

## ANR ACCLAIM Kick off meeting: 20<sup>th</sup> November 2025- Caen

Project N° **ANR-25-CE31-4222**

**Acting Scientific and Technical Officer** : Pierre Delahaye (GANIL)

Dates : 01/10/2025 – 30/09/2029 (48 months)

**French Partners:**



**International Partners:**



## WP1 : Management

**Steering Committee  
international members:**

- I Moore
- R De Groote
- A Falkowski

### I. Presentation of the WP dedicated to the management A

#### a) Members of WP1

- Pierre Delahaye (Coordinator)
- Leendert Hayen (Scientific leader@LPC)
- Nathalie Lombardie (Project Admin.@LPC Caen)
- Sabrina Lecerf (responsible for task WP1.1 project management with PI)
- Magali Tencé (responsible for task WP1.2 Dissemination)

#### b) Tasks of WP1

- Takes in charge all links with the ANR (scientific & financial reportings, other administrative documents ...),
- Takes in charge the follow up of the WPs (milestones & deliverables)
- Organises annual meetings to follow the project with the MORA steering committee,
- Prepares final reports to ANR (with participation of all partner labs),
- dissemination & scientific communication (sl3)

b) Tasks of WP1

- Dissemination of scientific and technical results
- Internal screens, newsletters and website GANIL
- Participation in annual events : Science festival, FENO, international Global Photowalk 2025...
- Events organisation : Open days, scientific mediation show
- Communication on LinkedIn
- MORA website

## Mora website page



[Click here for the latest achievements](#)

### Summary of the project

Searching for hints of CP violation in the radioactivity of polarized ions: the MORA project

Why are we living in a world of matter? What is the reason for the large matter-antimatter asymmetry observed in the Universe? The MORA (Matter's Origin from Radioactivity) project aims at answering this question by measuring the degree of polarization of ions in the trap after a laser system based on 1000 cavities. The MORA project started in 2018 [1]. The 2° collaboration offers the possibility to search for new CP violating interactions in a region that is less accessible by STM searches, in particular via the Lippmann model.

With a sensitivity of 2° to 10°, the MORA apparatus will additionally permit to probe the P0 (Polar State Interactions) effects for the first time. Technically, MORA uses an innovative trap orientation method, which combines the high trapping efficiency of a transparent Paul trap with laser orientation techniques. Recent studies have shown that a polarization degree close to 100% could be obtained with <sup>10</sup>Mg ions in the trap after a laser system based on 1000 cavities. The transparent Paul trap and beam optics have been designed with numerical methods to optimize the trap performances while maximizing large solid angles for the detection of the charged particles emitted during the decay. The tests of the detector setup are progressing. The MORA apparatus will be first commissioned in the ISOL5, beam line at JYFL, where the laser system is readily available, before moving back to GANIL, where its nominal sensitivity to New Physics will eventually be obtained with the intense beams of SPIRAL 1.

[1] P. Deléglise et al., arXiv:1812.03875, proceedings of the TOP 2018 conference, hep-ex/1812.03875.



Matter - antimatter imbalance in the universe



The MORA trap and detection setup



## News on GANIL website



### NEWS & HIGHLIGHTS



NOVEMBER 2, 2020  
First measurement of the degree of polarization of radioactive ions with the MORA experiment



OCTOBER 16, 2020  
Navin ALAVARI named a Fellow of American Physical Society APS 2020



OCTOBER 1, 2020  
Measurements at SPIRAL2 for Nuclear Medicine



OCTOBER 1, 2020  
A look back at the European Nuclear Physics Conference 2020

### EVENTS

NOVEMBER 21, 2020 - 10:30  
Development of GPU-Accelerated Particle Tracking Code MISTRACKO-CUDA for Studies of Collective Effects in Circular Accelerators  
Room 105, GANIL, Caen (France)  
[Read more](#)

CONFERENCE  
JUNE 16 + 17, 2020  
ICDOR 2020  
GANIL, Caen (France)  
[Read more](#)

NOVEMBER 21, 2020 - 10:30  
Asymmetric fission study in the lead-island region  
Room 105, GANIL, Caen (France)  
[Read more](#)

Par Magali Terrot • 06/11/2025

**GANIL**  
2 178 abonnés  
2 ans

L'expérience MORA, coordonnée par le GANIL, vient de franchir une étape décisive avec la première mesure du degré de polarisation d'ions radioactifs <sup>10</sup>Mg dans son piège, réalisée à l'installation K50L de l'Université de Jyväskylä (Finlande). Ce résultat, publié dans *European Physical Journal A*, constitue la première démonstration expérimentale de la polarisation laser d'ions radioactifs piégés dans un piège de Paul transparent.

