



## JRC TECHNICAL REPORTS

# EUFRAT, Open Access to the nuclear research infrastructure at JRC Geel

*Summary report 2017 - 2018*

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## **Abstract**

Open access activities to the nuclear research facilities operated at the Joint Research Centre (JRC) in Geel are reported. These activities are carried out by the unit Standards for Nuclear Safety, Security and Safeguards of the Directorate for Nuclear Safety and Security as part of its work programme. The open access activities at JRC Geel run since 2014 as an institutional programme under the EURATOM work programme. In 2017 the JRC decided to start a JRC-wide open access scheme to its research infrastructure co-ordinated by the Directorate for Strategy, Work Programme and Resources. The transition to a JRC-wide open access scheme is discussed and the results of the first two calls for proposals during 2017 and 2018 are summarised.

## **1 Introduction**

The unit Standards for Nuclear Safety, Security and Safeguards (SN3S unit or JRC.G.2) of the Directorate for Nuclear Safety and Security (JRC.G) of the JRC operates in Geel (Belgium) a nuclear research infrastructure, which is dedicated to accurate measurements of nuclear reaction and decay data. These measurements serve mainly the needs for safe operation of nuclear reactors, safe handling of nuclear waste and radiological protection for the safety of the citizen and the environment. They are also of importance for non-energy applications such as medical radionuclide production, materials research and cultural heritage.

Since 2005 the SN3S unit offers, within the EURATOM work programme, access to its nuclear facilities at JRC Geel for external users. In the period between 2005 and 2012 the open access scheme was running with support from the Directorate General for Research and Innovation (DG RTD) through the indirect actions NUDAME and EUFRAT. Since the beginning of 2014 the open access scheme was running as part of the direct actions of the JRC.

In 2017 the JRC decided to start a JRC-wide open access programme to its Research Infrastructure (RI) co-ordinated by the Scientific Development unit (JRC.A.5) of the Directorate for Strategy, Work Programme and Resources. Three pilot projects were selected in 2017, with the EUFRAT project, offering open access to the nuclear facilities at JRC Geel, as the only nuclear project.

The JRC-wide open access scheme provides access to the JRC RI according to two different modes: relevance-driven and market-driven. Market-driven access is granted upon payment of a fee covering the full access costs of the JRC. It is mainly targeted at industry. Relevance-driven access is exclusively dependent on scientific and socio-economic relevance at European level. It is based on a peer-reviewed selection by a User Selection Committee (USC) following a call for proposals.

The JRC opens access to its nuclear RI only through the relevance-driven mode. This access is offered free of charge, that is, without payment of the additional costs related to the access and operation of its facilities. The JRC nuclear RI is open to EU Member States (MS), candidate countries and countries associated to the EURATOM Research Programme Horizon 2020. The details of the calls for proposals together with their regulations can be found in Ref. [1].

Access of users to the JRC nuclear RI is fully in line with the European Charter for Access to Research Infrastructures defined by DG RTD [2]. It is regulated by the "Framework of Access to Joint Research Centre physical Research Infrastructures" ('Framework for access') [3]. It requires a Research Infrastructure Access Agreement (RIAA) [4] that details the organisation and management of the project and covers any necessary technical and legal aspects. Physical access of users to the JRC is regulated by the User Access Agreement (UAA) [5].

## 2 Implementation of open access to JRC Geel infrastructures

The nuclear facilities or laboratories at JRC Geel included in the open access scheme are:

- the GELINA facility, which combines a white neutron source produced by a linear electron accelerator with a high-resolution neutron time-of-flight facility;
- the MONNET facility for the production of continuous and pulsed proton-, deuteron- and helium ion beams, which is serving as a source of well characterised quasi-mono-energetic neutrons;
- the RADMET radionuclide laboratories, which are used for nuclear decay measurements; and
- a low-level radioactivity laboratory, which is hosted in the deep-underground facility HADES of the SCK•CEN.

