



# **GATE:** Gamma-ray Arrays Traveling for the European Community

## An Initiative for Training and Knowledge Transfer

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## To provide service improvements for Nuclear Physics research infrastructure

### Physics:

To understand key scientific problems related to nuclear structure and reaction dynamics:

- ▶ Shell structure evolution far from stability.
- ▶ Exotic shapes and excitations.
- ▶ Nuclear symmetries.
- ▶ Dissipative processes.
- ▶ The nuclear equation of state.
- ▶ Reactions and decays related to fundamental symmetries and QCD phenomena.

Explored in-depth in the NuPECC LRP (2024) & ALFA LoI.

### Approach:

To optimize the use of equipment and expertise of the nuclear community by identifying overlapping areas of interest and connect physics clusters with open dialogue. To combine efforts and resources developing instrumentation and techniques for frontline research.

**GATE** is created to promote:

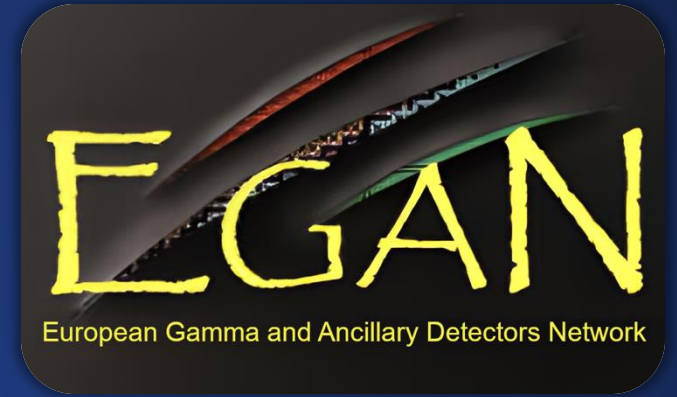
- ▶ The coordinated planning of experimental setups at the European TA RI (ALFA labs).
- ▶ Improved access to experimental equipment.
- ▶ Improved access to experimental data following FAIR principles.
- ▶ **The pooling & sharing of detectors with the wider community.**
- ▶ Training on maintenance of shared travelling detectors.
- ▶ The training of new users & experts in novel techniques.
- ▶ The dissemination of scientific and technological knowledge.
- ▶ **Encourage the development of synergies and new detector developments with the wider scientific community (Hadronic Physics).**

# Our History and Origin: EGAN, NUSPIN & INTRANS



Successfully delivering on several key goals:

- ▶ Promotion and Coordination of scientific and technological activities for frontline research.
- ▶ Exchange of knowledge and transfer of expertise between the working groups and towards young researchers.
- ▶ Optimization of the use, construction and maintenance of the resources.






# Previous InTraNS Events


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**Several successful schools and workshops have been held under InTraNS:**

**2023:**

 AGATA Analysis School - LNL (Italy), 10<sup>th</sup> -15<sup>th</sup> Sept.


**2024:**

 InTraNS 2024 Workshop - IJCLab (France), 22<sup>nd</sup>-25<sup>th</sup> Jan.

 Detector Training Workshop - LNL-INFN (Italy), 2<sup>nd</sup> -6<sup>th</sup> Sept.