En savoir plus : <https://fr.wikipedia.org/wiki/MORA>

CEA CNRS

**GANIL**

Première mesure du degré de polarisation d'ions radioactifs avec l'expérience MORA



Stéphane PUPIN et 50 autres personnes

5 publications

## Scientific news on the IN2P3/CNRS website



### Première mesure du degré de polarisation d'ions radioactifs avec l'expérience MORA

21 novembre 2020

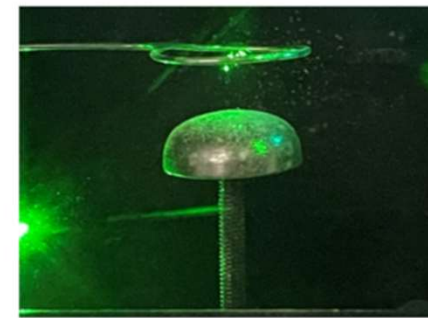
RESEAUX SCIENTIFIQUES PHYSIQUE NUCLEAIRE

L'expérience MORA, coordonnée par le GANIL, vient de franchir une étape décisive avec la première mesure du degré de polarisation d'ions radioactifs <sup>10</sup>Mg dans son piège, réalisée à l'installation K50L de l'Université de Jyväskylä (Finlande). Ce résultat, publié dans *European Physical Journal A*, constitue la première démonstration expérimentale de la polarisation laser d'ions radioactifs piégés dans un piège de Paul transparent.

**Qu'est-ce que MORA ?** Matter's Origin from Radioactivity vise à rechercher une violation de la symétrie fondamentale dite CP dans la désintégration des ions <sup>10</sup>Mg par émission d'un positron (l'ion <sup>10</sup>Mg est une particule susceptible d'acquiescer l'expérience entre la matière et l'antimatière observée dans l'univers). Elle est basée sur la mesure de la corrélation angulaire entre le moyen de recul de l'ion résiduel issu de la désintégration et le positron émis.

La mesure des angles entre les directions des particules issues de la réaction requiert que les spins des ions radioactifs soient tous orientés dans la même direction. Ils doivent être polarisés. Pour cela, l'expérience MORA utilise un piège de Paul transparent qui permet la polarisation des ions par leur interaction avec des faisceaux lasers pulsés. Grâce au piégeage des ions, la méthode de polarisation permet une efficacité supérieure de plusieurs ordres de grandeur à celle obtenue dans les techniques classiques de piégeage d'atomes neutres (pièges magnétiques-optiques). Comme dans ces derniers, le dispositif MORA permet une exposition prolongée des ions aux faisceaux lasers, conduisant à une forte polarisation.

## Demonstration at the Science festival



## I. Presentation of the WP dedicated to the management ANR ACCLAIM

### c) Delivrables & Milestones

#### **Deliverables :**

D1.1 Data Management Plan (01/04/2026)

D2.1 Update of Data Management Plan (01/10/2027)

D3.1 Final scientific report to ANR (30/09/2029)

D4.1 Final Data Management Plan (30/09/2029)

#### **Milestones :**

M1.1.1 Annual report (30/09/2026)

M1.1.2 Annual report (30/09/2027)

M1.1.3 Annual report (30/09/2028)

M1.2 Participation to annual events

## II. Framework of the project

### a) Work Packages (Project Breakdown Structure)

| Milestone / Deliverable number                          | Description   |
|---|---|
| <b>WP1: project management</b>                          |   |
| M1.1  | Annual reporting  |
| D1.1  | Final report  |
| M1.2  | Participation to annual events  |
| <b>WP2: Intense Ca beams</b>                            |   |
| M2.1.1  | Design for new target ion source ready                                      |
| M2.1.2  | Summary report on first online tests  |
| M2.1.3  | Summary report on second online tests                                       |
| D2.1  | Report on results achieved  |
| D2.2  | Thin Ca target ready  |
| <b>WP3: Ion bunching, stacking and separation</b>       |   |
| M3.1.1  | High intensity buncher design completed                                     |
| M3.1.2  | Starting offline commissioning of buncher at LPC Caen                       |
| M3.1.3  | High intensity buncher moved to DESIR                                       |
| D3.1  | High intensity buncher performance report                                   |
| M3.2.1  | Design for stacking trap for beam purification completed                    |
| M3.2.2  | Stacking trap constructed   |
| M3.2.3  | Stacking trap in operation at IGISOL  |
| D3.2  | Stacking trap for purification: performance report                          |
| <b>WP4: Polarisation and sensitivity of measurement</b> |   |
| M4.1.1  | Design of mirror system completed   |
| M4.1.2  | Mirror system operational at IGISOL   |
| D4.1  | Report on performance of mirror system                                      |
| M4.2.1  | Report on systematic effects due to transverse polarization                 |
| M4.2.2  | Full correction of systematic effects                                       |
| D4.2  | Report on analysis and sensitivity on D from purified <sup>39</sup> Ca beam |
| M4.3  | Uncertainty on theoretical corrections: status of investigation             |

