandie Accelerators and FRANCE2030 has validated a dedicated fund to support the development of this activity, reinforcing in the meantime our operation capabilities for basic science.

Many progresses are to be highlighted on this first part of the year:

We are very happy that the decree authorizing the creation and operation of the DESIR facility was formally published. GANIL teams now work on the authorization file for commissioning the facility !

Numerous technical difficulties on the superconducting magnets of S^3 have been overcome by the local teams of GANIL. Success is also on the cards for the electric dipole, which has reached its required voltage. We are thrilled to look for S3 commissioning in December !

On the side of the cyclotrons, new developments on the ion sources and the cyclotron injector lead to a significant increase in intensity and stability. Also, new CIME settings allow for a new type of ion beams, the cocktail beams, which are required for space applications.

R&D spreads over the lab, as AI is now supporting the on-line reconstruction of ion trajectories in VAMOS, MORA has shown its first polarization capability, and a new database for diffusion coefficients has been created.

On the top of all this, beautiful results from AGATA and MUGAST campaigns came to publication on the unexpected behavior of the shell structure in exotic nuclei... We wish you a pleasant reading and beautiful summer !

Patricia Roussel-Chomaz and Fanny Farget

HEADLINES

GANIL joins forces to create the Normandy Accelerators platform

The Normandy Region is providing €4.27 million in funding for the Normandy Accelerators project including €3.2 million for GANIL . The aim of this project is to set up a technological innovation platform offering a wide range of beams for carrying out radiative tests for the space, defense and nuclear industries. This association of particle accelerators supported by academic and industrial partners will be unique in France and Europe.

SAGA Project: winner of the France 2030 investment plan

The SAGA project is one of 30 new winners in the space section of the France 2030 investment plan. This programme aims at accelerating the transformation of key sectors of our economy through innovation and to position France as a "leader" in the world of tomorrow.

Visiting scientist 2026

GANIL welcomes international scientists to apply to its new visitor program. The objective of this visiting scientist program is to provide an international venue for research on nuclear physics, interdisciplinary research, accelerator and instrumentation developments. The call for applications 2026 Visiting Scientist at GANIL is open until September 1st 2025.

Program Advisory Committee (PAC) - 24th to 25th of November 2025

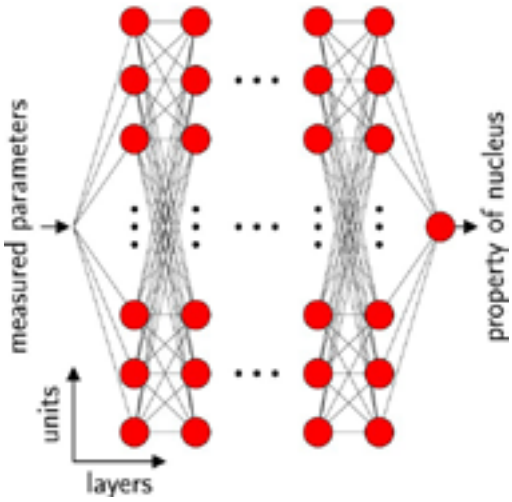
This call is open for experimental proposals to be performed at the GANIL SPIRAL2/NFS facility. Due to the heavy backlog on cyclotron experiences areas, no new experiences will be considered.
The deadline for submission of the proposals is October 1st, 2025 (12:00 CET).

Artificial intelligence empowering of VAMOS

Developed at GANIL, a neural network-based artificial intelligence model now helps in identifying nuclei detected in VAMOS. Designed for all experiments, it processes up to one million events per second, enabling real-time data analysis with exceptional accuracy, maintaining an atomic mass error margin below Ø.5%.

The results were published in Nuclear Instruments and Methods in Physics Research Section A.

→ Read the article



Demonstration of the laser polarisation in the trap of MORA

The degree of polarization of ^{23}Mg+ ions in the MORA trap has been measured at IGISOL in Finland. This is an experimental first for this innovative technique. Initial estimates show that it is greater than 55%, with a confidence interval of 9Ø%.

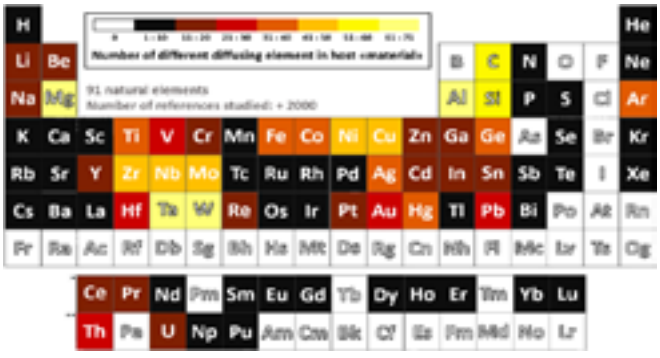
Creation of a database for studying diffusion coefficients

The database aims at bringing together the various parameters that govern diffusion coefficients. Few data exist for the usual operating temperatures (15ØØ to 25ØØ°C) of ISOL devices.