### 2.1 User Selection Committee

A USC was established following the terms of reference specified in Ref. [6]. The present USC consists of four independent European experts and one representative of the SN3S unit acting as the chair (see Table 1). The USC members have been appointed in March 2018 for a minimum period of 2 years. After 2 years half of the independent experts need to be replaced. The remaining independent experts can continue their terms up to 4 years. The kick-off meeting of the USC was held on 7 March 2018.

Table 1 User Selection Committee (USC) evaluating the proposals for the JRC Geel nuclear infrastructures

Name	Organisation
Y. Aregbe	Joint Research Centre, JRC Geel (Belgium)
P. De Felice	Italian National Agency for New Technologies, Energy and Sustainable Economic Development, ENEA Casaccia (Italy)
D. Doré	Commissariat à l'Énergie atomique et aux Énergies alternatives, CEA Saclay (France)
V. Semkova	Institute for Nuclear Researches and Nuclear Energy, INRNE Sofia (Bulgaria)
L. Snoj	Jožef Stefan Institute, JSI Ljubljana (Slovenia)

The proposals are evaluated based on four criteria with grades ranging from 0 to 10. The guidelines for the grades are: 0 = irrelevant, 4 = poor, 8 = good, 10 = excellent. An overall grade based on a weighted average is calculated using the weights specified in Table 2. Proposals with an average grading for scientific implementation below 6 or an overall grade below 6 are rejected.

Table 2 Selection criteria together with their weights for the evaluation of proposals for access to nuclear infrastructures at JRC Geel.

Criterion	Weight
1	Scientific implementation
2	Collaboration and access to new users
3	Strategic relevance to JRC
4	Strategic relevance for Europe

## 2.2 Submitted proposals

Two calls for proposals were opened and published during 2017 - 2018. Relevant dates of these calls are summarised in Table 3. In total 32 proposals were submitted. This is about 20 % more compared to the average number of submitted proposals per call during the period 2014-2016. The proposals were first screened for eligibility by JRC.A.5. Three proposals were considered as not eligible due to the involvement of a user that is not within one of the EU Member States (MS), candidate countries or countries associated to the EURATOM Research Programme. Unfortunately, some of these users are key organisations in their field worldwide. For example, proposals for cross section measurements at GELINA that involve the Oak Ridge National Laboratory (ORNL) as a provider of isotopically enriched samples, even without any additional cost, are not eligible. The production of well characterised isotopically enriched samples is a very complex process and ORNL is one of the few laboratories worldwide that can produce them. Therefore, the USC recommended that the present eligibility rule should be re-evaluated. They suggested that only the lead user should be subject to this eligibility rule. Unfortunately, this suggestion was not accepted by Directorate A.

Table 3 Time line of the call for proposals during 2017 and 2018.

Call identifier	Opening	Closure	USC meeting	Communication evaluation results
2017-1-RD-EUFRAT	07/12/2017	07/03/2018	07/03/2018	18/06/2018
2018-1-RD-EUFRAT	27/07/2018	15/10/2018	22/11/2018	07/12/2018

## 2.3 Result of the USC evaluation

The result of the evaluation by the USC is summarised in Table 4. Two eligible proposals were refused, however, with a recommendation to resubmit them after discussing the technical details with the local contact of the specific facility of the RI at JRC Geel. The accepted proposals originate from 23 different lead users. Most of the proposals rely on a collaborative effort from organisations (universities, national research institutes or regulatory authorities) of different MS. The list of users is given in Appendix A. They involve the contribution of 34 organisations of 16 MS. Although open access to the nuclear RI at JRC Geel started already in 2005, about 60 % of these users have never performed experiments at the facilities before. The total number of proposals and new users demonstrate the increasing interest of external users in the nuclear RI at JRC Geel.