## II. Framework of the project

### b) Delivrables & Milestones of all WPs

| Year                                       | 1 (starting fall 2025) |        |        |   | 2      |      |        |   | 3 |      |        |   | 4 |      |      |   |
|--|------------------------|--------|--------|---|--------|------|--------|---|---|------|--------|---|---|------|------|---|
| Task \ Trimester                           | 1                      | 2      | 3      | 4 | 1      | 2    | 3      | 4 | 1 | 2    | 3      | 4 | 1 | 2    | 3    | 4 |
| Project management                         |                        |        | M1.1   |   |        |      | M1.1   |   |   |      | M1.1   |   |   |      | D1.1 |   |
| Dissemination                              |                        | M1.2   |        |   |        | M1.2 |        |   |   | M1.2 |        |   |   | M1.2 |      |   |
| Production of Ca beams at SPIRAL 1         |                        | M2.1.1 |        |   |        |      | M2.1.2 |   |   |      | M2.1.3 |   |   |      | D2.1 |   |
| Ca target for IGISOL                       |                        |        | D2.2   |   |        |      |        |   |   |      |        |   |   |      |      |   |
| High intensity buncher for SPIRAL1 beams   | M3.1.1                 |        |        |   |        |      | M3.1.2 |   |   |      | M3.1.3 |   |   |      | D3.1 |   |
| Stacking trap for purified beams at IGISOL |                        |        | M3.2.1 |   |        |      | M3.2.2 |   |   |      | M3.2.3 |   |   |      | D3.2 |   |
| Control of polarisation                    | M4.1.1                 |        |        |   |        |      | M4.1.2 |   |   |      | D4.1   |   |   |      |      |   |
| Analysis of Data                           |                        |        |        |   | M4.2.1 |      |        |   |   |      | M4.2.2 |   |   |      | D4.2 |   |
| Theoretical corrections                    |                        |        |        |   |        |      | M4.3   |   |   |      |        |   |   |      |      |   |
| Preparation                                |                        |        |        |   |        |      |        |   |   |      |        |   |   |      |      |   |
| Ongoing task                               |                        |        |        |   |        |      |        |   |   |      |        |   |   |      |      |   |
| Operation                                  |                        |        |        |   |        |      |        |   |   |      |        |   |   |      |      |   |



## II. Framework of the project

### b) Allocated budget partners

Budget was slightly increased

- cover the Ti:Sa cavity (15k€)
- updated staff expenses

➔ still remain in the 7% allowed limit

|  | Partner<br><i>GANIL</i> | Partner<br><i>LPC Caen</i> | Partner<br><i>JYU</i> | Partner<br><i>KU Leuven</i> |
|--|-------------------------|----------------------------|-----------------------|-----------------------------|
| Staff expenses, including costs of a partial release from teaching obligations in a JCJC project | 279 260                 | 0                          | N/A                   | N/A                         |
| Instruments and material costs   | 65 000                  | 220 000                    | N/A                   | N/A                         |
| Building and ground costs  | 0                       | 0                          | N/A                   | N/A                         |
| Outsourcing / subcontracting   | 0                       | 0                          | N/A                   | N/A                         |
| Overheads costs  | 25 000                  | 15 000                     | N/A                   | N/A                         |
| Administrative management & structure costs**  | 49 850.10               | 31 725                     | N/A                   | N/A                         |
| <b>Sub-total</b>   | <b>419 110,1 €</b>      | <b>266 725 €</b>           | <b>N/A</b>            | <b>N/A</b>                  |
| <b>Requested funding</b>   | <b>685 835,1</b>        |                            |                       |                             |

**GANIL** : PhD student 3 years: 138k€ (Ca beam development for SPIRAL1)

Postdoctoral researcher 24 months: 141.3 k€ (Systematic effects and Data analysis)

**LPC Caen**: no staff expenses