The database was created in an attempt to evaluate the missing diffusion coefficients by inter- or extrapolation.

The results were published in Defect and Diffusion Forum.

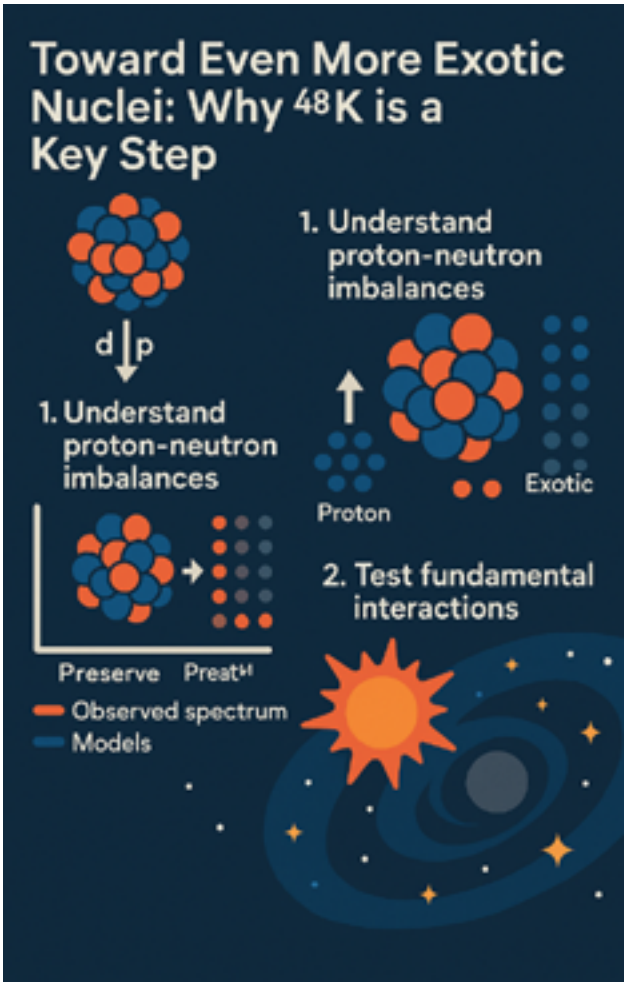
→ Read the article



SCIENTIFIC HIGHLIGHTS

Towards even more exotic nuclei: why ^{48}K is a key step

An international collaboration led by Surrey University and LPC Caen has carried out an experiment to study the structure of ^{48}K using the neutron transfer reaction: ^{47}K(d,p) ^{48}K at GANIL. Thanks to the MUGAST+AGATA+VAMOS setup, nine new bound quantum states have been observed for the first time in the ^{48}K, with the determination of spins and parities as well as their spectroscopic factors. These measurements probe the nuclear structure of ^{48}K, examining how protons and neutrons interact, particularly in the very special and poorly understood case between the proton (s1/2) and neutron (fp) orbitals, around the famous 'magic number' N = 28. This highly accurate result is a key step towards modelling even more exotic nuclei such as the isotopes of ^{44}S and ^{42}Si, the first spectroscopic measurements of which were carried out at GANIL almost 20 years ago. A long quest in the study of magic numbers, the pillars of atomic nucleus modelling.



The results of this experiment have been published in the journal Physical Review Letters.

→ Read the article

Highlighting the structure of ^{22}C by its lighter cousin ^{17}C

^{22}C, the heaviest isotope of carbon still bound, is a halo nucleus with N=16 neutrons. The neighbouring nucleus ^{24}O has 2 more protons, and is known to be stabilised by the N=16 neutron energy gap.

However, theoretical calculations suggest a weakening of this energy gap for carbon isotopes.

An experiment was carried out by a collaboration led by the University of Santiago de Compostela, Spain, and Surrey, Great Britain, on the LISE spectrometer, for the production of ^{16}C. A deuterium target was used to induce neutron capture reactions (d,p) to produce ^{17}C in excited states. The reaction pathways and excited states were identified using TIARA and EXOGAM. An excited state corresponding to a neutron occupation in an orbital similar to that which characterizes N=16 in ^{22}C was identified. This state is present even above the neutron evaporation threshold, and the measured spectroscopic factors suggest that the N=16 energy gap is maintained under conditions of increased proton/neutron imbalance, in contradiction with the theoretical expectations.