**2025:**

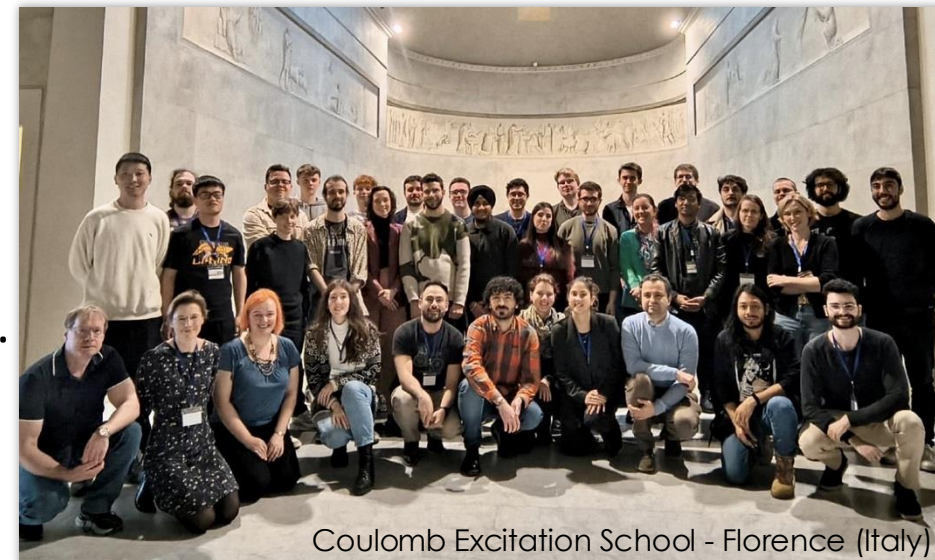
 AGATA Analysis School - IP2I -Lyon (France), 13<sup>th</sup>-17<sup>th</sup> Jan.

 Coulomb Excitation School - Florence (Italy), 27<sup>th</sup> -30<sup>th</sup> Jan.

 Decay Spectroscopy Workshop at RIKEN - (Spain), 27<sup>th</sup>-28<sup>th</sup> March.

 Germanium Detector School - Liverpool (UK), 7<sup>th</sup>-11<sup>th</sup> April.

**In total around 250 participants across Europe.**



Under **GATE** we propose splitting our work into 3 principal tasks:

► **Task 1: Campaign Organization & Support; ( $3 \times 20$  k€)**

*Maximising the physics utilization of nuclear facilities in Europe.*

► **Task 2: Working Groups Workshops/Courses;**

*Training for the next generation of researchers.*

► **Task 2.1: Training Courses; ( $3 \times 15$  k€)**

► 3 courses for specialized training.

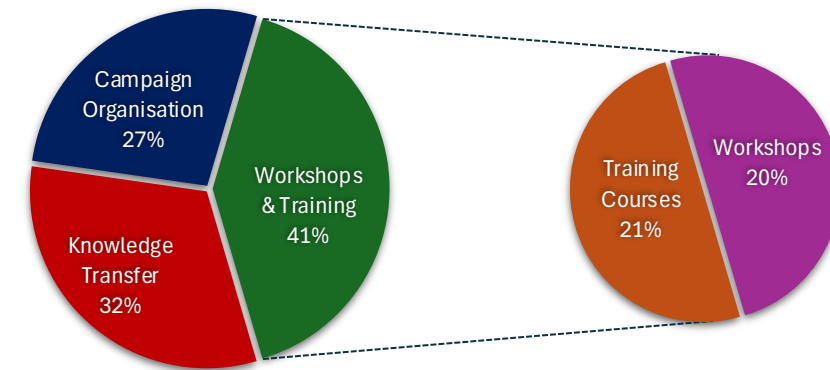
► **Task 2.2: Hands-on Workshops; ( $3 \times 15$  k€)**

► 3 workshops for hands-on training of practical detector aspects.

► **Task 3: Dissemination of Knowledge; (70 k€)**

*Sharing of technological expertise and transfer of knowledge.*

Proposed Costings of **GATE**



Task	Description	Estimated cost (€)
1	Campaign Organisation	60,000
2.1	Training Courses	45,000
2.1	Technical Workshops	45,000
3	Knowledge Transfer	70,000
Total cost		220,000

Acknowledging the 80% funding of eligible costs, conforming with Ares(2022)3456777

## ***Maximising the physics utilization of nuclear facilities in Europe (3 × 20 k€)***

For this task, we propose to organize annual meetings between the management of the nuclear spectroscopy collaborations and the directorate of the hosting infrastructures to ensure the best exploitation of the opportunities provided by the different infrastructures; to coordinate timelines and optimise the distribution of the resources for physics campaigns.