Table 4 Number of submitted, eligible and accepted proposals for the EUFRAT calls during 2017 and 2018

Call identifier/RI	Submitted	Eligible	Accepted
2017-1-RD-EUFRAT	20	17	15
GELINA	11	10	8
MONNET	1	1	1
HADES	6	4	4
RADMET	2	2	2
2018-1-RD-EUFRAT	12	12	12
GELINA	4	4	4
MONNET	2	2	2
HADES	4	4	4
RADMET	2	2	2

The scores of the accepted proposals are summarised in Table 5. The USC considered that most of the proposals are of high scientific value, important for nuclear technology developments and strategically relevant and complementary for the work programme of the Directorate for Nuclear Safety and Security. According to the USC the proposals include a well explained motivation and a detailed working, dissemination and exploitation plan. The USC considers the users of high quality. They are mostly composed of high level specialists combined with young researchers. About 70 % of the proposals involve experimental work that is part of a PhD thesis. This shows the importance of an open access scheme to support education and training activities in the nuclear field. The USC recognises that the majority of the experiments can only be performed at the highly specialised nuclear facilities of JRC Geel.

Most of the proposals are related to nuclear energy applications, with a strong link to the nuclear work programme of the JRC, in particular to projects ANDANTE (Accelerator-Based Nuclear Data Measurements and associated Applications in Nuclear Technology) and SARA (Science Applications of Radionuclides and Actinide Materials). These proposals will produce experimental data that will be incorporated in internationally recognised data libraries, such as the EXFOR library maintained by the Nuclear Energy Agency of the OECD, and will contribute to the production of international reference standards. Therefore they have a direct contribution to EU standardisation.

About 45 % of the proposals are in support to non-energy applications, such as cultural heritage, neutron imaging for materials research, testing of detectors and IT components, environmental studies using natural archives (corals), sustainable use of waste from NORM (Naturally Occurring Radioactive Material) industry and baseline studies in Antarctica of anthropogenic activities.

**Table 5 Summary of the evaluation by the USC of eligible proposals submitted for the calls during 2017 and 2018**

	Maximum	Total				
		1	2	3	4	
<b>2017-1-RD-EUFRAT</b>						
Average	8.66	4.24	1.94	1.40	1.07	
Standard deviation	0.31	0.15	0.13	0.10	0.05	
Minimum	8.10	4.00	1.70	1.20	1.00	
Maximum	9.20	4.50	2.10	1.50	1.10	
<b>2018-1-RD-EUFRAT</b>						
Average	8.36	4.08	1.87	1.35	1.07	
Standard deviation	0.45	0.30	0.10	0.07	0.05	
Minimum	7.30	3.40	1.70	1.20	1.00	
Maximum	9.00	4.50	2.00	1.40	1.10	

The USC endorses the initiative of the JRC to open its nuclear RI for access to external users. It acknowledges its importance for the development of science and new technologies, to boost competitiveness, to enhance the collaboration between scientists from different MS organisations and to provide training and capacity building. However, the USC raised a general concern that a minimum of permanent experienced scientific staff is required to guarantee high quality scientific supervision and collaboration with researchers from the MS organisations. In view of the high demand and unique role of JRC Geel facilities for the EU nuclear community, the USC recommends that the JRC guarantees the required human resources and scientific supervision to operate the facilities and provide scientific support.

### **3 Summary and conclusions**

The JRC-wide open access scheme to the nuclear RI at JRC Geel was discussed and the results of the first two calls for proposals offering access to the nuclear RI at JRC Geel were presented. This infrastructure consists of specialised facilities for nuclear reaction, radioactivity, radiation and technology studies in science and applications. The number of submitted proposals reveals a strong interest of MS organisations in these facilities. Most of the proposals are based on a collaborative effort and have a strong Education and Training component. The evaluation by the USC confirms the added value of the nuclear RI at JRC Geel and the important contribution of the open access scheme to the transfer of knowledge and capacity building, to foster collaboration between MS organisations and to standardisation of data. However, the USC also points out that this can only be realised by offering specialised nuclear facilities with an added value for MS organisations and by offering support by competent scientists who are recognised for their scientific knowledge, background and experience.