→ Read the article

UPCOMING MEETINGS AND EVENTS

August 25th-28th
Teachers at GANIL
https://indico.in2p3.fr/event/35763/

Sept 22th-26th
European Nuclear Physics Conference 2025
https://indico.in2p3.fr/event/30430/

Sept 17th
Scientific partners committee

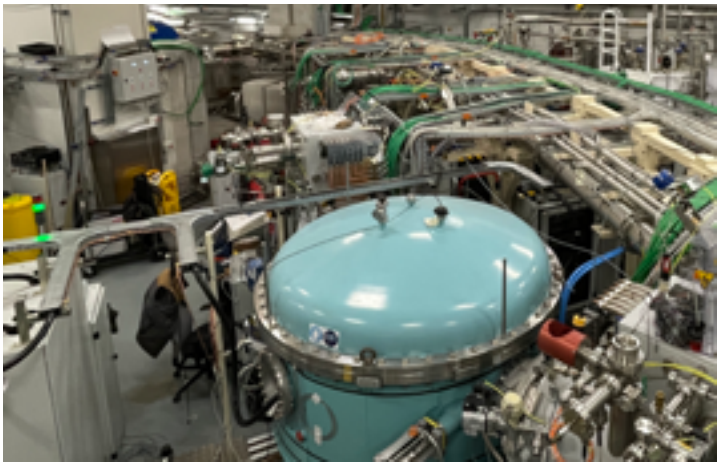
Sept 15th-19th
Agata week @GSI
https://indico.in2p3.fr/event/35264/

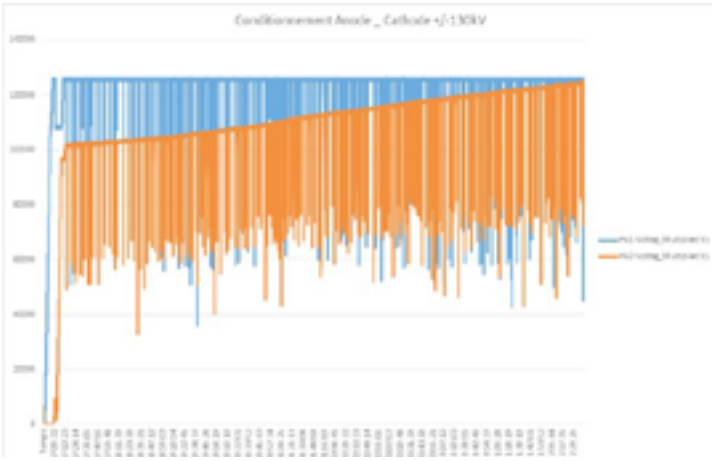
S^3 SMT6 magnet repair: a fruitful collaboration

One of the spectrometer's 7 SMT magnets suffered a conductor break in the helium chamber. After meticulous opening, the repair was prepared in detail, with the support of experts from DACM (Saclay). The aim was to replace a section of low-temperature superconductor to restore electrical continuity, while preserving vacuum and helium tightness and low-temperature tightness, without polluting the gas circuit. After a year of effort and a delicate repair, SMT#6 has been closed and secured thanks to the addition of an additional helium level probe. The entire system will be validated during the cooling phase in the last quarter of 2025. Congratulations to all the involved teams.

The electrical dipole of S^3 has reached its voltage for the next milestone J6B

The electric dipole was conditioned to +/-130 kV (260kV between electrodes). This voltage is required for the optical commissioning of S^3 with a $^{40}Ar14+$ beam at 0.73 MeV/u planned for milestone J6B. This work was carried out by the IJCLab team with the support of the GANIL teams. The next step is to continue this conditioning at +/- 200 kV (milestone J6C).





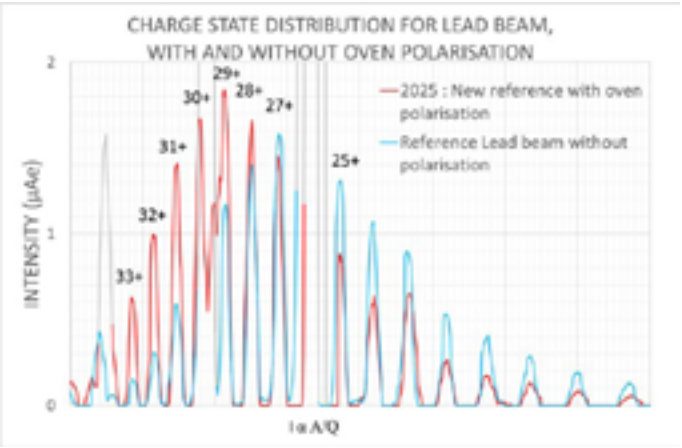
The target laboratory of GANIL (PALAIS project) is evolving

Financed by the Normandy Region, 3 new evaporators are renewing the very old fleet of machines and will enable us to produce the large number of targets required for S^3. After a few modifications, this laboratory will be fully operational by the end of August. Many thanks to all those involved.