We also offer our services for the organization of workshops to discuss physics opportunities and perspectives for the future of the field.

***Training for the next generation of researchers, ready to exploit in the best way all the essential tools needed for their research.***

## **Organization of training schools ( $3 \times 15 \text{ k€}$ )**

- ▶ The courses will cover the most important and useful subjects and techniques for nuclear spectroscopy, from hardware aspects to software tools, data access (FAIR) and management as well as data-analysis techniques of relevance to the investigation of the physics topics of interest.

## **Organization of hands-on workshops ( $3 \times 15 \text{ k€}$ )**

- ▶ Allowing the experts in detector technologies to share their knowledge and expertise in detector fabrication and maintenance, reducing the risk of exposure by the retiring experts and improving sustainability.

Such a dissemination of information will benefit the physics campaigns of the community of ~500 spectroscopists.



## ***Sharing of technological expertise and transfer of knowledge through the exchange of technical experts between infrastructures and research institutions.***

High-performance  $\gamma$ -ray spectroscopy is reliant on several specialised fields, The loss of critical personnel & expertise would be a major setback to their operation. This task aims to disseminate their knowledge and improve sustainability. In scenarios where transfer of hands-on skills are required, this task allows for technical experts to do on-site teaching at TA facilities, reducing technical risk by establishing new foundations of expertise.

- ▶ In scenarios where knowledge can be recorded, this task allows for the development of comprehensive documentation that conforms to the FAIR principles.
- ▶ This task allows for cross-cluster collaboration with the wider scientific community.

# Participants & Beneficiaries

## List of Partner Institutes:

GANIL, IJCLab, GSI/FAIR, LNL-LNS, U-Liverpool, IFIC Valencia

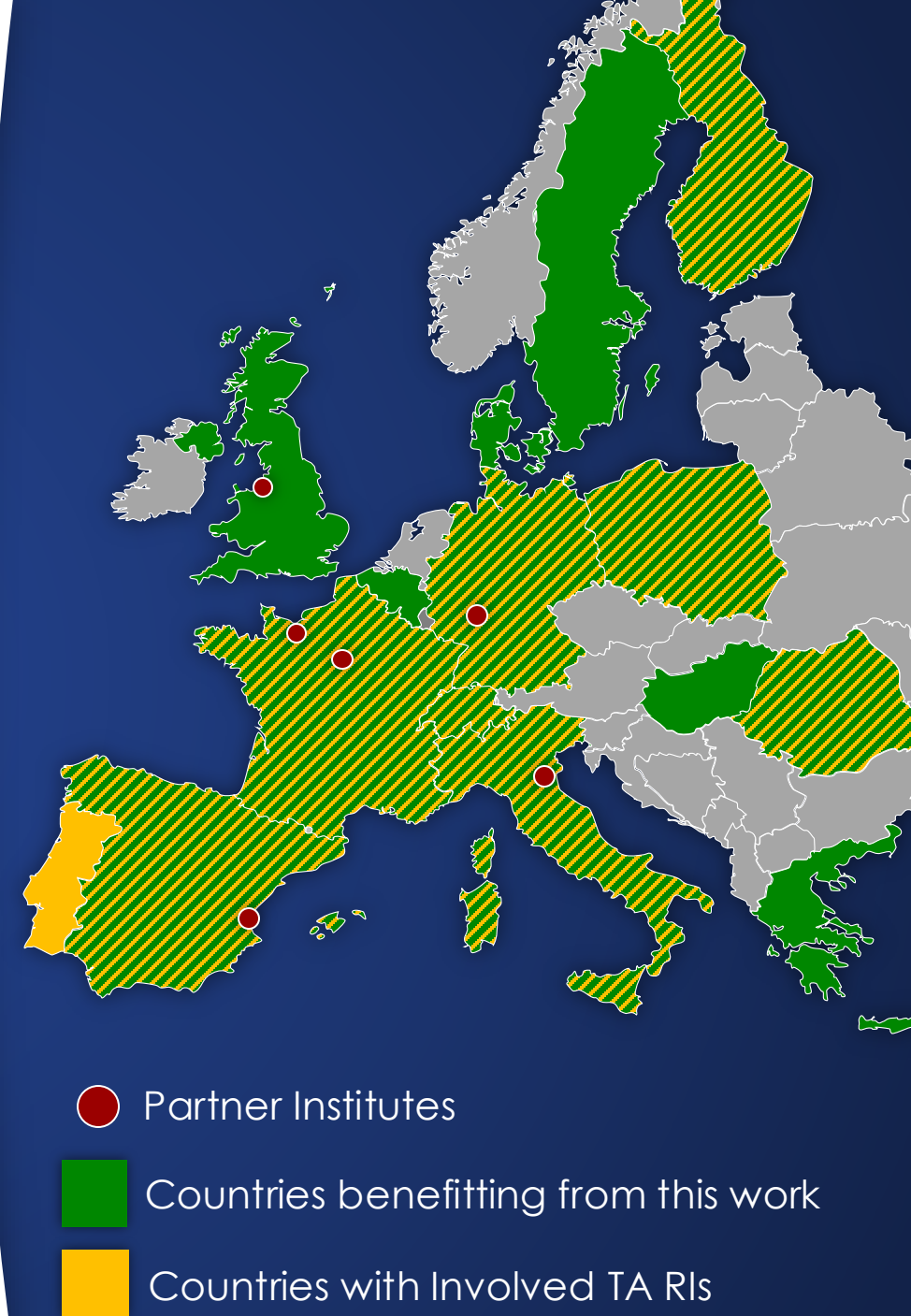
## The institutions involved in this proposal are:

INFN (LNL, LNS, Padova, Milano, Firenze, Napoli, Catania, Perugia), IN2P3, CNRS, ICEA, GANIL, IRFU, IJCLab-Orsay, IP2I-Lyon, IPHC-Strasbourg, JLU, FAIR/GSI, U-Köln, TU-Darmstadt, STFC Daresbury, U-Liverpool, U-Manchester, U-Birmingham, U-Surrey, U-York, U-West Scotland, U-Lund, KTH Stockholm, U-Uppsala, JYFL, HIL-Warsaw, U-Warsaw, IFJ-PAN Krakow, NIPNE Bucharest, ININ-HH/ELI-NP, Demokritos-Athens, IFIC-Valencia, U-Huelva, UAM-Madrid, U-Huelva, U-S. de Compostela, GFN-U-Complutense-Madrid, U-Salamanca, IEM-CSIC, ATOMKI-Debrecen, HIM, KU Leuven, UMAN, INRNE-BAS, UCO, LMU

## Connection to RIs with TA:

- CERN – ISOLDE and *n*-TOF
- FAIR/GSI (ESFRI)
- INFN – LNL and LNS
- IN2P3 – IJCLab infrastructures
- Consortium - IABA (CNA Seville/CMAM Madrid), ATOMKI Debrecen, IST Lisbon
- GANIL-SPIRAL2 (ESFRI)
- ELI-NP / IFIN-HH (ESFRI)
- JYFL-ACCLAB
- NLC Consortium - HIL Warsaw, IFJ/CCB

Additional beneficiaries outside of Europe (e.g. iThemba, RIKEN)



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## Thanks for your attention

### Any Questions?



## Scope:

*Horizon Europe - Work Programme 2025*

This topic aims at providing trans-national access (on-site or remote) and/or virtual access to integrated and customised research infrastructure services for curiosity-driven research in wide scientific domains, offered by a wide range of complementary and interdisciplinary top level research infrastructures. Given the funding rate, the topic also aims at fostering the sustainability of the access scheme. Proposals are expected to address one domain area and must explicitly state which area they address.