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## **List of abbreviations and definitions**

ANDANTE	Accelerator-based Nuclear Data Measurements and associated Applications in Nuclear Technology
CEA	Commissariat à l'Énergie atomique et aux Énergies alternatives
CERN	Organisation Européenne pour la Recherche Nucléaire
DG RTD	Direktorate General for Research and Innovation
EC	European Commission
ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EU	European Union
EUFRAT	European Facility for innovative Reactor and Transmutation Data
GELINA	Geel Electron Linear Accelerator
INRNE	Institute for Nuclear Researches and Nuclear Energy
IRMM	Institute for Reference Materials and Measurements
JRC	Joint Research Centre
JSI	Jožef Stefan Institute
MONNET	Mono-energetic Neutron Tower
MS	Member States
NORM	Naturally Occurring Radioactive Material
NUDAME	Nuclear Data Measurements at IRMM
ORNL	Oak Ridge National Laboratory
RADMET	Radionuclide Metrology
RI	Research Infrastructure
RIAA	Research Infrastructure Access Agreement
SARA	Science Applications of Radionuclides and Actinide Materials
SCK•CEN	Belgian Nuclear Research Centre
SN3S	Standards for Nuclear Safety, Security and Safeguards
UAA	User Access Agreement
USC	User Selection Committee

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## Appendix A.

Institute/organisaton	Country	RI Facility
Boulby Underground Laboratory	United Kingdom	HADES
Commissariat à l'Énergie atomique et aux Énergies alternatives CEA Cadarache	France	GELINA
European Organisation for Nuclear Research CERN	Switzerland	GELINA
Italian National Agency for New Technologies, Energy and Sustainable Economic Development ENEA Bologna	Italy	GELINA
Geological Survey of Denmark and Greenland	Denmark	HADES
Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering IFIN-HH	Romania	GELINA
Hungarian Academy of Sciences, Nuclear Analysis and Radiography Department MTA EK	Hungary	HADES
Hungarian Academy of Sciences, Institute for Nuclear Research MTA Atomki	Hungary	GELINA
Hungarian Academy of Sciences, Institute for Particle and Nuclear Physics, Wigner Research Centre for Physics MTA Wigner RCP	Hungary	HADES
Istituto di Fisica del Plasma, CNR	Italy	GELINA
Istituto Nazionale di Fisica Nucleare, Bologna INFN Bologna	Italy	GELINA
Istituto Nazionale di Fisica Nucleare, Legnaro INFN Legnaro	Italy	GELINA
Istituto Nazionale di Fisica Nucleare, Trieste INFN Trieste	Italy	GELINA
Institut de Radioprotection et de Sécurité Nucléaire, IRSN	France	GELINA
Jožef Stefan Institute JSI	Slovenia	GELINA
Katholieke Universiteit Leuven, KU Leuven	Belgium	MONNET
Laboratorio Subterráneo de Canfranc	Spain	HADES
National Academy of Sciences of Ukraine, Institute for Nuclear Research, Lepton Physics Department LPD KINR	Ukraine	HADES
National Centre for Scientific Research "Demokritos"	Greece	RADMET
National Physical Laboratory NPL	United Kingdom	MONNET
Physikalisch-Technische Bundesanstalt PTB Braunschweig	Germany	GELINA
Polish Academy of Sciences, Henryk Niewodniczanski Institute of Nuclear Physics	Poland	HADES
Science and Technology Facilities Council	United Kingdom	GELINA

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Swedish Radiation Safety Authority SSM	Sweden	HADES
Technical University of Denmark DTU	Denmark	HADES
Technical University of Dresden	Germany	HADES
Université de Strasbourg	France	GELINA
Università degli Studi di Milano-Bicocca, Dipartimento di Fisica "G. Occhialini"	Italy	GELINA
Università di Bologna	Italy	GELINA
Universität Bremen	Germany	HADES
University of Edinburgh, School of Physics and Astronomy	United Kingdom	GELINA
Universiteit Hasselt UHasselt	Belgium	RADMET
University of Ioannina, Department of Physics	Greece	MONNET
Uppsala University, Department of physics and astronomy	Sweden	MONNET

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