Ion source optimisation for metallic beam

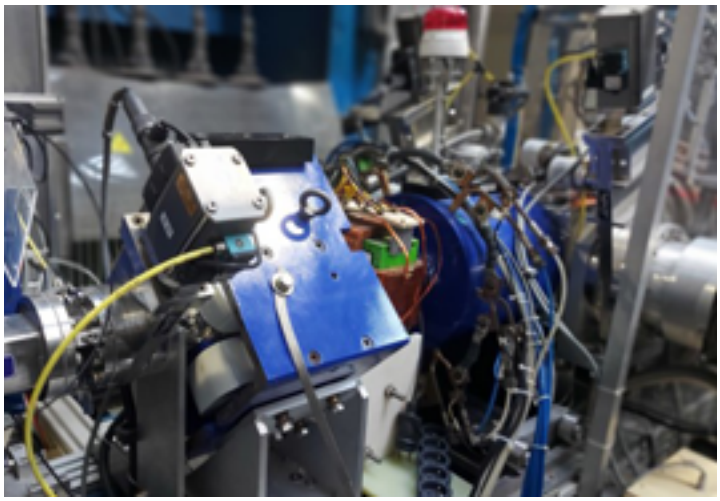
Studies on optimizing the ion sources at GANIL have led to technical adjustments enabling the polarization of evaporation ovens.

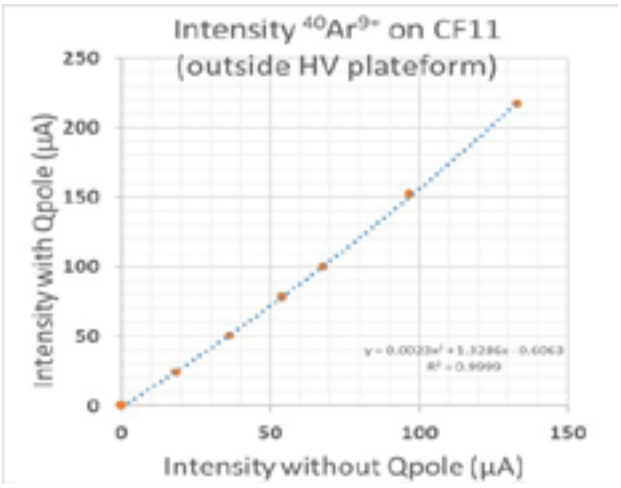
This modification improves beam extraction, particularly for highly charged ions, resulting in a significant increase in their intensity and a reduced consumption of samples.



Ion source extraction optimisation on Injector 1

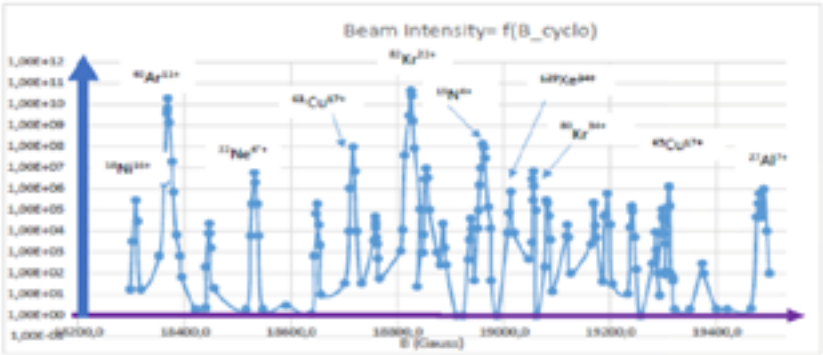
A new quadrupole was integrated into the ion source extraction line on injector 1. Its effect is to better compensate for the space charge and to improve transport in the accelerator tube at the output of the high-voltage platform. The results show gains in beam intensity of up to more than 50%, particularly for intense beams.





New cocktail beam at the CIME cyclotron

A beamline downstream CIME is under study to perform testing of electronic components. About 10 ion beams at the maximal energy will have to be adjusted in less than 10 minutes per beam for industrial applications. A team of 15 cyclotron experts successfully optimized and identified 24 ion types at 16.5 MeV/u by varying CIME's magnetic field.



Find all the issues of the newsletter on the GANIL website

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