The scientific domains covered under this topic are:

- ▶ ~~Area 1: Environment: atmospheric chemistry and dynamics.~~
- ▶ **Area 2: Physical sciences and engineering: hadron physics.**

For Area 2, proposers should fully exploit transversal links to and identify common developments with neighbouring communities within the field of particle and nuclear physics building on the work of recent Horizon projects where applicable.

Access also includes ad hoc users' training and scientific and technical support. Training courses for using the infrastructures may also be supported. Training courses and ad hoc users' training will prepare the new generations of researchers to properly exploit leading-edge research infrastructures and should provide them with appropriate skills for data stewardship.

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***This topic will not support longer-term R&D for new instrumentation, tools, methods and advanced digital solutions.***

## *Direct costs for providing trans-national or virtual access to the installation:*

- ▶ ***Personnel cost of administrative, technical and scientific staff directly assigned to the functioning of the installation and to the support of the users.***
- ▶ *Costs of contracts for maintenance and repair (including specific cleaning, calibrating and testing) specifically awarded for the functioning of the installation (if not capitalised).*
- ▶ *Costs of consumables specifically used for the installation and the research work of the users.*
- ▶ *Costs of contracts for installation management, including security fees, insurance costs, quality control and certification, upgrading to national and/or EU quality, safety or security standards (if not capitalised) specifically incurred for the functioning of the installation.*
- ▶ *Costs of energy power and water where it can be verified as being supplied exclusively for the installation and as being a major cost item for the installation.*
- ▶ *Costs of general services when they are specifically included in the provided access services (e.g. library costs, shipping costs).*
- ▶ *Costs of software licence, internet connection or other electronic services for data management and computing when they are needed to provide access services.*
- ▶ ***Costs of specific scientific services included in the access provided or needed for the provision of access.***

***“This topic will not support longer-term R&D for new instrumentation, tools, methods and advanced digital solutions.”- Horizon Europe - Work Programme 2025***



# Hadronic Physics Facilities

Several Hadronic Facilities utilising  $\gamma/X$ -ray detectors could benefit from collaboration with Nuclear Instrumentation, to name a few:

- ▶ INFN-LNF: DAΦNE & SIDDHARTA-2
- ▶ CERN:  $n$ -TOF & ISOLDE
- ▶ GSI/FAIR: ESR & CRYRING
- ▶ GANIL: NFS
- ▶ ELI: ELI-NP

Significant development in fast-timing with FATIMA, low-noise preamplification, Pulse Shape Analysis (PSA) with AGATA.



Following the success of the previous schools we propose the following topics, to align with the shared goals of Hadronic & Nuclear physics.

## **Schools & courses**

- ▶ High-rate processing & analysis ( $n$ -TOF)
- ▶ Simulation schools (GEANT, SSLG4)
- ▶ High multiplicity studies
- ▶ Coulomb excitation
- ▶ Data Analysis & Access (FAIR)

## **Hands-on Workshops**

- ▶ Detector Fabrication (AGATA, FATIMA, ALICE, LHCb)
- ▶ Cryostat Development

**INFRA-SERV** - Research infrastructures services to support health research, accelerate the green transition and the digital transformation, and advance frontier knowledge the access to RIs, to support transnational access to state-of-the-art facilities for researchers, relevant for a large research domain or in support of societal challenge and EU priorities.

**INFRA-TECH** - Next generation of scientific instrumentation, tools, methods, and advanced digital solutions of research infrastructures and foster innovation and co-creation with industry, to support research infrastructure needs for technology development to maintain and upgrade their services and to create new ones, and to support the Destination Earth initiative.

*Justification on why an output or result-based approach is not possible or appropriate*

- ▶ *The contribution from the Union budget is being used to reimburse costs for providing transnational or virtual access, and not the action for which the access is being used. Therefore, the union contribution is not related to a specific output or result, and it is therefore not possible or appropriate to base the use on these.*

*DECISION authorising the use of unit costs for the costs of providing trans-national and virtual access in Research Infrastructures actions under the Horizon Europe Programme and the Research and Training Programme of the European Atomic Energy Community - Ares(2022)3456777*